

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

Sem:V	Total Hours Distribution per week		
Total Credit: 03	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): 0 Hrs.
Subject Code	BTCVE501T	Name of Subject: Hydraulics Engineering	
Examination Scheme			
Internal Marks:		University Marks:	Minimum Passing Marks:
30 Marks		70 Marks	45 Marks
(15marks for sessional Examination)			3 Hours
(15 Marks for Activity based)			

Course Objective	
1	To know the boundary layer theory and concept of drag and lift
2	To understand the various losses occurring in pipe flow, various phenomenon occurring in this case
3	To compute uniform flow through open channel and understand the concept of specific energy
4	To analyse the gradual varied flow and hydraulic jump concept
5	To understand the design principle of various hydraulic machines likes turbines and pumps

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

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

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

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

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

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

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

31/10/15
Chaitanya G. Shenoi

A. N. Dabhadre
 (Dr. A.N. Dabhadre)
 BOS Member

~~_____~~
 (Dr. Avinash N Shrikhande,
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RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

FACULTY OF SCIENCE & TECHNOLOGY

B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

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

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

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

Shrihari
Center of Studies

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

Sem: V	Total Hours Distribution per week 3-1-0		
Total Credit:04	Lecture (L):03 Hrs	Tutorial/Activity (T/A): 01 Hrs.	Practical (P): 00 Hrs.
Subject Code	BTCVE502T	Name of Subject: Reinforced Cement Concrete Designs	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)	70 Marks	45 Marks	4 Hr

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

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

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

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

age, cracks due to temperature and shrinkage, restrain induced cracks, cracks due to loading. Needs for crack width control. Moment– curvature relationship, deflection control of beams and one way slabs. Limit state of collapse in flexure: Analysis and design of singly reinforced rectangular section. Limit state of Collapse in Flexure: Analysis & design of the Tee & L- beam section. Limit state of Collapse in Shear & Bond: Design of beam for shear , shear span, post cracking resistance, shear mechanism approach , shear failure modes and collapse loads, interaction of shear , flexure and axial force ,Check for bond.			
	10		
Unit No.3			
Limit state of collapse in compression: Analysis & design of short axially loaded column. Columns subjected to uni-axial bending, use of interaction curves.	08		3
	08		

Unit No.4			
Design of one –way, simply supported, single span and cantilever slabs and continuous slab / beam with IS coefficients,	07		4
	07		
Unit No.5			
Design of rectangular pad / slopped footing for axial load. Design of Simply supported Two-way slab	04		5
	04		

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

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

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

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Sem: V	Total Hours Distribution per week		
Total Credit: 03	Lecture (L): 3Hrs	Tutorial/Activity (T/A): NA	Practical (P): 2 Hrs.
Subject Code	BTCVE 503T	Name of Subject: Civil Engineering Materials, Testing and Evaluation	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

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

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

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

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

comparison for environmental impact, health and safety.			
	07		
Unit No.3 Special Materials			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Composite Materials: RCC, FRC, AAC (Autoclaved aerated concrete) blocks, WPC (Wood-plastic composites) Material, Cera sheets, 3D wall WPC panels, polymer based materials, steel/concrete composite bridge decks, fibre reinforced plastics structural insulated panels.	03		3
New Techniques in Constructions-Introduction, 3D printing, photo catalytic admixture, self-healing concrete, Biomaterials, zero cement concrete ,hemp lime, wood-glass epoxy composites, bamboo.	04		3
	07		
Unit No.4 Testing Procedures of Materials			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Material Testing, Machines and Equipment Requirements---Necessity of material testing, various testing methods, destructive tests, classification of destructive tests---static, impact and cyclic testing,non-destructive testing- its classification ,visual inspection, penetration test, ultrasonic test.	03		4
Testing Procedures for bricks, reinforcing steel, fine aggregates, coarse aggregates. Documenting the experimental program, including the test procedures, collected data, method of interpretation and final results.	04		4
	07		
Unit No.5 Testing and Evaluation Procedures of Materials			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Quality control- Use of test data/ testing reports in the material selection for various civil engineering projects /construction, Sampling, Acceptance criterion,	04		5
Code of practice and guidelines in this regards for Cements; Aggregates; Concrete (plain and reinforced); Soils; Bitumen and asphaltic materials; Timbers; Glass and Plastics; Structural Steel.	03		5
	07		

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

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

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

Signature
Chaitan G. Shinde

Signature
 (Dr. A.N. Dabhade)
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CIVIL ENGINEERING MATERIALS, TESTING AND EVALUATION

BTCVE503P

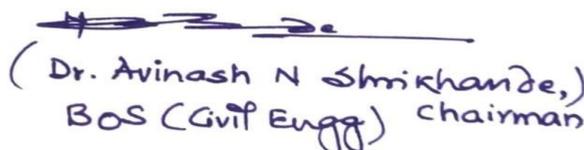
Evaluation Scheme: (25-Internal/25-External)

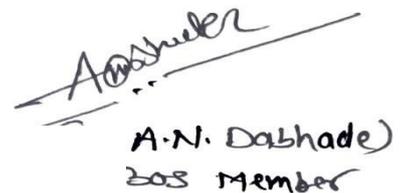
(P-2 Hrs/Week); Total Credits- 01

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

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


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B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: V	Total Hours Distribution per week		
Total Credit: 03	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): 0 Hrs.
Subject Code	BTCVE504T	Name of Subject: Professional Practice, Law & Ethics	
Examination Scheme			
Internal Marks:		University Marks:	Minimum Passing Marks:
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)		70 Marks	45 Marks
			Examination Duration: 3 Hours

Course Objective

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

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

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BECVE504T 1						2	2	3				1
BECVE504T 2						2	2	3				1
BECVE504T 3						2	2	3				1
BECVE504T 4						2	2	3				1
BECVE504T 5						2	2	3				1

1 Low

2 Medium

3 High

SYLLABUS

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

Unit No.5			
Global issues, Multinational Corporations, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Corporate Social Responsibility	07		5

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
I,II,III, IV,V	Professional Ethics	R. Subramaniam	Oxford Publications, New Delhi.				Yes
	Human Values And Professional Ethics by,	Jayshree Suresh and B. S. Raghavan	S. Chand Publications				Yes
	Ethics in Engineering by-	Mike W. Martin and Roland Schinzinger	Tata McGraw-Hill - 2003.				Yes
	Human Values & Professional Ethics by,	S. B. Gogate	Vikas Publishing House Pvt. Ltd., Noida.				Yes
	Professional Ethics and Human Values	A. Alavudeen, R.Kalil Rahman, and M. Jayakumaran	University Science Press.				Yes
	Engineering Ethics & Human Values	M.Govindarajan, S.Natarajan, and V.S.SenthilKumar	PHI Learning Pvt. Ltd - 2009.				Yes

Shrihari
Center for Science

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B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: V	Total Hours Distribution per week		
Total Credit: 01	Lecture (L): 00 Hrs	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): 02 Hrs.
Subject Code	BTCVE507P	Name of Subject: Industrial Training & Professional Skill Training	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
50 Marks	50 Marks	50 Marks	--

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

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

MAPPING OF CO WITH PO

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

1 Low 2 Medium 3 High

SYLLABUS

Part A: Industrial Training

(25 Marks Internal and 25 Marks External)

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

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

(25 Marks Internal and 25 Marks External)

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

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

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

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

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

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RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

FACULTY OF SCIENCE & TECHNOLOGY

B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: V	Total Hours Distribution per week		
Total Credit: 00	Lecture (L): 02 Hrs	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): 0 Hrs.
Subject Code	BTCVE508AU	Name of Subject: Organizational Behaviour	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
50 Marks	AUDIT	--	--

Course Objective

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

After completion of syllabus student able to

1	Understand the concept and importance of organizational behaviour.
2	Acquire the knowledge of interpersonal behaviour and transaction analysis
3	Know different traits and theories of personality
4	Analyze the importance of motivation in organization and types of leadership

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

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

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

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
I,II, III,IV	Organizational behaviour	MN Mishra					
	The human side of organization	Michale Drafke					
	Management and Organizational behaviour	Laurie.J. Mullins					
	Organizational behaviour	K. Aaswathappa					

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

Sem: V	Total Hours Distribution per week: 3-0-0		
Total Credit:3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A):0 Hrs.	Practical (P): 0 Hrs.
Subject Code	BTCVE505T	Name of Subject: Elective – I (Advanced Structural Analysis)	
Examination Scheme			
Internal Marks:		University Marks:	Minimum Passing Marks:
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)		70 Marks	45 Marks
			Examination Duration: 3 Hours

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

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

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

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

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

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

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

Sem: V	Total Hours Distribution per week		
Total Credit: 3	Lecture : 3 Hours	Tutorial//Activity(T/A):N.A	Practical(P): N.A
Subject Code	BTCVE505T	Subject:- Geo Synthetics Engineering (Elective-I)	
Examination Scheme			
Internal Marks-	University Marks	Minimum Passing Marks:	Examination Duration:
30 Marks (15 Marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3Hours

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

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

MAPPING OF CO WITH PO

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

1Low

2Medium

3High

SYLLABUS

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

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

References

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

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

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

Sem: V	Total Hours Distribution per week		
Total Credit:03	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 3 Hrs.	Practical (P): Nil Hrs.
Subject Code	BTCVE505T	Name of Subject: Geo Environmental Engineering (Elective-I)	
Examination Scheme			
Internal Marks:		University Marks:	Minimum Passing Marks:
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)		70 Marks	45 Marks
		Examination Duration:	3 Hours

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

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

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

Unit No.1			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Introduction and Soil-water-environment interaction :	01		1
Introduction to geo-environmental Engineering,	01		
Soil-water-environment interaction relating to geotechnical problems,	01		
Waste:-source, classification and management of waste,	01		
Physical, chemical and geotechnical characterization of municipal solid waste,	01		
Impact of waste dump and its remediation	01		
	06		
Unit No.2			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Geotechnical application of waste and disposal:	01		2
Geotechnical use of different types such as Thermal power plant waste,	01		
Municipal Solid Waste, mine waste,	01		
Industrial waste.	01		
Waste disposal facilities,	01		

Parameters controlling the selection of site for sanitary and industrial landfill.	01		
Site characterization. MoEF guidelines.	01		
	07		
Unit No.3			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Landfill Components:Landfill layout and capacity, components of landfill and its functions.	01		3
Types and functions of liner and cover systems,.	01		
Compacted clay liner, selection of soil for liner, methodology of construction	02		
Leachate, Gas Management and Geosynthetics: Management of Leachate and gas.	02		
Various components of leachate collection and removal system and its design. gas disposal/utilization. Closure and post closure monitoring system,	01		
Geosynthetics- Geo membranes - geosynthetics clay liners -testing and design aspects.	02		
	09		
Unit No.4			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Soil remediation: Investigation of contaminated soil, sampling, assessment.	02		4
Transport of contaminants in saturated soil	01		
Remediation of contaminated soil- in-situ / exit remediation, bio remediation,	01		
thermal remediation, pump and treat method,	01		
phyto remediation and electro-kinetic remediation	01		
	06		
Unit No.5			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Variation in Engineering properties of soil	02		5
atterberg limit, shear strength,	01		
Permeability and swelling due to change in environment/pore fluid.	02		
	05		

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

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B.TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: V	Total Hours Distribution per week		
Total Credit: 3	Lecture : 3 Hours	Tutorial//Activity(T/A): 0 Hrs	Practical(P): 0 Hrs
Subject Code	BTCVE505T	Subject: Advanced Building Materials (Elective-I)	
Examination Scheme			
Internal Marks-	University	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks. for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hrs

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

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

MAPPING OF CO WITH PO

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

1Low

2Medium

3High

SYLLABUS

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

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

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

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

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B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: V	Total Hours Distribution per week		
Total Credit: 03	Lecture (L): 3 Hrs.	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): 0 Hrs.
Subject Code	BTCVE505T	Name of Subject: Ground Water Hydrology (Elective-I)	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

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

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

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

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

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

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

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

Sem: V	Total Hours Distribution per week		
Total Credit: 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hrs	Practical (P) : 0 Hrs
Subject Code:	BTCVE505T	Name of Subject: Advanced Surveying (Elective-I)	
Examination Scheme			
Internal Marks:		University Marks:	Minimum Passing Marks:
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)		70 Marks	45 Marks
		70 Marks	3 Hours

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

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

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

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

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

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

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

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B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: V	Total Hours Distribution per week 3-0-0		
Total Credit: 03	Lecture (L): 03 Hrs	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): 0 Hrs.
Subject Code	BTCVE506T	Name of Subject: Advanced Concrete Structure (Elective-II)	
Examination Scheme			
Internal Marks:		University Marks:	Minimum Passing Marks:
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)		70 Marks	45 Marks
			Examination Duration: 04 Hours

Course Objective

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

Course Outcome

After completion of syllabus student able to

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

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

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

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

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

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

Sem: V	Total Hours Distribution per week		
Total Credit: 3	Lecture (L): 3 Hrs	Tutorial/Activity: 0 Hrs	Practical (P): 0 Hrs
Subject Code	BTCVE506T	Name of Subject: Earth Retaining Structures (Elective-II)	
Examination Scheme			
Internal Marks:		University Marks:	Minimum Passing Marks:
30 Marks (15 Marks. for Sessional Examination) (15 Marks for Activity based)		70 Marks	45 Marks
			Examination Duration: 3 Hours

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

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

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

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

References

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

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

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

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

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

Sem: V	Total Hours Distribution per week		
Total Credit: 3	Lecture (L): 03 Hrs	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): 0 Hrs.
Subject Code	BTCVE506T	Name of Subject: Climate Change and its Mitigation (Elective-II)	
Examination Scheme			
Internal Marks:		Marks:	Minimum Passing Marks:
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)		70 Marks	45 Marks
			Examination Duration: 3 Hours

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

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

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

Unit No.1 Earth's Climate System			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Introduction to Climate Change; History and Trends of Climate	02		1
Atmosphere – weather and Climate	01		
Causes of global and regional climate change	01		
climate parameters – Temperature, Rainfall, Humidity	01		
Wind – Global ocean circulation and its effect	01		
Carbon cycle	01		
	07		
Unit No.2 Greenhouse Gases			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Introduction and effect of Carbon dioxide, methane, nitrous oxide, water vapor, ozone and chlorofluorocarbons	02		2
Chemistry of greenhouse gases	01		
Sources and sinks, their cycle in atmosphere	01		
Radiative forcing	01		
Effects on plants and animals	01		
instruments used for quantification	01		
	07		

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

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

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

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

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

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B.TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: V	Total Hours Distribution per week		
Total Credit: 3	Lecture : 3 Hours	Tutorial//Activity (T/A): 0 Hrs	Practical (P): 0 Hrs
Subject Code:-	BTCVE506T	Subject: - Advanced Concrete Technology (Elective-II)	
Examination Scheme			
Internal Marks-	University	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks. for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To know different types of cement as per their properties for different field applications, properties of Aggregates and Admixture
2	To understand the knowledge of Special Concrete To know tests on concrete in plastic and hardened stage as well as behavior of concrete structure
3	To understand Design economic concrete mix proportion for different exposure conditions and intended purpose.
4	To understand the behavior and strength of concrete structure.
5	To understand the concept of durability and testing of concrete

Course Outcomes	
After completion of syllabus, students would be able to	
1	Think logically for development Concrete technology application in field of Civil Engineering
2	Differentiate special concrete from conventional concrete Gain an experience in the implementation of Concrete Materials on Engineering concepts which are applied on Construction Fields
3	Understand the process of mix design of concrete.
4	Gain an experience in the implementation of Concrete Materials on Engineering concepts which are applied on Construction Fields.
5	To Understand the various factors affecting the concrete and Advanced Non-Destructive Testing Methods.

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

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

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

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1&2	Concrete Technology	MS Shetty;	S.Chand Publication New Delhi		Text Book		
3	Concrete Technology	PKumar Mehta,	Indian Concrete Institute		Text Book		
4&5	Properties Of Concrete	AM.Neville	Pearson Education		Text Book		
3	Concrete Technology	ML Gambhir;	Tata McGraw Hill		Text Book		

3	Concrete mix design for flyash and superplasticizer	Kishore kaushal	ICI bulletin	Apr-june 1997		Research paper	
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List of Code/Handbook

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

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

Sem: V	Total Hours Distribution per week		
Total Credit: 03	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.	Practical (P): 0 Hrs.
Subject Code	BTCVE506T	Name of Subject: Flood Control and Drainage (Elective-II)	
Examination Scheme			
Internal Marks:		University Marks:	Minimum Passing Marks:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)		70 Marks	45 Marks
			Examination Duration: 3 Hours

Course Objective

This course will enable students to:

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

Course Outcome

After Studying this course, Students will be able to:

1	Understand the role and responsibility of engineers in Flood Mitigation.
2	Understand the role and responsibility of engineers in Estimation of Design Flood
3	Learn and apply the knowledge of GIS, remote Sensing in Natural Hazard Mitigation.
4	Apply the Concept in Operation and Maintenance of Urban Drainage System.
5	Apply the knowledge of pattern of Drainage system at Irrigation area.

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

SYLLABUS

Unit No.1 Flood Engineering			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
<p>Flood Engineering:</p> <p>General:</p> <p>Introduction, Basics of floods, Natural and man-made floods, Flows in catchments, Causes of flooding, Environmental and economic losses, Flood control structures.</p> <p>FLOOD HAZARD MITIGATION: Flood management measures, Flood control strategies.</p>	07		1
	07		
Unit No.2 ESTIMATION OF DESIGN FLOOD: & FLOOD ROUTING THROUGH RESERVOIRS AND CHANNELS			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
<p>ESTIMATION OF DESIGN FLOOD:</p> <p>Introduction, Methods of design flood computations: Observation of Highest Flood, Empirical flood formulae, Flood frequency studies- Gumbel's method– Design flood and design storm</p>	08		2

(FLOOD ROUTING THROUGH RESERVOIRS AND CHANNELS			
Flood routing through reservoirs—general, basic principles of flood routing ISD method- Modified Pulse method. Flood routing through channels – Muskingum method.			
		08	
Unit No.3 Risk Management			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Risk Management: Risk assessment, Risk reduction and management, Advanced Warning Systems: Global positioning systems, Applications of remote sensing and GIS, Role of Information Technology in natural hazard mitigation management		07	3
		07	
Unit No.4 Drainage Engineering			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Drainage Engineering: Land Drainage systems: necessity-types-surfaces and subsurface drainage-design considerations. Introduction to Drainage Problems in Different Climates: Urbanisation - Its effects and consequences for drainage. Operation and Maintenance of Urban Drainage Systems: Maintenance requirements and planning, Cleansing of sewers and drains, repair options,		07	4
		07	
Unit No.5 Patterns of drainage system			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Patterns of drainage system- Drainage criteria formulation for off season drainage, crop season drainage, salt drainage- use of steady state and unsteady state approaches in formulation. - criteria for irrigated area. –incorporation of intentional and		07	5

unavoidable losses			
	07		

Text Books:

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

Reference Book:

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

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Sem: V	Total Hours Distribution per week		
Total Credit: 3	Lecture (L): 3Hrs	Tutorial/Activity (T/A): 0 hrs	Practical (P): 0 Hrs.
Subject Code	BTCVE506T	Name of Subject: Railway Engineering (Elective-II)	
Examination Scheme			
Internal Marks:		University Marks:	Minimum Passing Marks:
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)		70 Marks	45 Marks
			Examination Duration: 3 Hours

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

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

MAPPING OF CO WITH PO

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12
Subject Code & CO												
CO1	3	3										
CO2	3	2										
CO3	3	3	2									
CO4	3	3	1									
CO5	3	2	2	1								

1 Low

2 Medium

3 High

SYLLABUS

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

Simple track layouts			3
Rail joints and welding of rails			3
Track maintenance			
Track drainage			3
	08		
Unit No.4 Modernization of Railway Track			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Modern methods of track maintenance	08		
Rehabilitation of track			4
Renewal of track			
Tractive resistance and power			
Railway stations			
Railway yards			
	08		
Unit No.5 Signalling & Control system			
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Railway tunnelling	08		5
Signalling			
Interlocking			
Modern development in railways			5
Development of high speed and super high speed railway track			5
Maintenance of railway tracks for high speed trains			5
	08		

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
I,II,III, IV&V	Railway Engineering	Saxena and Arora, Dhanpat Rai& Sons	Dhanpat Rai& Sons	I	✓	-	
I,II,III, IV&V	Railway Engineering	S.C.Rangawala	Charotar Publishing House Pvt. Ltd.	I	✓	-	

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