



NAAC A+ Accredited Approved by AICTE, New Delhi, Govt. of Maharashtra (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)

Department of Civil Engineering

# DEPARTMENT OF CIVIL ENGINEERING

# Structure & Curriculum

# From

# Academic Year 2022-23

## Vision of Institute

To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

# **Mission of Institute**

[M1] To strive for rearing standard and stature of the students by practicing high standards of Professional ethics, transparency and accountability

[M2] To provide facilities and services to meet the challenges of Industry and Society

[M3] To facilitate socially responsive research, innovation and entrepreneurship

[M4] To ascertain holistic development of student and staff members by inculcating knowledge and profession as work practices

# Vision of the Department

To lead young aspirants to become competitive and enthusiastic applied scientists in the interest of nation building through diversified innovative techniques in the arena of civil engineering

# **Mission of the Department**

[MD1] To deliver qualified and trained civil engineers to the society with high standards of moral values and professional ethics

[MD1] To nurture the young minds through State-of-the-Art laboratory and classroom facilities for advanced resolution of industrial and social civil engineering problems
[MD3] To develop collaborative teaching, training and research programs in order to bring innovative ideas and techniques to solve civil engineering challenges of futures
[MD4] To improve the knowledge base of graduate and post-graduate engineers by solving real life industry problems, and through innovative interdisciplinary research
[MD5] To yield engineering professionals who can serve the global needs in the domain of civil engineering for a better tomorrow

# **Program Education Objectives (PEO)**

- The graduates will be able to apply principles of advanced Mathematics and Engineering sciences to analyze and solve civil engineering problems.
- Create sustainable environment to plan infrastructure for social needs.
- Design and execute civil engineering projects.
- Develop as a leader and to inculcate team spirit to execute ethically the projects.
- Adopt emerging technologies for lifelong learning.

# **Program Outcomes (PO)**

Engineering Graduates will be able to:

**1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**3. Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**4. Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**7. Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**12. Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

# Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

SCHEME OF INSTRUCTION & SYLLABI

Programme: Civil Engineering

Scheme of Instructions: Second Year B. TECH in Civil Engineering

Semester – IV

Sr.	Course	Course	Course Title	тт	T D Con		T D Contact			EX	AM SCH	EME	
No.	Category	Code	Course The	L	L     T     I $3$ -     - $3$ -     - $3$ -     - $3$ 1     - $3$ 1     - $3$ 1     - $3$ -     - $2$ -     - $-$ -     2 $-$ -     2 $-$ -     2 $-$ -     2 $-$ -     2 $-$ -     2 $2$ -     - $2$ -     - $2$ -     - $2$ -     - $2$ -     - $2$ -     - $2$ 1     10	r	Hrs/Wk	Credits	CT-1	<b>CT-2</b>	TA/CA	ESE	TOTAL
1	PCC	BCE2401	Hydrology and Water Resources	3	-	-	3	3	15	15	10	60	100
2	PCC	BCE2402	Surveying	3	-	-	3	3	15	15	10	60	100
3	PCC	BCE2403	Transportation Engineering	3	-	-	3	3	15	15	10	60	100
4	PCC	BCE2404	Structural Analysis	3	1	-	4	4	15	15	10	60	100
5	PCC	BCE2405	Environmental Engineering	3		-	3	3	15	15	10	60	100
6	PCC	BCE2406	Surveying Lab	-	-	2	2	1	-	-	25	25	50
7	PCC	BCE2407	Transportation Engineering Lab	-	-	2	2	1	-	-	25	25	50
8	PCC	BCE2408	Structural Analysis Lab	-	-	2	2	1	-	-	25	25	50
9	PCC	BCE2409	Environmental Engineering Lab	-	-	2	2	1	-	-	25	25	50
10	PROJ	BCE2410	Micro Project	I	-	2	2	1	-	-	25	25	50
11	HSMC	BSH2401	Human Values for Professional Society	3	-	-	3	3	15	15	10	60	100
12	MCC	BAU2404	Group Reading of Classics	2	-	-	2	Audit	-	-	-	-	-
			Total	20	1	10	31	24	90	90	185	485	850
- Lectur	e		Т	-Tuto	rial		F	P-Practical					

L-Lecture

CT1- Class Test 1 CT2- Class Test 2

**P-Practical** TA/CA- Teacher Assessment/Continuous Assessment

ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	Project / Seminar / Industrial Training	MCC (Mandatory Courses)
Credits	3		00	20			01	Yes
Cumulative Sum	7	27	20	28			01	-1 ./

**PROGRESSIVE TOTAL CREDITS :56+24 =80** 

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Tulsiramji Gaikwad-Patil College of Engineering and Technology								
<b>- - -</b>		Wardha Road, Nagpur-441 108						
3		NAAC Accredited with A+ Grade	•					
	(An Autonomous	Institute Affiliated to RTM Nagpur Unive	ersity, Nagpur	)				
Progran	n: B.Tech. Civil	Engineering						
Semester	-IV BCE2401 : H	drology & Water Resources						
Tea	ching Scheme		Examinati	on Scheme				
Theory	y 3 Hrs/week		CT-I	15Marks				
Tutoria	al		CT-II	15 Marks				
Total Cre	edits 3		CA	10 Marks				
Duration o	of ESE: 3Hrs		ESE	60 Marks				
Pre-Requ	isites: Engineering	Applied Chemistry	<b>Total Marks</b>	100 Marks				
		<b>Course Contents</b>		<u> </u>				
	Introduction: Hyd	drology, definition, engineering hydrolo	gy, and its	importance,				
	development of hyd	rology and allied science, hydrological cycle	, hydrological	evolution and				
	brief description of	its components, the earth and its atmosphere,	, importance of	f temperature,				
	humidity, and wind	in hydrological study.						
	Precipitation: Defi	nition anticipation, artificial rains, types of	precipitation,	orthographic,				
Unit I	conventional and cyclonic, factors affecting precipitation with reference to physiographic							
	divisions of India							
	Measurement of precipitation: Non-automatic and automatic rain gauges, selection of site,							
	density and adequacy of rain gauge stations, optimal number of rain gauge, radar							
	measurement of rainfall, mass curve, supplementary rainfall data missing records, intensity							
	duration frequently a	and depth area duration analysis						
	Infiltration: defini	tion, mechanism, factors affecting infilt	ration, infiltra	tion indices,				
	measurement, applic	ation, problems.						
Unit II	Evaporation and transpiration: definition, mechanism and factors affecting evaporation,							
	evaporation estimations by pan, water budget, energy budget and imperial formula, control of							
	evaporation. Evapo-	transpiration and its measurement. Interception	on and its meas	urement.				
	Runoff: Source and	components of run-off, classification of st	reams, factors	affecting the				
TT 24 TTT	runoff processes, estimation methods, measurement of discharge of streams by area-slope and							
Unit III	area velocity method.							
	<b>Hydro-graphics:</b> Flood hydrology, definition, typical flood hydrograph and its components,							
	base flow and base f	low separation, unit hydrograph, S-curve and	its use, instant	aneous UHG.				
	distributions average	is: statistics in hydrological analysis, p	robability and	a probability				
Unit IV	analysis <b>Floods</b> ca	ge measure of dispersion, co-relation. Analysis of time series, frequency auses and effects, factors affecting peak flows and estimation of peak						
	flows, low flow, bas	auses and effects, factors affecting peak flows and estimation of peak sin flood, flood routing and flood forecasting, economic planning for flood						
	control (Emergency action plan)							
	Geo-hydrology: Int	roduction, occurrence and distribution of gro	ound water, wa	ater table and				
	water table maps,	aquifer, aquiclude, aquitard and aquifuge.	. Groundwater	exploration,				
Unit V	electrical sensitivity	method, confined and unconfined aquit	fer, porosity,	permeability,				
	specific yield, speci	tic retention, Darcy's law, introduction to h	hydraulic wells	s, open wells,				
	Sale yield lest, Well Groundwater real	nyunautics- intage well theory, water well L	recharge site	illig.				
	Groundwater recharge: Concept of recharge, selection of recharge sites, recharging							

	methods, spreading method, induced recharge method, recharge well method, sub-surface
	dams, waste water recharge, recharge by urban storm runoff, recharge through rain water
	harvesting. Groundwater Management, Conjunctive Use, Artificial Recharge of Groundwater,
	Groundwater Quality Modelling.
	Rain Water Harvesting: Introduction to rain water harvesting, Assessment of site's water
	resources, water harvesting methods using earthwork, tanks.
Text Boo	bks
T.1	Hydrology And Water Resources Engineering - S.K.Garg, Khanna Publishers, 2015 edition
T.2	Text book of Hydrology - P. Jaya Rami Reddy, Laxmi Publications, 3rd edition 2016
Т 3	Hydrology & Water Resource Engineering - Gite & Deshpande, Nirali Prakashan, 2018
1.5	edition
Т4	Irrigation & Water Resources Engineering - G.L. Asawa, New Age International Publishers,
	2005 edition
Reference	e Books
<b>R</b> .1	Engineering Hydrology – Dr. K. Subramanya, Tata McGraw Hill, 4th edition 2017
R.2	Irrigation Engineering – R. N. Reddy, Gene-Tech Books, 2010 edition
R 3	Irrigation, Water Resources and Water Power Engineering - Dr. P.N.Modi, Standard Book
<b>R</b> .5	House, 11 <sup>th</sup> edition 2019
R.4	Hydrology – Madan Mohan Das, PHI Learning, 2009
R.5	Rain Water Harvesting for Drylands and Beyong- Brad Lancaster. Rain Resourse Press.
Useful L	inks
1	https://nptel.ac.in/courses/105/104/105104103/
2	https://nptel.ac.in/courses/105/105/105105042/
3	https://nptel.ac.in/courses/105/103/105103026/

	Course Outcomes	CL	Class Sessions
BCE2401.1	<b>Describe</b> knowledge of hydrology as well as measurement of precipitation	2	9
BCE2401.2	<b>Apply</b> knowledge of basics of hydrology in calculating infiltration, evaporation, total runoff.	3	10
BCE2401.3	<b>Classify</b> the components and factors affecting the runoff, as well as analyze the hydro-graphics.	2	8
BCE2401.4	Analyze the flood occurrence & frequency by applying Statistical techniques	4	10
BCE2401.5	<b>Apply</b> the knowledge of geo-hydrology & groundwater recharge terms in planning, assessing & computation of ground water potential and its assessment techniques.	3	9

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3		NAAC Accredited with A+ Grade	•				
D	(An Autonomou	s Institute Affiliated to RTM Nagpur Unive	ersity, Nagpur	)			
Program	n: B.Tech. Civil	Engineering					
Semester	-IV BCE2402 : Sur	rveying	Γ				
Tea	ching Scheme	-	Examinati	on Scheme			
Theor	y 3 Hrs/week	-	CT-I	15Marks			
Tutori	al -	_	CT-II	15 Marks			
Total Cr	edits 3	_	CA	10 Marks			
Duration of	of ESE: 3Hrs		ESE	60 Marks			
Pre-Requ	isites: Engineering	g Mechanics	Total Marks	100 Marks			
	1	Course Contents					
	Chain and Compass Traversing						
	Introduction: - Class	sification, division of survey, Principle of surv	vey,				
Unit I	Chain Surveying: - Basics, direct ranging and cross staff survey.						
	Compass Surveying: Prismatic Compass, true and magnetic bearing, local attraction,						
	Compass traversing.	, traverse adjustment of closing errors.	•	1.			
<b>T 1 1 T</b>	Leveling: Leveling	: Definitions, Study of Dumpy & Auto Le	vel, temporary	adjustments,			
Unit II	principles of levelin	ig, reduction of levels, Classification of level	ing, Curvature	& Refraction			
	Contenting and Tr	imponetrical Leveling					
	Contouring: Defin	itions Characteristics uses and metho	de of locativ	ng contours			
	Contouring: Definitions, Characteristics, uses, and methods of locating contours,						
Unit III	Interpolation of contours.						
	accessible and inaccessible (with instrument station in/not in the same vertical plane as the						
	elevated object)						
	Theodolite Survevi	ing: Theodolite: Introduction. Type of Theodo	olite. Temporar	v adjustment.			
Unit IV	Principle Axes and relationship, Measurement of horizontal and vertical angles, Traverse						
Unit I v	Computation: Consecutive and independent co-ordinates, adjustment of closed traverse, Area						
	calculation by co-ordinate.						
	Plane Table Survey	ying & Computation of Area & Volume	1 1 1 1	• , ,•			
	Plane Table Survey	: Instruments and accessories, advantages and	d disadvantage	s, orientation,			
Unit V	three point problem	ratio = rati	d Volumo, Tr	two-point and			
Unit v	Simpsons Bula arro	is in plane table surveying	u volume. In	ipezoidai alid			
	Introduction to Re	amote sensing and Geographical Information	ion System (	CIS) and its			
	applications						
Text Boo	ks						
T.1	Surveying and Leve	lling - Kanetkar and Kulkarni (Vol.I) Pune	Vidyarthi Gril	na Prakashan,			
T.2	2006 edition Surveying and Level	ling - Dr. B.C. Punmia (Vol. I) Laxmi Publics	ations, 17 <sup>th</sup> edit	ion 2016			
Т 3	Surveying (Vol 1)	S K Duggal McGraw-Hill 5 <sup>th</sup> edition 2010					
T.1 T.2 T.3	Surveying and Level 2006 edition Surveying and Level Surveying (Vol 1) – S	ling - Kanetkar and Kulkarni (Vol.1) Pune ling - Dr. B.C. Punmia (Vol. I) Laxmi Publica S. K. Duggal, McGraw-Hill, 5 <sup>th</sup> edition 2019	ations, 17 <sup>th</sup> edit	ion 2016			

T.4	Surveying and Leveling – N. N. Basak, Tata McGraw–Hill Education, 2 <sup>nd</sup> edition 2017
Reference	ce Books
R.1	Surveying Fundamentals & Practices – Jerry A. Nathanson, Pearson Publication, 7 <sup>th</sup> edition 2017
R.2	Surveying with Construction Applications – Barry & Dianne, Pearson Education India, 8 <sup>th</sup> edition 2013
R.3	Construction Surveying and Layout – Wesley Crawford, Creative Construction Publishing, 3 <sup>rd</sup> edition 2002
R.4	Surveying-I – D.G. Phadke, V.M. Thorat, Nirali Prakashan, 4 <sup>th</sup> reprint edition
R.5	Surveying Fundamentals & Practices – Jerry A. Nathanson, Pearson Publication, 7 <sup>th</sup> edition 2017
Useful L	inks
1	https://nptel.ac.in/courses/105/107/105107122/

	Course Outcomes	CL	Class Sessions
BCE2402.1	<b>Discuss</b> the basic concepts of surveying and use of conventional surveying equipment	2	8
BCE2402.2	<b>Implement</b> the basic principles, operation, handling & uses of advanced surveying equipment	3	9
BCE2402.3	<b>Sketch</b> the location map, contour map using surveying equipment	3	10
BCE2402.4	<b>Interpret</b> linear and angular measurements and elevations using Theodolite surveying	3	8
BCE2402.5	<b>Interpret</b> survey data for preparing drawings, plans or maps & to calculate their areas & volumes	3	10

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Program	n: B	Tech. Civil	Engineering			
Semester	-IV	BCE2403 : Tra	ansportation Engineering	<b>1</b>		
Tea	ching	Scheme		Examinati	on Scheme	
Theor	y	3 Hrs/week		CT-I	15Marks	
Tutori	al	-		CT-II	15 Marks	
<b>Total Cr</b>	edits	3		CA	10 Marks	
<b>Duration</b>	of ESE	: 3Hrs		ESE	60 Marks	
Pre-Requ	isites	Engineering	Mechanics	<b>Total Marks</b>	100 Marks	
			<b>Course Contents</b>	I		
Unit I	High India <b>High</b> High sub-	a, Classification <b>a, Classification</b> <b>away Alignmen</b> <b>away Materials</b> grade soils, aggr	ent & Planning: Principles of Highway pla of roads, network patterns, Planning, Survey <b>t:</b> Requirements, Engineering Surveys. <b>s:</b> Properties of sub grade and pavement co regates and bituminous materials. Application	nning, Road de rs. mponent mater n of Geo-synthe	evelopment in ials, Tests on etics.	
Unit II	Higl over trans	<b>hway Geometr</b> taking sight dist sition curves, ver	<b>ic Design</b> : Cross Section elements, carriag ances Horizontal alignment- Curves, design rtical curves.	eways, camber of super elevati	r, stopping & on, widening,	
Unit III	Pave load flexi High Cem	ement Design: ' , tyre pressure, ble pavement de nway Construc- ent Concrete pa	Types of pavements & characteristic, Design ESWL for dual Wheels, repetitions, Grou esign. Analysis of load & temperature stresse ection & Maintenance: Earthen/Gravel re- vement, Pavement failures, Pavement evalua	n parameters, A p Index & IR s of rigid paven pad, Bituminou tion	Axle & Wheel C method of nent, joints as pavement,	
	Traf	fic Engineeri	ng: Traffic characteristics (Road Use	r, Driver an	d Vehicular	
Unit IV	<ul> <li><sup>1</sup> characteristics) Traffic Studies (Volume studies, speed studies, parking studies and accident studies.) Traffic Safety (Causes and types of accidents, Use of intelligent transportation system)</li> <li><sup>7</sup> Bridge Engineering: Classification, identification and site selection. Flood discharge, waterways, scour depth, economic span. IRC classification of Loads, Forces, Stresses: IRC Specification &amp; code of practices, Critical combinations.</li> <li>Rating and Maintenance: Methods &amp; Techniques of rating of existing bridges Inspection, Repairs, maintenance, corrosion-causes and prevention aesthetics</li> </ul>					
Unit V	Unit VRapid Mass Transport system: Need for Metros, Basic planning & finances, Civil Engineering aspects, Surveys & Investigations, Electronics & Communication Engineering aspects, Signaling systems, Mechanical & Tunnel Ventilation systems, Electrical Engineering aspects, OHE, Green buildings, Carbon credits & clear air mechanics.					
1 ext Boo	KS			t oth -		
T.1	Highway Engineering – Khanna and Justo, Nem Chand Publication, 10 <sup>th</sup> Revised edition 2018					
T.2	Textb Distri	book of Highwa butors, 1 <sup>st</sup> editio	ay & Traffic Engineering – Subhash C. on 2017	Saxena, CBS	Publishers &	
Т.3	Distributors, 1 <sup>st</sup> edition 2017 Bridge Engineering - S. C. Rangwala, Charotar Publishing House Pvt. Limited, 16 <sup>th</sup> Revised edition 2017					

T.4	Principles, practices and design of Highway Engineering - S. K. Sharma, S. Chand & Company, 2014 edition
T.5	Traffic Engineering & Transport Planning - L.R.Kadiyali, Khanna Publishers, 1999 edition
Reference	ee Books
R.1	Principles of Pavement Design - Yoder and Witzak, Wiley India Pvt. Ltd., 2nd edition 2011
R.2	World Metro Systems – Paul E. Garbutt, Capital Transport Publishing, 2nd edition 1997
R.3	Traffic & Highway Engineering – Nicholas Garber, Wadsworth Publishing, 5th edition 2013
R.4	Highway Engineering – L.R.Kadiyali, Khanna Publishers, 1st edition 2018
Useful L	inks
1	https://nptel.ac.in/courses/105/101/105101087/
2	https://nptel.ac.in/courses/105/105/105105107/
3	https://nptel.ac.in/courses/105/101/105101008/

	Course Outcomes	CL	Class Sessions
BCE2403.1	<b>Classify</b> Highway Planning, Materials and Engineering surveys for highway alignment	2	9
BCE2403.2	<b>Design</b> the Geometric Elements of Highways and Urban roads, Flexible and Rigid pavements.	6	8
BCE2403.3	<b>Analyze</b> the load and temperature stresses of rigid pavement, joints and judge the Highway Construction and Maintenance	4	10
BCE2403.4	<b>Summarize</b> and undertake the concepts of Traffic studies & classification, identification, site selection for Bridge Engineering	2	10
BCE2403.5	<b>Apply</b> the knowledge regarding Rapid Mass Transportation System	3	8

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Chy **Director Academics** 

Tulsiramji Gaikwad-Patil College Of Engineering And Technology, Nagpur

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7 • 1		Ŭ	Wardha Road, Nagpur-441 108						
			NAAC Accredited with A+ Grade						
	(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)								
Program	n: B.	Tech. Civil	Engineering						
Semester	-IV	BCE2404: Strue	ctural Analysis						
Tea	ching	Scheme		Examinati	on Scheme				
Theor	y	3 Hrs/week		CT-I	15Marks				
Tutoria	al	1 Hrs/week		CT-II	15 Marks				
Total Cre	edits	4		СА	10 Marks				
Duration of	of ESE	: 3Hrs		ESE	60 Marks				
Pre-Requisites: Engineering Mechanics, Mechanics of Solids Total Marks 100 Marks					100 Marks				
			<b>Course Contents</b>						
∐nit I	Intro	duction of Stati	cally indeterminate Structures, Concept of Static indeterminacy, Analysis						
Omt I	of fiz	xed and continu	es beams by theorem of three moments, effe	cts of sinking of	support				
	Slop	Slope defection method as applied to indeterminate beams & continues beams portal frames.							
Unit II	Fran	Frame with inclined legs up to 3 degrees of freedom.							
emt n	Analysis of Continuous Beams & Simple Portal frames (sway and Non-Sway) Using Moment								
	Dist	Distribution Method							
	Rolli	ing loads on sin	nply supported beams with concentrated and	l uniformly dist	ributed loads,				
Unit III	maximum B.M. and S.F. Influence Line Diagrams for Reactions, Shear Forces and Bending								
	Mon	Moments in simply supported beam, cantilevers and beams with overhangs, ILD for forces in							
	mem	bers of Simple	Trusses.						
	Basi	Basic concept, Degree of Freedom, Direct Stiffness Method. Formulation of elemental local							
	stiff	ness matrix and	global stiffness matrix for beam members	(without axial	deformation),				
Unit IV	for	plane frame m	embers. Member load matrix due to co	ncentrated load	ls, uniformly				
	distr	ibuted loads. T	ransformation matrix, Assembly of global/	structural load	matrix up to				
	three	e elements. Solu	tion to problems with maximum degree of fr	eedom three.					
	Forn	Formulation of elemental/local stiffness matrix and global stiffness matrix for plane truss.							

	i officiation of clothenau local stiffices matrix and Stobar stiffices matrix for plane dass.
Unit V	Transformation matrix, Assembly of global/ Structural stiffness matrix up to (8 x 8).
	Assembly of global / structural load matrix. Solution to problems with maximum degree of
	freedom three.

	needoin three.
Text Boo	bks
T.1	"Structural Analysis: A Matrix Approach" author by Pandit G.S and Gupta S.P., 2 <sup>nd</sup> edition, Tata McGraw-Hill Publishing company LTD, New Delhi, 1997
T.2	"Structural Analysis-I" author by Bhavikatti S. S., 4th edition Vikas Publication
Т.3	"Structural Analysis" author by Ghali ,A; Neville, A. M; Brown, T.G., 6 <sup>th</sup> edition REPRINT, Taylor And Francis publication
T.4	"Structural Analysis", author by Vaidyanatnan, R and Perumal PVol – I & II, 3rd edition, Laxmi Publication, New Delhi, 2007.
Reference	ce Books
<b>R</b> .1	"Analysis of structures: Theory and Design Vol. 2" author by Vazirani V.N, Ratwani M.M. and S.K. Duggal, 2 <sup>nd</sup> edition Khanna Publishers New Delhi 2009.
R.2	"Structural Analysis (volume II)" author byBhavikatti,4 <sup>th</sup> edition, S.S Vikas publishing House LTD Delhi 2011

R.3	"Mechanical Behavior of Materials" author by Courtney, T. H., 2 <sup>nd</sup> Edition McGraw-Hill publication, 2005.
R.4	"Basic Structural Analysis" author by Reddy C. S. 2 <sup>nd</sup> edition Tata Mc graw Hill publication
Useful L	inks
1	https://nptel.ac.in/courses/105/101/105101085/
2	https://nptel.ac.in/courses/105/105/105166/
3	https://nptel.ac.in/courses/105/105/105180/

	Course Outcomes	CL	Class Sessions
CE2404.1	<b>Apply</b> knowledge to determine the forces in determinate structures and indeterminate structures	3	9
CE2404.2	<b>Analyze</b> the slope and deflection of beams and frames under structural loading conditions and use the approximate method for analysis of multistoried frame structures	4	9
CE2404.3	<b>Apply</b> knowledge of Influence Line structural members for rolling loads	3	9
CE2404.4	<b>Apply</b> stiffness method to analyze beams and plane frames.	3	9
CE2404.5	<b>Apply</b> direct stiffness method to formulate, stiffness matrix, transformation matrix, load matrix to analyze plane truss.	3	9

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			Wardha Road, Nagpur-441 108				
3			NAAC Accre	dited with A+ Grade			
	(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)						
Program	1: B.	Tech. Civil	Engineering				
Semester-	IV	BCE2405: Env	rironmental Engin	neering			
Tea	ching	Scheme			Examinati	on Scheme	
Theory	ÿ	3 Hrs/week			CT-I	15Marks	
Tutoria	ıl	-			CT-II	15 Marks	
Total Cre	dits	3			CA	10 Marks	
Duration o	f ESE	: 3Hrs			ESE	60 Marks	
Pre-Requ	isites	Engineering A	pplied Chemistry	, Fluid Mechanics	<b>Total Marks</b>	100 Marks	
			Cour	rse Contents			
	Intro	oduction: Impo	rtance and necess	ity of water supply scheme.			
	Wat	er Demand: Al	l types of water of	demand, empirical formulae	e, factors affect	ing per capita	
Unit I	dema	and, variation in	demand, design	period, population forecastin	ng methods and	l examples.	
	Sources of water: Rain water, Ground water-springs, infiltration galleries, dug wells, tube						
	Inta	s, Suitace water	ocation types -	river lake canal reservoir.			
	Con	vevance of wat	er. Types of nine	s joints fittings values & a	nnurtenances		
	Hvd	raulic design	aspects: Friction	. Manning's. Darcy-Wei	shbach & Ha	zen-Williams	
Unit II	equation and problem						
	<b>Rising main and pumps:</b> Concept of rising main, Classification, working, merits and						
	dem	erits, selection o	f pumps.				
	Wat	er quality: Ph	ysical, Chemica	l and bacteriological chara	acteristics of v	water, Health	
	effects of various water characteristics, Standards of drinking water. (WHO 2011, CPHEOO,						
	IS 10500). Water borne diseases						
	Water treatment: Objective of treatment, unit operations and processes, house hold &						
Unit III	community based rural water treatment, decentralized water treatment, flow sheet of						
	conventional water treatment plant.						
	Aeration: Purpose, types of aerators, design of cascade aerator.						
	<b>Coagulation and Flocculation:</b> Definition, Principles, types of coagulants and reactions,						
	Sedi	mentation. Pri	nciples types of	setting basins inlet and	outlet arranger	nents simple	
	desig	of sedimentat	ion tank	setting busins, met and	outlet allanger	nemes, simple	
TT <b>*4</b> TS7	Clar	iflocculators: F	rinciples and ope	eration.			
Unit IV	Filtr	ation: Mechani	sm of filtration.	types of filters-RSF, SSF,	Pressure filters	s, elements of	
	filter	rs sand specific	cation, operation	al problems in filtration,	Design of SS	SF and RSF,	
	Men	hbrane filtration	technique of wat	er treatment.	, , , ,, ,, ,		
	Disi	nfection: Purpo	se, Mechanism, c	riteria for good disinfectan	t, various disin	tectants, their	
Unit V	chara	acteristics, disi	nection by chlo	rination using different fo	orms of chlori	ne. Types of	
		ribution system	a Doguinamanta	of a good distribution and	am mathada a	of distribution	
	Dist	ribution system	is. Requirements	or a good distribution syst	em, methods (	or distribution	

	systems and layouts, Leakage and leak detector, Study of fire hydrants.
	Storage reservoirs for treated water: Types, capacity of reservoir, mass curve.
	Miscellaneous Methods of Water Treatment: Colour, Odors & Taste removal,
	removal of iron & manganese - water softening processes, base exchange process, swimming
	pool
	water treatment.
Text Boo	ks
T.1	Water supply & Sanitary Engineering - B.C. Punmia, Laxmi Publication, 2016 edition
T.2	Water supply and Sanitary Engineering - Birdie G.S., Dhanpat Rai Publication, 2010 edition
T.3	Environmental Engg. I - P. N. Modi, Standard Book House, 5th edition, 2018
T.4	Environmental Engg.(Water supply Engg.) - S.K.Garg, Khanna Publication, 33 <sup>rd</sup> edition. 2010
T.5	Environmental Engg. – N.N.Basak, Tata Mcgraw Hill Publication, 22 <sup>nd</sup> reprint edition
T.6	Environmental Engg. – G.N. Pandey, Tata Mcgraw Hill Publication, 5th reprint edition
Reference	e Books
<b>R</b> .1	Water Supply and Sanitary Engineering – S.C.Rangwala, Charotar Publishing House, 2005 edition
R.2	Water supply and sewage -M.J.Mcghee, Mc.Graw Hill, 6th edition, 1991
R.3	Environmental Pollution Control Engg C.S.Rao, New Age International Publishers, 3 <sup>rd</sup> edition, 2018
R.4	Elements of Environmental Engineering – Dr.K.N.Duggal, S.Chand Publication, 2007 edition
R 5	CPHEOO manual on Water Supply & Treatment 2009, New Delhi, Ministry of Urban
<b>R</b> .5	Development, G.O.I.
Useful Li	inks
1	https://nptel.ac.in/courses/105/105/105105201/
2	https://nptel.ac.in/courses/105/106/105106119/

	Course Outcomes	CL	<b>Class Sessions</b>
BCE2405.1	<b>Describe</b> the importance and necessity of water supply scheme.	2	8
BCE2405.2	<b>Implement</b> the basic concepts of water conveyance systems & hydraulic design aspects.	3	9
BCE2405.3	<b>Determine</b> characteristics of water, BIS & WHO drinking water standards and necessity of water treatment.	3	10
BCE2405.4	Examine sedimentation & filtration water treatment units	4	8
BCE2405.5	<b>Analyze</b> disinfection & miscellaneous units of conventional water treatment plant.	4	10

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Progra	m: B.Tech. Civil	Engineering				
Semeste	r Course Code	Name of Course	L	Т	Р	Credits
IV	BCE2406	Surveying Lab	-	-	2	1
Pre-Req	uisites:					
		<b>Course Contents</b>				CO
1	Measurement of dis	tance by Chaining / Tape and ranging				CO1
2	Determination of an	ea of given polygon by tape and cross staff s	urvey	•		CO1
3	Measurement of b computation of corr	bearings of sides of traverse with prism rect included angles.	atic (	compas	s and	CO2
4	Determination of e plane method and r	elevation of various points with dumpy le use & fall Method.	vel b	y collin	nation	CO2
5	Fixing bench mark leveling and check	with respect to temporary bench mark with leveling.	n Auto	o level	by fly	CO2
6	L - Section and cross section of road (One full size drawing sheet each for L-section and cross section)					CO3
7	Measurement of ho	rizontal angles using Theodolite by method of	of repe	etition		CO3
8	Measurement of ver	rtical angles with Theodolite.				CO3
9	Determination of horizontal distance between two inaccessible points with Theodolite.				CO3	
10	Locating given buil	ding by plane table traversing (One full size	drawi	ng shee	t	CO4
11	Locating given buil	ding by Theodolite traversing (One full size	drawi	ng shee	t)	CO4
12	Determination of el	evation of point by trigonometric leveling.				CO3
13	Determination of an	ea of a irregular figure by using Planimeter				CO4
14	To draw Contour m	ap of given area (One full size drawing shee	t)			CO5
15	To give site Layout	for given plan of building.				CO5
Text Bo	oks					
T.1	Surveying and Lev	elling - Kanetkar and Kulkarni (Vol.I), Pune	e Vidy	arthi Gi	riha Pra	kashan
T.2	Surveying and Lev	elling - Dr. B.C. Punmia (Vol. I & II), Laxm	i Pub	lication	S	
Referen	ce Books					
<b>R</b> .1	R.1 Surveying and Leveling - Basak N. N.1st Edition, Tata McGraw–Hill Publishing company Ltd. New Delhi					
Useful L	inks					
1	https://nptel.ac.in/c	ourses/105/107/105107122/				

	Course Outcomes	CL	Lab Sessions
BCE2406.1	<b>Demonstrate</b> ability to work in a team to carry out a survey of a small area using appropriate methods	3	4
BCE2406.2	<b>Apply</b> the basic principles, operation, handling & uses of the surveying equipment	3	6
BCE2406.3	<b>Interpret</b> the angle and distance measurement; and leveling procedures and apply them to field conditions	3	10
BCE2406.4	<b>Examine</b> the observation, computation and adjustment of a Traverse to carry out basics survey computation and adjustment	4	6
BCE2406.5	<b>Evaluate</b> survey data for preparing drawings, plans or maps	5	4

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Program: B. Tech. Civil Engineering							
Semester	c Course Code	Name of Course	L	Т	Р	Credits	
IV	BCE2407	Transportation Engineering Lab	-	-	2	1	
Pre-Req	uisites: Nil						
		<b>Course Contents</b>				СО	
1	To Perform Californ	nia Bearing Ratio Test				CO1	
2	To identify AASH7	O Classification of Sub grade Soil				CO1	
3	To determine the ag	gregate crushing value of the given specime	n			CO2	
4	To determine the ab	rasion value of coarse aggregate by using Lo	os Ang	gles ma	chine	CO2	
5	To determine the ag	gregate impact value of the given specimen				CO2	
6	To determine the Sp	pecific gravity and water absorption of an agg	gregat	e samp	le	CO2	
7	To determine the Pe	enetration Value of the given bitumen				CO4	
8	To determine the du	ctility value of the given bitumen				CO4	
9	To determine the So	oftening point of the given bitumen				CO5	
10	To determine the Fl	ash point and Fire point of the given bitumer	1			CO5	
Text Boo	oks						
T.1	Highway Engineer	ing: Khanna and Justo, Nem Chand Publicati	ion				
T.2	Principles and prac	tices of Highway Engineering - S. K. Sharm	a, Kha	anna Pu	blicatio	on	
Reference	ce Books						
<b>R</b> .1	Pavement Design:	Yoder and Witzak, Wiley Publication					
R.2	Traffic Engineerin	g: L.R.Kadiyali, Khanna Publishers					
R.3	Relevant IS Codes: IS-2720-PART-16-1979, AASHTO manual, IS:2386-Part 1 to 6-1963, IS:1203-1978, IS 1208-1978, IS 1201 to 1220 (1978).					5-1963,	
Useful L	inks						
1	https://nptel.ac.in/c	ourses/105/101/105101087/					
2	https://nptel.ac.in/c	ourses/105/105/105105107/					
3	https://nptel.ac.in/courses/105/101/105101008/						

	Course Outcomes	CL	Lab Sessions
BCE2407.1	<b>Identify</b> the properties of highway materials and draw appropriate conclusion	2	4
BCE2407.2	<b>Determine</b> the properties of aggregate used for road construction	3	8
BCE2407.3	<b>Determine</b> flakiness index & elongation index of aggregate.	3	4
BCE2407.4	<b>Evaluate</b> the suitability of bitumen and check the properties of bitumen by Penetration & Ductility tests	5	4
BCE2407.5	<b>Relate</b> complete knowledge of softening point, Flash and Fire point of bitumen.	4	4

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Program: B.Tech. Civil Engineering							
Semester	<b>Course Code</b>	Name of Course	L	Т	Р	Credits	
IV	BCE2408	Structural Analysis Lab	-	-	2	1	
Pre-Requ	isites: Engineering	Mechanics, Mechanics of Solids					
		<b>Course Contents</b>				CO	
1	To find the slope	and deflection of continuous beam.				CO 1	
2	To find the value of Flexural rigidity (EI) for a given beams and compare with theoretical value						
3	To determine the when the other en	moment required to produce a given rotation d is i) Pinned ii) Fixed	n at on	e end of	f a bear	m CO 2	
4	To calculate the E types of struts.	Eulers Buckling load in order to determine t	he beha	vior of	differe	nt CO 3	
5	To determine the horizontal thrust of	horizontal thrust and to draw the influence of two hinged parabolic arch.	line dia	gram fo	or	CO3	
6	To measure the st strain gauge.	rain in the cantilever beam with the help of	acousti	ic resist	ance	CO3	
7	To verify the Max	xwell's reciprocal theorem for beam.				CO2	
8	To determine hor	zontal thrust for indeterminate portal frame	<b>)</b>			CO2	
9	Analysis of a continuous beam using computer software.					CO 4, CO5	
10	Analysis of a plar	e frame using computer software.				CO 4, CO5	
11	Analysis of a plar	e truss using computer software.				CO4, CO5	
Text Boo	ks						
T.1	"Structural Analys Tata McGraw-Hill	is: A Matrix Approach"author by Pandit G. Publishing company LTD, New Delhi, 199	S and O 7	Gupta S	.P., 2 <sup>nd</sup>	edition,	
T.2	"Structural Analys	is-I" author by Bhavikatti S. S., 4th edition	Vikas	Public	ation		
T.3	"Structural Analys Taylor And Franci	is" author by Ghali ,A; Neville, A. M; Brov s publication	vn, T .C	$G_{\cdot}, 6^{\text{th}} \epsilon$	dition	REPRINT,	
T.4	"Structural Analys LaxmiPublication,	is", author by Vaidyanatnan, R and Peruma New Delhi, 2007.	l PVol	– I & II	, 3rd ed	dition,	
Referenc	e Books						
R.1	"Analysis of struct S.K. Duggal, 2 <sup>nd</sup> ed	ures: Theory and Design Vol. 2" author by dition Khanna Publishers New Delhi 2009.	Vaziran	i V.N, I	Ratwan	i M.M. and	
R.2	"Structural Analys LTD Delhi 2011	is (volume II)" author byBhavikatti,4 <sup>th</sup> edit	ion, S.S	Vikas	publish	ing House	
R.3	"Mechanical Beha publication, 2005.	vior of Materials" author by Courtney, T. H	I., 2 <sup>nd</sup> E	dition I	McGrav	w-Hill	

R.4	"Basic Structural Analysis" author by Reddy C. S. 2 <sup>nd</sup> edition Tata Mcgraw Hill publication		
Useful Links			
1	https://nptel.ac.in/courses/105/105/105166/		
2	https://nptel.ac.in/courses/105/105/105180/		

	Course Outcomes	CL	Lab Sessions
BCE2408.1	<b>Analyze</b> the slope and deflection of continuous beam and flexural rigidity to compare with theoretical value.	4	4
BCE2408.2	<b>Determine</b> the moment required to produce a rotation at one end of beam and verification of Maxwell Reciprocal Theorem.	3	2
BCE2408.3	<b>Determine</b> the behaviour of strut by Euler's buckling load and measure horizontal thrust of two-hinged parabolic arch.	3	4
BCE2408.4	Analysis of continuous beam using Staad Pro.	4	6
BCE2408.5	Analysis of plane frame and truss using Staad Pro.	4	6

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Program: B. Tech. Civil Engineering						
Semester	Course Code	Name of Course	L	Т	Р	Credits
IV	BCE2409	Environmental Engineering Lab	-	-	2	1
Pre-Requ	isites: Engineerin	g Applied Chemistry, Environmental Engine	eering			·
Course Contents CO						
1	Determination of Chlorides CO1, CO2			CO2		
2	Determination of	Solid's (Suspended & dissolved)			CO1, (	CO2
3	Determination of	Turbidity		CO2, CO3		
4	Determination of	Acidity			CO2, (	CO3
5	Determination of	Dissolved Oxygen			CO2, (	CO3
6	Determination of Conductivity CO2, CO3			CO3		
7	Determination of	Residual Chlorine			CO2, C	CO3
8	Determination of	coagulant by Jar Test apparatus		CO	<b>1, CO</b> 2	2, CO4
9	Determination of	COD in waste water		CO	93, CO4	4, CO5
10	Determination of BOD in waste water CO3, CO4, CO5					4, CO5
Text Books						
T.1	Water supply & Sanitary Engineering - B.C. Punmia, Laxmi Publication					
T.2	Water supply and Sanitory Engineering - Birdie G.S., Dhanpat Rai Publication					
T.3	Environmental Engg. I - P. N. Modi, Std. Publication					
T.4	Environmental Engg.(Water supply Engg.) - S.K.Garg, Khanna Publication					
Reference Books						
R.1	CPHEOO manual, New Delhi, Ministry of Urban Development, G.O.I.					
R.2	Water supply and sewage -M.J.Mcghee, Mc. Graw Hill					
R.3	Environmental Pollution Control EnggC.S.Rao, Mc. Graw Hill					
R.4	R.4Relevant IS Codes: IS 3025 Part 11 (1983), and 22 (1986), IS 3025 Part 32 (1988), IS 3025-15 (1984), IS 3025-10 (1984), IS 3025 Part 22 (1986), IS 3025-50 (2001)					
Useful Links						
1	https://nptel.ac.in/courses/105/105/105105201/					
2	https://nptel.ac.in/c	courses/105/106/105106119/				

	Course Outcomes	CL	Lab Sessions
BCE2409.1	<b>Identify</b> and recommend water quality analysis tests for determining pollution in water	2	4
BCE2409.2	<b>Identify</b> and recommend tests for analysis of physical constituents of water	2	4
BCE2409.3	<b>Investigate</b> properties of chemical constituents of water using identification tests	6	6
BCE2409.4	<b>Evaluate</b> & acquire the knowledge to test strength & quality of reagents & coagulants	5	4
BCE2409.5	<b>Examine</b> the concepts of water quality related to Environmental Engineering	4	2

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3	NAAC Accredited with A+ Grade					
Ducanan	(An Autonomous	s Institute Affiliated to RTM Nagpur Ur	nversity, Nagp	ur)		
Program	I: B. Iech. IV Sen	lester (All Branches)				
Semester	IV BSH2401: Hur	nan Values for Professional Society				
Tea	ching Scheme		Examination	on Scheme		
Theory	Theory 3 Hrs/week		CT-I	15 Marks		
Tutoria	1 -		CT-II	15 Marks		
Total Cre	dits 3		CA	10Marks		
Duration of	f ESE: 3Hrs		ESE	60 Marks		
Pre- Requis	site: Ethical Science & I	Business Ethics	<b>Total Marks</b>	100 Marks		
	<b>T</b> A <b>L</b> A <b>L</b> A <b>L</b> A	Course Contents				
	Introduction to Va	lue Education				
Unit I	Value Education, I	Definition, Concept and Need for Value	Education, The	content and		
	Process of Value	Education, Basic Guidennes for value	Education, Sel	1-exploration		
	as a liteans of valu	umon Boing Family Society and Nat	180			
	Human Baing is n	are then just the Body Understanding	ne Mysolf os Co	ovistance of		
Unit II	the Self and the R	dy Understanding the activities in the	Solf and the ac	tivities in the		
	the Self and the Body, Understanding the activities in the Self and the activities in the					
	Basics for Respect	and today's Crisis: Affection Guidance	Reverence G	lory		
	Social Ethics					
Unit III	The Basics for Ethical Human Conduct. Defects in Ethical Human Conduct. Holistic					
0	Alternative and Universal Order. Universal Human Order and Ethical Conduct					
	<b>Basic Theories</b>	,				
	Basic Ethical principles, Moral Developments, Deontology, Utilitarianism, Virtue					
Unit IV	theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral					
	Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas,					
	Moral Autonomy.					
	Global Issues in Pr	ofessional Ethics:				
	Introduction- Current Scenario, Technology Globalization of MNCs, International					
Unit V	Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable					
Unit v	Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in					
	Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual					
Property Rights.						

Text Books			
T.1	A.N Tripathy, New Age International Publishers, 2003.		
T.2	Bajpai. B. L, New Royal Book Co, Lucknow, Reprinted, 2004.		
T.3	Bertrand Russell Human Society in Ethics & Politics.		
T.4	Professional Ethics: R. Subramanian, Oxford University Press, 2015.		
Reference Books			
R.1	Corliss Lamont, Philosophy of Humanism.		
R.2	Gaur. R.R, Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.		
R.3	Gaur. R.R, Sangal. R, Bagaria. G.P, Teachers Manual Excel Books, 2009.		
R.4	I.C. Sharma. Ethical Philosophy of India Nagin & co Julundhar.		
R.5	Mortimer. J. Adler, – Whatman has made of man.		
R.6	Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, Cengage Learning, 2015.		

	Course Outcomes	CL	Class Sessions
BSH2401.1	<b>Describe</b> Value Education and its role for Self-exploration.	2	9
BSH2401.2	Illustrate the Harmony in the Human Being and Society.	3	9
BSH2401.3	<b>Examine</b> the Ethical Human Conduct along with Universal Order.	3	9
BSH2401.4	Use of various theories of Basic Ethical principles.	3	9
BSH2401.5	<b>Predict</b> Global Issues in Professional Ethics and Sustainable Development.	3	10

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