



Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

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

- To strive for rearing standard and stature of the students by practicing high standards of professional ethics , transparency and accountability.
- To provide facilities and services to meet the challenges of Industry and Society.
- To facilitate socially responsive research, innovation and entrepreneurship.
- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Vision of the Department

To forge learning Center of Excellence in the field of Civil Engineering

Mission of the Department

- To promote academic and ethical development while upholding high standards.
- To provide advance facilities with the skills needed to face Industry and societal challenges.
- To promote socially responsible research, innovation, and entrepreneurship in the field of Civil Engineering.
- To foster the holistic development of both students and faculty members by inculcating a blend of knowledge and professional work methods for overall progress.

Program Education Objectives (PEO)

Graduates will be able to

- PEO1 : Analyse and design civil engineering structures while keeping social awareness and ethical responsibilities in mind.
- PEO2 : Demonstrate leadership abilities in supporting sustainable practices in Civil Engineering
- PEO3 : Exhibit a commitment to lifelong learning, staying updated on developing technologies and industry trends, and adjusting to the evolving world of Civil Engineering.
- PEO4 : Executing Proficiency in creative problem-solving and innovation, demonstrating an entrepreneurial attitude within the context of Civil Engineering.

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. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME				
									CT-1	CT-2	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	-	-	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

L- Lecture

T-Tutorial

P-Practical

CT1- Class Test 1

TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2

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

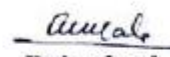
Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	Project / Seminar / Industrial Training	MCC (Mandatory Courses)
Credits	3	--	--	20	--	--	01	Yes
Cumulative Sum	6	27	18	28	--	--	01	--

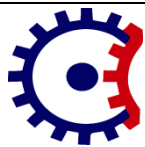
PROGRESSIVE TOTAL CREDITS :56+24 =80


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Vice Principal
Tulsiramji Gaikwad-Patil
College Of Engineering &
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Principal
Tulsiramji Gaikwad Patil College Of
Engineering and Technology, Nagpur



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Program: B.Tech. Civil Engineering

Semester-IV

BCE2401 : Hydrology & Water Resources

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	CT-I	15Marks
Tutorial		CT-II	15 Marks
Total Credits	3	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks
Pre-Requisites: Engineering Applied Chemistry		Total Marks	100 Marks

Course Contents

Unit I	<p>Introduction: Hydrology, definition, engineering hydrology, and its importance, development of hydrology and allied science, hydrological cycle, hydrological evolution and brief description of its components, the earth and its atmosphere, importance of temperature, humidity, and wind in hydrological study.</p> <p>Precipitation: Definition anticipation, artificial rains, types of precipitation, orthographic, conventional and cyclonic, factors affecting precipitation with reference to physiographic divisions of India</p> <p>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 and depth area duration analysis</p>
Unit II	<p>Infiltration: definition, mechanism, factors affecting infiltration, infiltration indices, measurement, application, problems.</p> <p>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 and its measurement.</p>
Unit III	<p>Runoff: Source and components of run-off, classification of streams, factors affecting the runoff processes, estimation methods, measurement of discharge of streams by area-slope and area velocity method.</p> <p>Hydro-graphics: Flood hydrology, definition, typical flood hydrograph and its components, base flow and base flow separation, unit hydrograph, S-curve and its use, instantaneous UHG.</p>
Unit IV	<p>Statistical Methods: statistics in hydrological analysis, probability and probability distributions, average measure of dispersion, co-relation. Analysis of time series, frequency analysis. Floods: causes and effects, factors affecting peak flows and estimation of peak flows, low flow, basin flood, flood routine and flood forecasting, economic planning for flood control (Emergency action plan)</p>
Unit V	<p>Geo-hydrology: Introduction, occurrence and distribution of ground water, water table and water table maps, aquifer, aquiclude, aquitard and aquifuge. Groundwater exploration, electrical sensitivity method, confined and unconfined aquifer, porosity, permeability, specific yield, specific retention, Darcy's law, introduction to hydraulic wells, open wells, safe yield test, Well Hydraulics- Image well theory, Water Well Design and Drilling.</p> <p>Groundwater recharge: Concept of recharge, selection of recharge sites, recharging</p>

	<p>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.</p> <p>Rain Water Harvesting: Introduction to rain water harvesting, Assessment of site's water resources, water harvesting methods using earthwork, tanks.</p>
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Text Books

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, 3 rd edition 2016
T.3	Hydrology & Water Resource Engineering – Gite & Deshpande, Nirali Prakashan, 2018 edition
T.4	Irrigation & Water Resources Engineering - G.L. Asawa, New Age International Publishers, 2005 edition

Reference Books

R.1	Engineering Hydrology – Dr. K. Subramanya, Tata McGraw Hill, 4 th 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 House, 11 th edition 2019
R.4	Hydrology – Madan Mohan Das, PHI Learning, 2009
R.5	Rain Water Harvesting for Drylands and Beyond- Brad Lancaster. Rain Resource Press.

Useful Links

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	Apply knowledge of hydrology as well as measurement of precipitation	3	9
BCE2401.2	Apply knowledge of basics of hydrology in calculating infiltration, evaporation, total runoff.	3	10
BCE2401.3	Classify the components and factors affecting the runoff, as well as analyze the hydro-graphics.	3	8
BCE2401.4	Analyze the flood occurrence & frequency by applying Statistical techniques	4	10
BCE2401.5	Apply 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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Program: B.Tech. Civil Engineering

Semester-IV | BCE2402 : Surveying

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	CT-I	15Marks
Tutorial	-	CT-II	15 Marks
Total Credits	3	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks
Pre-Requisites: Engineering Mechanics		Total Marks	100 Marks

Course Contents

Unit I	<p>Chain and Compass Traversing Introduction: - Classification, division of survey, Principle of survey, 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.</p>
Unit II	<p>Leveling: Leveling: Definitions, Study of Dumpy & Auto Level, temporary adjustments, principles of leveling, reduction of levels, Classification of leveling, Curvature & Refraction corrections, Reciprocal leveling.</p>
Unit III	<p>Contouring and Trigonometrical Leveling Contouring: Definitions, Characteristics, uses, and methods of locating contours, interpolation of contours. Trigonometrical Leveling: Indirect leveling, elevation of a point with base of an object accessible and inaccessible (with instrument station in/not in the same vertical plane as the elevated object)</p>
Unit IV	<p>Theodolite Surveying: Theodolite: Introduction, Type of Theodolite, Temporary adjustment, Principle Axes and relationship, Measurement of horizontal and vertical angles, Traverse Computation: Consecutive and independent co-ordinates, adjustment of closed traverse, Area calculation by co-ordinate.</p>
Unit V	<p>Plane Table Surveying & Computation of Area & Volume Plane Table Survey: Instruments and accessories, advantages and disadvantages, orientation, Methods of plane table surveying – radiation, intersection, traversing, resection, two-point and three-point problems in plane tabling. Computation of Area and Volume: Trapezoidal and Simpsons Rule, errors in plane table surveying. Introduction to Remote sensing and Geographical Information System (GIS) and its applications</p>

Text Books



T.1	Surveying and Levelling - Kanetkar and Kulkarni (Vol.I) Pune Vidyarthi Griha Prakashan, 2006 edition
T.2	Surveying and Levelling - Dr. B.C. Punmia (Vol. I) Laxmi Publications, 17 th edition 2016
T.3	Surveying (Vol 1) – S. K. Duggal, McGraw-Hill, 5 th edition 2019

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

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


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Program: B.Tech. Civil Engineering			
Semester-IV	BCE2403 : Transportation Engineering		
Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week		CT-I 15Marks
Tutorial	-		CT-II 15 Marks
Total Credits	3		CA 10 Marks
Duration of ESE: 3Hrs			ESE 60 Marks
Pre-Requisites: Engineering Mechanics			Total Marks 100 Marks
Course Contents			
Unit I	Highway Development & Planning: Principles of Highway planning, Road development in India, Classification of roads, network patterns, Planning, Surveys. Highway Alignment: Requirements, Engineering Surveys. Highway Materials: Properties of sub grade and pavement component materials, Tests on sub-grade soils, aggregates and bituminous materials. Application of Geo-synthetics.		
Unit II	Highway Geometric Design: Cross Section elements, carriageways, camber, stopping & overtaking sight distances Horizontal alignment- Curves, design of super elevation, widening, transition curves, vertical curves.		
Unit III	Pavement Design: Types of pavements & characteristic, Design parameters, Axle & Wheel load, tyre pressure, ESWL for dual Wheels, repetitions, Group Index & IRC method of flexible pavement design. Analysis of load & temperature stresses of rigid pavement, joints Highway Construction & Maintenance: Earthen/Gravel road, Bituminous pavement, Cement Concrete pavement. Pavement failures, Pavement evaluation		
Unit IV	Traffic Engineering: Traffic characteristics (Road User, Driver and Vehicular characteristics) Traffic Studies (Volume studies, speed studies, parking studies and accident studies.) Traffic Safety (Causes and types of accidents, Use of intelligent transportation system) Bridge Engineering: Classification, identification and site selection. Flood discharge, waterways, scour depth, economic span. IRC classification of Loads, Forces, Stresses: IRC Specification & code of practices, Critical combinations. Rating and Maintenance: Methods & Techniques of rating of existing bridges Inspection, Repairs, maintenance, corrosion-causes and prevention, aesthetics.		
Unit V	Rapid 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.		
Text Books			
T.1	Highway Engineering – Khanna and Justo, Nem Chand Publication, 10 th Revised edition 2018		
T.2	Textbook of Highway & Traffic Engineering – Subhash C. Saxena, CBS Publishers & Distributors, 1 st edition 2017		
T.3	Bridge Engineering - S. C. Rangwala, Charotar Publishing House Pvt. Limited, 16 th 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 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 Links	
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	Classify Highway Planning, Materials and Engineering surveys for highway alignment	3	9
BCE2403.2	Design the Geometric Elements of Highways and Urban roads, Flexible and Rigid pavements.	6	8
BCE2403.3	Analyze the load and temperature stresses of rigid pavement, joints and judge the Highway Construction and Maintenance	4	10
BCE2403.4	Summarize and undertake the concepts of Traffic studies & classification, identification, site selection for Bridge Engineering	3	10
BCE2403.5	Apply the knowledge regarding Rapid Mass Transportation System	3	8


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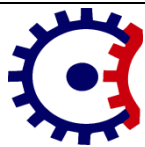
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Program: B.Tech. Civil Engineering				
Semester-IV	BCE2404: Structural Analysis			
Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15Marks
Tutorial	1 Hrs/week		CT-II	15 Marks
Total Credits	4		CA	10 Marks
Duration of ESE: 3Hrs			ESE	60 Marks
Pre-Requisites: Engineering Mechanics, Mechanics of Solids			Total Marks	100 Marks
Course Contents				
Unit I	Introduction of Statically indeterminate Structures, Concept of Static indeterminacy, Analysis of fixed and continuous beams by theorem of three moments, effects of sinking of support			
Unit II	Slope deflection method as applied to indeterminate beams & continuous beams portal frames. Frame with inclined legs up to 3 degrees of freedom. Analysis of Continuous Beams & Simple Portal frames (sway and Non-Sway) Using Moment Distribution Method			
Unit III	Rolling loads on simply supported beams with concentrated and uniformly distributed loads, maximum B.M. and S.F. Influence Line Diagrams for Reactions, Shear Forces and Bending Moments in simply supported beam, cantilevers and beams with overhangs, ILD for forces in members of Simple Trusses.			
Unit IV	Basic concept, Degree of Freedom, Direct Stiffness Method. Formulation of elemental local stiffness matrix and global stiffness matrix for beam members (without axial deformation), for plane frame members. Member load matrix due to concentrated loads, uniformly distributed loads. Transformation matrix, Assembly of global/ structural load matrix up to three elements. Solution to problems with maximum degree of freedom three.			
Unit V	Formulation of elemental/local stiffness matrix and global stiffness matrix for plane truss. 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.			
Text Books				
T.1	“Structural Analysis: A Matrix Approach” author by Pandit G.S and Gupta S.P., 2 nd edition, Tata McGraw-Hill Publishing company LTD, New Delhi, 1997			
T.2	“Structural Analysis-I” author by Bhavikatti S. S., 4 th edition Vikas Publication			
T.3	“Structural Analysis” author by Ghali ,A; Neville, A. M; Brown, T .G., 6 th edition REPRINT, Taylor And Francis publication			
T.4	“Structural Analysis”, author by Vaidyanathan, R and Perumal PVol – I & II, 3rd edition, Laxmi Publication, New Delhi, 2007.			
Reference Books				
R.1	“Analysis of structures: Theory and Design Vol. 2” author by Vazirani V.N, Ratwani M.M. and S.K. Duggal, 2 nd edition Khanna Publishers New Delhi 2009.			
R.2	“Structural Analysis (volume II)” author by Bhavikatti, 4 th edition, S.S Vikas publishing House LTD Delhi 2011			

R.3	“Mechanical Behavior of Materials” author by Courtney, T. H., 2 nd Edition McGraw-Hill publication, 2005.
R.4	“Basic Structural Analysis” author by Reddy C. S. 2 nd edition Tata Mc graw Hill publication
Useful Links	
1	https://nptel.ac.in/courses/105/101/105101085/
2	https://nptel.ac.in/courses/105/105/105105166/
3	https://nptel.ac.in/courses/105/105/105105180/

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


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Program: B.Tech. Civil Engineering

Semester-IV BCE2405: Environmental Engineering

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	CT-I	15Marks
Tutorial	-	CT-II	15 Marks
Total Credits	3	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks
Pre-Requisites: Engineering Applied Chemistry, Fluid Mechanics			Total Marks 100 Marks

Course Contents

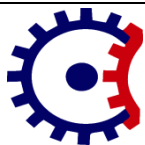
Unit I	<p>Introduction: Importance and necessity of water supply scheme.</p> <p>Water Demand: All types of water demand, empirical formulae, factors affecting per capita demand, variation in demand, design period, population forecasting methods and examples.</p> <p>Sources of water: Rain water, Ground water-springs, infiltration galleries, dug wells, tube wells, Surface water stream, lake, river, impounding reservoirs, ponds & sea.</p> <p>Intake structures: Location, types - river, lake, canal, reservoir etc.</p>
Unit II	<p>Conveyance of water: Types of pipes, joints, fittings, valves & appurtenances. Hydraulic design aspects: Friction, Manning's, Darcy-Weishbach & Hazen-Williams equation and problem.</p> <p>Rising main and pumps: Concept of rising main, Classification, working, merits and demerits, selection of pumps.</p>
Unit III	<p>Water quality: Physical, Chemical and bacteriological characteristics of water, Health effects of various water characteristics, Standards of drinking water. (WHO 2011, CPHEEO, IS 10500). Water borne diseases</p> <p>Water treatment: Objective of treatment, unit operations and processes, house hold & community based rural water treatment, decentralized water treatment, flow sheet of conventional water treatment plant.</p> <p>Aeration: Purpose, types of aerators, design of cascade aerator.</p> <p>Coagulation and Flocculation: Definition, Principles, types of coagulants and reactions, coagulant doses, types of mixing and flocculation devices.</p>
Unit IV	<p>Sedimentation: Principles, types of setting basins, inlet and outlet arrangements, simple design of sedimentation tank.</p> <p>Clariflocculators: Principles and operation.</p> <p>Filtration: Mechanism of filtration, types of filters-RSF, SSF, Pressure filters, elements of filters sand specification, operational problems in filtration, Design of SSF and RSF, Membrane filtration technique of water treatment.</p>
Unit V	<p>Disinfection: Purpose, Mechanism, criteria for good disinfectant, various disinfectants, their characteristics, disinfection by chlorination using different forms of chlorine. Types of chlorination.</p> <p>Distribution systems: Requirements of a good distribution system, methods of distribution</p>

	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 Books	
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, 5 th edition, 2018
T.4	Environmental Engg.(Water supply Engg.) - S.K.Garg, Khanna Publication, 33 rd edition. 2010
T.5	Environmental Engg. – N.N.Basak, Tata Mcgraw Hill Publication, 22 nd reprint edition
T.6	Environmental Engg. – G.N. Pandey, Tata Mcgraw Hill Publication, 5 th reprint edition
Reference Books	
R.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, 6 th edition, 1991
R.3	Environmental Pollution Control Engg. - C.S.Rao, New Age International Publishers, 3 rd edition, 2018
R.4	Elements of Environmental Engineering – Dr.K.N.Duggal, S.Chand Publication, 2007 edition
R.5	CPHEEO manual on Water Supply & Treatment 2009, New Delhi, Ministry of Urban Development, G.O.I.
Useful Links	
1	https://nptel.ac.in/courses/105/105/105105201/
2	https://nptel.ac.in/courses/105/106/105106119/

	Course Outcomes	CL	Class Sessions
BCE2405.1	Illustrate the importance and necessity of water supply scheme.	3	8
BCE2405.2	Implement the basic concepts of water conveyance systems & hydraulic design aspects.	3	9
BCE2405.3	Determine 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	Analyze disinfection & miscellaneous units of conventional water treatment plant.	4	10


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 Department of Civil Engineering
 T.G.P.C.E.T. Nagpur.


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 Tulsiramji Gaikwad-Patil
 College Of Engineering
 and Technology, Nagpur



Program: B.Tech. Civil Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
IV	BCE2406	Surveying Lab	-	-	2	1

Pre-Requisites:

Course Contents		CO
1	Measurement of distance by Chaining / Tape and ranging	CO1
2	Determination of area of given polygon by tape and cross staff survey.	CO1
3	Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angles.	CO1
4	Determination of elevation of various points with dumpy level by collimation plane method and rise & fall Method.	CO2
5	Fixing bench mark with respect to temporary bench mark with Auto level by fly leveling and check leveling.	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 horizontal angles using Theodolite by method of repetition	CO4
8	Measurement of vertical angles with Theodolite.	CO4
9	Determination of horizontal distance between two inaccessible points with Theodolite.	CO4
10	Locating given building by plane table traversing (One full size drawing sheet	CO5
11	Locating given building by Theodolite traversing (One full size drawing sheet)	CO4
12	Determination of elevation of point by trigonometric leveling.	CO2
13	Determination of area of a irregular figure by using Planimeter	CO5
14	To draw Contour map of given area (One full size drawing sheet)	CO3
15	To give site Layout for given plan of building.	CO5

Text Books

T.1	Surveying and Levelling - Kanetkar and Kulkarni (Vol.I), Pune Vidyarthi Griha Prakashan
T.2	Surveying and Levelling - Dr. B.C. Punmia (Vol. I & II), Laxmi Publications

Reference Books

R.1	Surveying and Leveling - Basak N. N.1st Edition, Tata McGraw–Hill Publishing company Ltd. New Delhi
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Useful Links

1	https://nptel.ac.in/courses/105/107/105107122/
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	Course Outcomes	CL	Class Sessions
BCE2402.1	Examine the basic concepts of surveying and use of conventional surveying equipment	3	8
BCE2402.2	Implement the basic principles, operation, handling & uses of advanced surveying equipment	3	9
BCE2402.3	Sketch the location map, contour map using surveying equipment	3	10
BCE2402.4	Interpret linear and angular measurements and elevations using Theodolite surveying	3	8
BCE2402.5	Interpret survey data for preparing drawings, plans or maps & to calculate their areas & volumes	3	10


 H.O.D.
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 College Of Engineering
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Semester	Course Code	Name of Course	L	T	P	Credits
IV	BCE2407	Transportation Engineering Lab	-	-	2	1

Pre-Requisites: Nil

Course Contents		CO
1	To Perform California Bearing Ratio Test	CO1
2	To identify AASHTO Classification of Sub grade Soil	CO1
3	To determine the aggregate crushing value of the given specimen	CO3
4	To determine the abrasion value of coarse aggregate by using Los Angles machine	CO2
5	To determine the aggregate impact value of the given specimen	CO2
6	To determine the Specific gravity and water absorption of an aggregate sample	CO2
7	To determine the Penetration Value of the given bitumen	CO4
8	To determine the ductility value of the given bitumen	CO4
9	To determine the Softening point of the given bitumen	CO5
10	To determine the Flash point and Fire point of the given bitumen	CO5

Text Books

T.1	Highway Engineering: Khanna and Justo, Nem Chand Publication
T.2	Principles and practices of Highway Engineering - S. K. Sharma, Khanna Publication

Reference Books

R.1	Pavement Design: Yoder and Witzak, Wiley Publication
R.2	Traffic Engineering: 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).

Useful Links

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


H.O.D.
Department of Civil Engineering
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Program: B.Tech. Civil Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
IV	BCE2408	Structural Analysis Lab	-	-	2	1

Pre-Requisites: Engineering Mechanics, Mechanics of Solids

Course Contents		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 .	CO 1
3	To determine the moment required to produce a given rotation at one end of a beam when the other end is i) Pinned ii) Fixed	CO 2
4	To calculate the Eulers Buckling load in order to determine the behavior of different types of struts.	CO 3
5	To determine the horizontal thrust and to draw the influence line diagram for horizontal thrust of two hinged parabolic arch.	CO3
6	To measure the strain in the cantilever beam with the help of acoustic resistance strain gauge.	CO3
7	To verify the Maxwell's reciprocal theorem for beam.	CO2
8	To determine horizontal thrust for indeterminate portal frame	CO2
9	Analysis of a continuous beam using computer software.	CO 4, CO5
10	Analysis of a plane frame using computer software.	CO 4, CO5
11	Analysis of a plane truss using computer software.	CO4, CO5

Text Books

T.1	“Structural Analysis: A Matrix Approach” author by Pandit G.S and Gupta S.P., 2 nd edition, Tata McGraw-Hill Publishing company LTD, New Delhi, 1997
T.2	“Structural Analysis-I” author by Bhavikatti S. S., 4 th edition Vikas Publication
T.3	“Structural Analysis” author by Ghali ,A; Neville, A. M; Brown, T .G., 6 th edition REPRINT, Taylor And Francis publication
T.4	“Structural Analysis”, author by Vaidyanatnan, R and Perumal PVol – I & II, 3rd edition, LaxmiPublication, New Delhi, 2007.

Reference Books

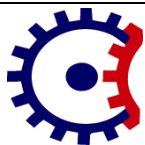
R.1	“Analysis of structures: Theory and Design Vol. 2” author by Vazirani V.N, Ratwani M.M. and S.K. Duggal, 2 nd edition Khanna Publishers New Delhi 2009.
R.2	“Structural Analysis (volume II)” author by Bhavikatti, 4 th edition, S.S Vikas publishing House LTD Delhi 2011
R.3	“Mechanical Behavior of Materials” author by Courtney, T. H., 2 nd Edition McGraw-Hill publication, 2005.

R.4	“Basic Structural Analysis” author by Reddy C. S. 2 nd edition Tata Mcgraw Hill publication
Useful Links	
1	https://nptel.ac.in/courses/105/105/105105166/
2	https://nptel.ac.in/courses/105/105/105105180/

	Course Outcomes	CL	Lab Sessions
BCE2408.1	Analyze the slope and deflection of continuous beam and flexural rigidity by MDM.	4	4
BCE2408.2	Determine the moment required to produce a rotation at one end of beam and verification of Maxwell Reciprocal Theorem.	3	2
BCE2408.3	Determine the behavior 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


H.O.D.
Department of Civil Engineering
T.G.P.C.E.T. Nagpur.


Dean Academics
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College Of Engineering
and Technology, Nagpur



Program: B. Tech. Civil Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
IV	BCE2409	Environmental Engineering Lab	-	-	2	1

Pre-Requisites: Engineering Applied Chemistry, Environmental Engineering

Course Contents		CO
1	Determination of Chlorides	CO1
2	Determination of Solid's (Suspended & dissolved)	CO1
3	Determination of Turbidity	CO2
4	Determination of Acidity	CO2
5	Determination of Dissolved Oxygen	CO3
6	Determination of Conductivity	CO3
7	Determination of Residual Chlorine	CO4
8	Determination of coagulant by Jar Test apparatus	CO4
9	Determination of COD in waste water	CO5
10	Determination of BOD in waste water	CO5

Text Books

T.1	Water supply & Sanitary Engineering - B.C. Punmia, Laxmi Publication
T.2	Water supply and Sanitary 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	CPHEEO 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 Engg. -C.S.Rao, Mc. Graw Hill
R.4	Relevant 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)

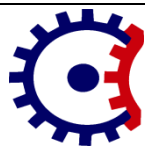
Useful Links

1	https://nptel.ac.in/courses/105/105/105105201/
2	https://nptel.ac.in/courses/105/106/105106119/

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


H.O.D.
Department of Civil Engineering
T.G.P.C.E.T. Nagpur.


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Program: B.Tech. IV Semester (All Branches)

Semester IV BSH2401: Human Values for Professional Society

Teaching Scheme

Theory 3 Hrs/week

Tutorial -

Total Credits **3**

Duration of ESE: 3Hrs

Examination Scheme

CT-I 15 Marks

CT-II 15 Marks

CA 10Marks

ESE 60 Marks

Pre- Requisite: Ethical Science & Business Ethics

Total Marks **100 Marks**

Course Contents

Unit I

Introduction to Value Education

Value Education, Definition, Concept and Need for Value Education, The Content and Process of Value Education, Basic Guidelines for Value Education, Self-exploration as a means of Value Education.

Unit II

Harmony in the Human Being, Family, Society and Nature

Human Being is more than just the Body, Understanding Myself as Co-existence of the Self and the Body, Understanding the activities in the Self and the activities in the Body, Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory.

Unit III

Social Ethics

The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct, Holistic Alternative and Universal Order, Universal Human Order and Ethical Conduct.

Unit IV

Basic Theories

Basic Ethical principles, Moral Developments, Deontology, Utilitarianism, Virtue theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

Unit V

Global Issues in Professional Ethics:

Introduction- Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable 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	Relate Value Education and its role for Self-exploration.	3	9
BSH2401.2	Illustrate the Harmony in the Human Being and Society.	3	9
BSH2401.3	Examine the Ethical Human Conduct along with Universal Order.	3	9
BSH2401.4	Use of various theories of Basic Ethical principles.	3	9
BSH2401.5	Predict Global Issues in Professional Ethics and Sustainable Development.	3	10


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