



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 2023-24

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.

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SCHEME OF INSTRUCTION & SYLLABI

Programme: Civil Engineering

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

Semester – VII

Sr.	Course	Course Code	Course Title	т	т	р	Contact	Credita		E	XAM SCH	IEME	
No.	Category	Course Code	Course Thie		I	ľ	Hrs./Wk	Credits	CT1	CT2	TA/CA	ESE	TOTAL
1	PCC	BCE4701	Estimating & Costing	3	1	-	4	4	15	15	10	60	100
2	PCC	BCE4702	Advanced Design of Reinforced Concrete Structure.	3	1	-	4	4	15	15	10	60	100
3	PEC	BCE4703-06	Program Elective-V	3	-	-	3	3	15	15	10	60	100
4	PEC	BCE4707-10	Program Elective-VI	3	-	-	3	3	15	15	10	60	100
5	OEC	B\$\$XX01-14	Open Elective-III	3	-	-	3	3	15	15	10	60	100
6	PEC	BCE4715-18	Program Elective-VII	3	-	-	3	3	15	15	10	60	100
7	PCC	BCE4719	Estimating & Costing Lab	-	-	2	2	1	-	-	25	25	50
8	PCC	BCE4720	Advanced Design of Reinforced Concrete Structure Lab	-	-	2	2	1	-	-	25	25	50
9	PROJ	BCE4721	Seminar based on Emerging Courses*	-	I	2	2	2	-	-	25	25	50
10	MCC	BAU4707	Behavioral and Interpersonal Skills	2	-	-	2	Audit	-	-	-	-	-
			Total	20	2	6	30	24	90	90	175	475	850

*There will be two presentations, based on seminar topic to be selected in consultation with a guide preferably based on emerging trends.

L-Lecture

T-Tutorial

P-Practical

CT1- Class Test 1

CT2- Class Test 2

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

TA/CA- Teacher Assessment/Continuous Assessment

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	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				8	09	03	02	Yes
Cumulative Sum	04	27	20	63	21	09	06	

PROGRESSIVE TOTAL CREDITS : 126+24 = 150

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SCHEME OF INSTRUCTION & SYLLABI

Programme: Civil Engineering

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

Semester - VIII

Sr.	Course	Course	Course Title	т	Т	р	Contact		EXAM SCHEME					
No.	Category	Code	Course Hue		I	r	Hrs./Wk	Credits	CT1	CT2	TA/CA	ESE	TOTAL	
1	PROJ	BCE4801	Project	-	-	16	16	08	-	-	50	50	100	
2	PCC	BCE4802	Comprehensive Viva-voce	-	-	-	-	3	-	-	-	100	100	
3	HSMC	BCE4803	Extra-Curricular Activities / Competitive Exam	-	-	-	-	2	-	-	100	-	100	
4	MCC	BAU4808	Project based Science, Technology, Social, Design and Innovation	2	-	-	2	Audit	-	-	-	-	-	
			Total	2	-	16	18	13	-	-	150	150	300	

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	02			03			08	Yes
Cumulative Sum	06	27	20	66	21	09	14	

PROGRESSIVE TOTAL CREDITS :150+13 =163

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Program: Civil Engineering List of Electives offered by Civil Engineering Department

Program Elective- I	Program Elective- II	Program Elective- III	Program Elective- IV		
Semester V Environmental Engineering	Semester V Hydrology & Water Resources Engineering	Semester VI Hydraulics	Semester VI Construction Engineering & Management		
BCE3504-Rural Water Supply and Onsite Sanitation Systems	BCE3508-Water Resources Field Methods	BCE3604- Design of hydraulic structures	BCE3608-Building Construction Practice		
BCE3505-Environmental Laws and Policy	BCE3509- Water Quality Engineering	BCE3605-Hydraulic modelling	BCE3609- Advanced Concrete Technology & Sustainable Construction Methods		
BCE3506-Solid and Hazardous Waste Management	BCE3510- Surface Hydrology	BCE3606- Urban Hydrology and Hydraulics	BCE3610-Repairs & Rehabilitation of Structures		
BCE3507-Air and Noise Pollution and Control	BCE3511-Environmental Fluid Mechanics	BCE3607-River Engineering	BCE3611- Construction Equipment & Automation		

Program Elective- V	Program Elective- VI	Program Elective- VII	Open Elective- I	Open Elective- II
Semester VII Transportation Engineering	Semester VII Structural Engineering	Semester VII Geotechnical Engineering	Semester V	Semester VI
BCE4703-Pavement Design	BCE4707-High Rise Structures	BCE4715-Foundation Engineering	B\$\$XX07- Introduction to art and Aesthetics	B\$\$XX08- Metro Systems & Engineering
BCE4704- Urban Transportation Planning	BCE4708- Industrial Structures	BCE4716-Geotechnical Design		
BCE4705- Airport Planning and Design	BCE4709-Prestressed Concrete	BCE4717-Structural Geology		
BCE4706-High Speed Rail Engineering	BCE4710- Earthquake Engineering	BCE4718-Rock Mechanics		

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	Wardha Road, Nagpur-441 108	
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Program:	B.Tech. Civil Engineering	
Semester-V	I BCE4701: Estimating & Costing	

Semester-											
Tea	ching	Scheme		Examination	on Scheme						
Theory	y	3 Hrs/week		CT-I	15 Marks						
Tutoria	al	1 Hr/week		CT-II	15 Marks						
Total Cre	dits	4		CA	10 Marks						
Duration o	f ESE	: 3Hrs		ESE	60 Marks						
Pre-Requ	isites	Construction	Engineering and Management	Total Marks	100 Marks						
	Course Contents										
Unit I	Introduction: Importance and purpose of the subject, Units of measurement as per code Items of work and Description of items of work, administrative approvals, technical sanction, preliminary estimates, objectives, and its methods										
Unit II	Detailed estimates, objectives, importance, and accuracy. Methods of detailed estimates, Detailed estimates of load bearing and framed structures. Calculation of reinforcing steel with Bar bending Schedule.										
Unit III	Spec writi Tenc esser	cifications: Purp ing and developi ders and Contrac ntials of contrac	bose and principles of specifications writing ang detailed specifications. cts: Methods of carrying out works, tender t, type of contracts, contract documents, land	ng, Types of s notice, acceptar acquisition act	pecifications, nce of tender, , BOQ.						
Unit IV	Rate rates labo	Analysis: Intro , labour guideli r, Rate analysis	oduction, Purpose and principles of CSR, I nes from National Building Organization, n of major items of work.	Factors affectin narket rates of	g analysis of materials and						
Unit V	Valu Real meth	ation: Purpose Estate, Tenure ods, Capitalized	of valuation, Factors affecting property pric of land, Free hold and lease hold, sinking d value, Methods of valuation, Net & Gross i	ce and cost, Ty fund, Depreci ncome, Rent fix	pes of Value. ation, and its sation						
Text Bool	KS										

T .1	"Estimating, Chakraborti N	Costing, M., UBS P	Specification ublication, Calc	& cutta	valuation , 2010	in	Civil	Engineering",	authored	by

T.2	"Estimating and costing" authored by Dutta B.N., S, Dutta & Co, Lucknow-I (1995)
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Т 3	"Civil Estimating, costing and valuation", authored by Amarjit Aggarwal, R.C. Chaudhary, S.
1.5	Kumar Katson Publishing, 1984.

T.4	"Textbook	of Estimating	and	Costing",	authored	by	Birdie	G.S.",	Dhanpat	Rai	and	sons,
1.4	Delhi-1996											

Reference	Reference Books		
R .1	"Estimating & Costing" authored by Chandola S.P. &Vazirani V.N, Khanna Publishers 2-B, Nath market, Naisarak, Delhi, 2010		
R.2	"Estimating & Costing in civil Engineering", authored by Dutta B.N, UBS Publishers distributors ltd., 5 Ansari Road, NewDelhi, February 1999		
R.3	"Estimating, Costing and Valuation" authored by Rangawala S.C., Charotar publishing Pvt ltd. Anand (1998)		
R.4	"Estimate, Costing and Valuation" authored by Dr. R P Rathaliya, Mayur Rathaliya, Atul Prakashan Gandhi Road, Ahmedabad,2018.		
Useful Links			
1	https://nptel.ac.in/content/storage2/courses/105103023/pdf/mod5.pdf		
2	https://nptel.ac.in/courses/105/103/105103093/		

	Course Outcomes	CL	Class Sessions
BCE4701.1	Prepare the tender documents; fill the contracts by using the knowledge of contract submission and opening in awarding the work to the contractor.	6	9
BCE4701.2	Relate the concept of SD, EMD, MAS, Running Bill, Final Bill during the entire project.	4	9
BCE4701.3	Apply the preliminary estimate for administrative approval and technical sanction for a civil engineering project.	3	9
BCE4701.4	Apply the technique of Rate analysis in estimating the exact cost of material and manpower and hence the entire project.	3	9
BCE4701.5	Analyze the bill of quantities using the types of preliminary techniques and detailed estimation of buildings and roads.	4	9

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~	• (A	An Autonomous	s Institute Affiliate	d to RTM Nagpur Uni	versity, Nagpur	
Program	n: B.'	Tech. Civil E	ngineering			
Semester	-VII	BCE4702: Adv	anced Design of Re	einforced Concrete Struc	cture.	
Tea	ching	Scheme			Examination	on Scheme
Theor	у	3 Hrs/week			CT-I	15 Marks
Tutori	al	1 Hr/week			CT-II	15 Marks
Total Cr	edits	4			CA	10 Marks
Duration of	of ESE	: 3Hrs			ESE	60 Marks
Pre-Requ	isites	Reinforced Cor	ncrete Structure, Ste	el Structure	Total Marks	100 Marks
			Course	Contents		
Unit I	Desig meth meth	gn of circular wat od, Design of rec ods/ IS code meth	er tank with roof slab stangular water tank nod	o/dome resting on ground b with one-way roof slab re	by approximate m sting on ground b	ethods/IS code by approximate
Unit II	Anal	ysis and design of	f columns subjected to	o biaxial moments.		
Unit III	Desig	gn of RCC Cantil	ever and Counter-fort	Retaining wall.		
Unit IV	Desig	gn of combined re	ectangular & combine	ed trapezoidal footing.		
Unit V	Anal	ysis and design of	f portal frames (single	e bay single storey) hinged	or fixed at base.	
Text Boo	ks					
T.1	"Conc	erete Technology	"author by Gambhir N	M.L 4th Edition,: Tata Mc	Graw Hill Publica	tion 1995.
T.2	"Conc	crete Technology'	'author by Neville A	. M.; Brooks J. J., Pearso	on Educationpubli	cation.
Т.3	"Desig McGr	gn of Concrete St aw-Hill Publication	ructures" author by N on, 2004.	ilson, A. H., D. Darwin, a	nd C. W. Dolan, 1	3th edition.
T.4	"Rein P, 1st	forced Concrete S edition, Tata McO	Structural Elements: E Graw Hill Publication	Behaviour Analysis and De 1, 1986	sign" author by P	urushothaman,
Reference	e Bool	ks				
R .1	Bhavi Ist edi	katti S. S., Advan ition – 2006.	nced R. C. C. Design	Volume-II, New age inte	ernational publish	er, New Delhi,
R.2	Krish 2005	na Raju N, Advar	nced R. C. C. Design	, CSB Publisher and Distr	ributor, New Delh	ii, 2nd edition-
R.3	"Fund 2006	lamentals of RC 1	Design" author by M	L Gambhir, Prentice Hall	India Learning F	Private Limited

R.4	"Brook Properties of Concrete" author by 1 st edition Neville A.M., J.J. Addison Wesley publisher 1999.	
Useful Links		
1	https://nptel.ac.in/courses/105/105/105105104/	

	Course Outcomes	CL	Class Sessions
CE4702.1	Design of all components of water tank by applying the knowledge of is code .	6	9
CE4702.2	Design of column for Structural conditions.	6	9
CE4702.3	Design of RCC Cantilever and Counter-fort Retaining wall	6	9
CE4702.4	Design of combined rectangular & combined trapezoidal footing	6	9
CE4702.5	Design of Portal frames with hinged or fixed end conditions .	6	9

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	• (A	An Autonomous	s Institute Affiliated to RTM Nagpur Univ	ersity, Nagpur	•)
Program	n: B.'	Tech. Civil E	ngineering		
Semester	-VII	BCE4703: Pro	ogram Elective-V (Pavement Design)		
Tea	nching	Scheme		Examinati	on Scheme
Theor	·у	3 Hrs/week		CT-I	15 Marks
Tutor	al	-		CT-II	15 Marks
Total Cr	edits	3		CA	10 Marks
Duration	of ESE	: 3Hrs		ESE	60 Marks
Pre-Request Structural	iisites Analy	: Transportation sis, Reinforced C	Engineering, Structural Analysis, Advanced Concrete Structure	Total Marks	100 Marks
			Course Contents		
Unit I	Type press	es of pavement - sure – contact pres	– Factors affecting design of pavements – when ssure, Material characteristics – Environmental an	el loads –ESWL nd other factors	Concept- tyre
Unit II	Mate cone of the	erial characteris bearing value, pl ermal expansion of	tics: AASHO subgrade soil classification. Gro ate load test for K, modulus of rupture, elasticity of concrete. Layer equivalent concepts.	up index, CBR, , poisons's ratio	North Dakota and coefficient
Unit III	Anal mult temp	Analysis of flexible and rigid pavements: stress, strain, deflection analysis for single, two, three and multi layered flexible pavement system. Stress and deflections for rigid pavements due to load and temperature, influence charts, ultimate load analysis, ioints and its types.			
Unit IV	Flexible Pavement design: Flexible pavement design using CBR Method, IRC method, AASHTO Method, Restrengthenig of Pavement				
Unit V	Rigid Pavement Design : IRC method of Rigid pavement design – Importance of Joints in Rigid Pavements- Types of Joints – Use of Tie Bars and Dowell Bars. AASHTO method of Rigid pavement design				
Text Boo	ks				
T.1	Princi	ples of Pavement	Design by Yoder, E. J& Witczak, M.W., John W	iley and Sons, U	JSA
T.2	Paven	nent analysis and	Design by Huang, Y. H. (1993), Prentice Hall, E	nglewood Cliffs,	New Jersey
Т.3	Highv	vay Engineering -	- S.K. Khanna & C.J. Justo, Nemchand & Bros.,	7th Edition (200	0)
T.4	Principles and Practices of Highway Engineering – Dr. L. R. Kadiyali & Dr.N.B.Lal – Khanna publishers – (2003)				
Reference	e Bool	ks			
R.1	Highv	way Engg by S.K.	Khanna & C.E.G. Justo, Nem Chand Bros., Room	rkee.	
R.2	Relev	ant IRC Code: 37	, 58, (latest) and BIS standards		
R.3	Princi	ples and Practice	of Highway Engg. byL.R.Kadiyali, Khanna Publ	ishers, Delhi	

R.4	Hot-Mix Asphalt Paving Handbook 2000, National Asphalt Pavement Association and US Army Corps of Engineers, 2000	
Useful Links		
1	https://nptel.ac.in/content/storage2/courses/105104098/TransportationII/lecture6/2slide.htm	
2	https://nptel.ac.in/courses/105/104/105104098/	

	Course Outcomes	CL	Class Sessions
BCE4703.1	Analyze and Design pavement and under different loading conditions for highways and airfields taking into consideration different characteristics.	4	9
BCE4703.2	Show a pavement management system framework.	3	9
BCE4703.3	Design of highway appurtenance and highway drainage.	6	9
BCE4703.4	Experiments Performance considering different field conditions	3	9
BCE4703.5	Recommend to increase the strength of pavements along with its economy point of view	5	9

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Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade) (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur) **Program: B.Tech. Civil Engineering** Semester-VII BCE4704: Program Elective-V (Urban Transportation Planning) **Teaching Scheme Examination Scheme** 3 Hrs/week 15 Marks CT-I Theory 15 Marks **Tutorial CT-II**

CA

ESE

Total Marks

10 Marks

60 Marks

100 Marks

Pre-Requisites: Transportation Engineering

3

Total Credits

Duration of ESE: 3Hrs

Course Contents

Unit I	Introduction to Urban transportation planning; systems approach to Urban transportation planning; types of models; concept of travel demand and supply; socio-economic, Urban morphology – Urbanization, Urban activity systems
Unit II	Urban land use , network, and transport system characteristics affecting urban transportation planning; study area definition, zoning principles, cordon and screen lines, data collection through primary
Unit III	Data collection through primary and secondary sources, sampling techniques; four-stage sequential modelling approach; trip generation; trip distribution; modal split; trip assignment;
Unit IV	land use-transport models; public transport planning, integration of different modes; travel demand management measures; case studies
Unit V	Path assignment, Capacity restrained assignment and Multi path assignment - Route-choice behavior; Land use transportation models – Urban forms and structures - Location models - Accessibility – Lowry derivative models - Quick response techniques - Non-Transport solutions for transport problems; Preparation of alternative plans - Evaluation techniques – Plan implementation - Monitoring - Financing of Project – urban development planning policy - Case studies.
Text Bool	KS

T.1	Urban Transportation Planning: A Decision-Oriented Approach (McGraw-Hill Series in Transportation) Hardcover – Import, 1 January 2001
T A	

T.2	Urban Transportation: Planning, Operation and Management Hardcover – 25 September 2012
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- T.3 Advance in transportation engineering, pulugurtha, ghosh and biswas, 2018
- T.4 Optimization models and methods for equilibrium traffic assignment, krylatov zakhorov and tuoivinen, 2019

Reference Books R.1 Transportation Engineering and Planning, C. S. Papacostas and P. D. Prevedouros, Trans Tech Publications Publications

K.1	Publications
R.2	Urban Transportation Planning, Michael D. Meyer, Eric J. Miller, McGraw-Hill
R.3	Public Transportation, G. E. Gray and L. A. Hoel, New Jersey, 1992

R.4	Highway Engineering, Khanna, S.K; Justo, C.E.G. NT.M.C.N.Limited
Useful Li	nks
1	https://nptel.ac.in/content/storage2/courses/105104098/TransportationII/lecture6/2slide.htm
2	https://nptel.ac.in/courses/105/104/105104098/

	Course Outcomes	CL	Class Sessions
BCE4704.1	Illustrate to Urban transportation planning; systems approach, types of models; concept of travel demand and supply;	3	9
BCE4704.2	Infer the Urban land use, network, and transport system characteristics affecting urban transportation planning; study area definition, zoning principles	4	9
BCE4704.3	Appraise Data collection through sources, sampling techniques; modelling approach; trip generation; trip distribute, trip assignment;	4	9
BCE4704.4	Defend land use-transport models; public transport planning, integration of different modes; travel demand its management with case study.	5	9
BCE4704.5	Modify Path assignment, Capacity restrained assignment and Multi path assignment - Route-choice behavior; Land use transportation models .	6	9

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Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade) (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur) **Program: B.Tech. Civil Engineering** Semester-VII BCE4705: Program Elective-V (Airport Planning and Design) **Teaching Scheme Examination Scheme** 3 Hrs/week CT-I 15 Marks Theory Tutorial **CT-II** 15 Marks CA **Total Credits** 3 10 Marks Duration of ESE: 3Hrs ESE 60 Marks **Total Marks** 100 Marks Pre-Requisites: Transportation Engineering **Course Contents History and organisation** of air transport, Aircraft characteristics related to airport design, Airport Unit I configuration, Airport planning and air travel demand forecasting, Classification of airports- ICAO standards : Zoning laws : Air Traffic Management: Navigational aids: ground based systems, satellite based systems, air traffic control, Grading, Environmental guidelines for airport projects, air-traffic demand estimation. Unit II Airport hangars- their planning and design criteria ; Airport landscaping, grading and drainagegeneral aspects ; Airport terminal and amenities ; Taxiway and Gate Capacity, Taxi way design, Taxiways- alignment- geometry and turning radiusexit taxiways - Aprons- planning and design ; Holding Aprons - Terminal Aprons - Airport drainage -**Unit III** Function of Airport Passenger and Cargo Terminal - Design of Air Freight Terminals - Airport access - Airport Landside planning - Capacity Runway Capacity and configuration, Runway design, Runway sorientation and geometric design-Unit IV Runway patterns, Design principles of critical, semi-critical, non-critical airport pavements, FAA and PCA methods; maintenance and rehabilitation of airfield pavements, Airport terminal area, Airport airside capacity and delay, Planning and design of the terminal area, Unit V Airport access, airport lighting and marking, Financial strategies for terminal area lav-out. implementation, Environmental impacts of airports **Text Books** T.1 Wells, Alexander; Young, Seth, Airport Planning & Management, McGraw Hill,5th Edition, July,2009 T.2 Yoder and Witzack, Principles of Pavement Design, John Willey and Sons., 1975 T.3 Huang, Y. H., Pavement Analysis and Design, Prentice-Hall, Inc. Englewood Cliffs, New Jersey, 2004 Shahin, M. Y., Pavement Management for Airports, Roads and Parking Lots, Chapman and Hall, New T.4 York. 1994 **Reference Books** R. Horonjeff and F. X. Mckelvey, Planning & Design of Airports, 5th Edition, Mc Graw Hill, New **R**.1

N. Ashford, S. Mumayiz and P. H. Wright, Airport Engineering, 4th Edition, John Wiley, New York,

Khanna, Arora and Jain, Planning and Design of Airports, Nemchand Bros., 2001

York, 2010

2011.

R.2

R.3

R.4	De N. Richard, & Odoni, Airport Systems: Planning, Design, and Management, McGraw Hill Amedeo, 1st Edition, 2004.
Useful L	inks
1	https://nptel.ac.in/courses/105/107/105107123/
2	https://nptel.ac.in/courses/105/104/105104098/
3	https://nptel.ac.in/courses/105/105/105105107/

	Course Outcomes	CL	Class Session s
BCE4705.1	Infer Airport planning and air travel demand forecasting, ICAO standards ; Zoning laws	4	9
BCE4705.2	Explain Air Traffic Management: Navigational aids: ground based systems, satellite based systems, air traffic control, Grading,	4	9
BCE4705.3	Compile Taxi way, Aprons- planning and design; Airport drainage - Design of Air Freight Terminals	6	9
BCE4705.4	Modify Runway, - critical airport pavements, FAA and PCA methods ; maintenance and rehabilitation of airfield pavements,	6	9
BCE4705.5	Compose of the terminal area, terminal area lay-out, Airport access, airport lighting and marking,	6	9

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- (An Autonomous Institute Annated to RTM Nagpur University, Nagpur)						
Program: B.Tech. Civil Engineering						
Semester	-VII	BCE4706: I	Program Elective-V (Hi	igh Speed Rail Engine	eering)	
Teaching Scheme		Scheme			Examinatio	on Scheme
Theor	y	3 Hrs/week			CT-I	15 Marks
Tutori	al	-			CT-II	15 Marks
Total Cro	edits	3			CA	10 Marks
Duration of	of ESE	: 3Hrs			ESE	60 Marks
Pre-Requ	isites	Engineering M	echanics, Transportation	Engineering	Total Marks	100 Marks
			Course Co	ntents		
Unit I	Form Tech Tracl	ulation of HSR E nical Standard ar k Spacing, Gradie	asic Plan in India, Necess d System Selection, Load nts, Track Structure, Roll	sity of HSR System in 1 ding gauge and Structu ing Stock.	India, Traffic Fre ral gauge, Platfo	equency, Basic orm Clearance,
Unit II	Key comr comp	elements of HS nunication and ponents, Construc	R systems and subsyste control), Polyamide gu tion of the catenary, Testi	ems including: core sy tide plate, Static resp ng, Loss prevention.	ystems (trains, p ponse, Rail pa	power, signal, d, Anchorage
Unit III	Track exper	k system and c rience from tunne	ivil infrastructure (earth Is building, Channel Tunr	work, bridges, viaduc nel Rail Link, Loss prev	ention Tunnels)).General loss g risks,
Unit IV	basic Paran Leve	e design and cor meters, Construct ls on Services / F	struction of HSR station on Method, Operation M acilities	ns and rolling stock i lethod, Interoperability	maintenance fac and Gauge Selec	ilities, Design tion, Required
Unit V	High engir partio	speed rail engi neering, design a cular emphasis or	neering : definition, network nd construction of high the unique engineering e	work, comparison with speed rail (HSR) pass lements of HSR technol	n other mode, senger transport logy.	Development, systems with
Text Boo	ks	A				
T.1	High S	Speed Trains Har	lcover – Import, 1 Novem	ıber 2011.		
T.2	Const	ruction and mana	gement of high speed rail,	, 2015		
Т.3	Desig	n of High-Speed	Railway Turnouts,ping wa	ang, 2015		
T.4	A Tex	t Book Of Railwa	y Engineering, by S.C. Sa	axena, S.P.Arora,		
Reference	e Bool	ks				
R.1	High Speed Rail Planning, Policy, and Engineering, Volume I: Overview of Development and Engineering Requirements Paperback – Import, 8 February 2016					
R.2	Railway Engineering Paperback , satish Chandra, Agrawal, – 21 January 2013					
R.3	Railway Track Engineering by JS Mundrey, 5th edition,					
R.4	Railw	ay Engineering b	v Satish Chandra, Aqarwa	1,2008		
Useful Li	nks					

1	https://nptel.ac.in/courses/105/107/105107123/
2	https://nptel.ac.in/courses/117/106/117106089/
3	http://www.nptelvideos.in/2012/11/transportation-engineering-ii.html

	Course Outcomes	CL	Class Sessions
BCE4706.1	Explain High speed rail engineering, network, comparison, Development, design and construction, passenger transport systems, elements of HSR technology.	4	9
BCE4706.2	Infer Key elements and subsystems including: communication and control, Polyamide guide ,Construction Testing , Loss prevention - Lessons learnt and recommendations,	4	9
BCE4706.3	Contrast track system and civil infrastructure loss, Channel Tunnel Rail Link, Loss prevention – lessons learnt and recommendation, Tunnelling risks,	4	9
BCE4706.4	Compose HSR stations and rolling stock maintenance facilities, Parameters, Construction Method , Operation Method, Interoperability and Gauge Selection, Levels on Services / Facilities	6	9
BCE4706.5	Write Formulation of HSR Basic Plan in India, Necessity, Traffic Frequency, Countermeasures against Earthquakes and Natural Disasters, Basic Technical Standard and System Selection, Loading gauge and Structural gauge, Platform Clearance, Track Spacing, Gradients, Track Structure, Rolling Stock.	6	9

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Program	: B.Tech. Civ	il Engineering		~	
Semester-V	VII BCE4707:	Program Elective-VI (High Rise Structures)			
Teac	hing Scheme		Examinati	on Scheme	
Theory	3 Hrs/wee	k	CT-I	15 Marks	
Tutorial	-		CT-II	15 Marks	
Total Cred	lits 3		CA	10 Marks	
Duration of	ESE: 3Hrs		ESE	60 Marks	
Pre-Requis	sites: Reinforced	Cement Concrete	Total Marks	100 Marks	
		Course Contents			
Unit I	Performance of t failures influence in buildings.	buildings, behaviors of various types of buildings i of unsymmetrical, infill walls, foundations, soft story	n past earthqua y & detailing of	kes. Modes of reinforcements	
Unit II	Frames shear wal Analysis of frame	led buildings, mathematical modeling of building w s shear walled buildings, Analysis of coupled shear w	ith different stru valled building	ictural systems	
Unit III	Special aspects soilstructure inter	in Multi-story buildings, Effect of torsion, flexibaction on building response, drift limitation	ble first story ,	P-delta effect,	
Unit IV	Strength, ductility loads & shear. De IS code provision	v and energy absorption, ductility of reinforced mem etailing of RCC members, beam, column, Beam-colum s.	bers subjected to mn joints for due	o flexure, axial ctile behaviors,	
Unit V	Design of multi Configurations	-story buildings with bracings & infills. Tall E	Buildings, Struc	tural Concept,	
Text Book	S				
T.1 S	eismology Comm tructural Engineer	ittee (1999). <i>Recommended Lateral Force Requireme</i> rs Association of California.	ents and Commer	ıtary.	
Т.2 І	Design of Seismic	Isolated Structures- Farzad Naeim, James M. Kelly, F	Published 2 DEC	2007	
T.3 $\begin{bmatrix} A \\ B \end{bmatrix}$	A K. Chopra, Dyn Edition), Prentice-I	amics of Structures: Theory and Applications to Earth Hall of India.	hquake Engineer	ing (3rd	
T.4 H	Housner, G. W. &Jenning, P.C. "Earthquake Design Criteria", Earthquake Engineering Research Institute, Oakland, California, USA, 1982				
Reference	Books				
R.1 I F	S 13920, Ductile l Practice, 1993.	Detailing of Reinforced Concrete Structures Subjected	d to Seismic Ford	ces – Code of	
R.2	A.K. Chopra, Dyna	amics of Structures, 3rd Edition, Pearson, 2007.			
R.3 I	PankajAgarwal and ndia, 2006.	d Manish Shrikhande, Earthquake Resistant Design of	f Structures, Prer	ntice Hall	

Kramer, S. L. "Geotechnical Earthquake Engineering", Prentice Hall, New Jersey, 1996.

R.4

Useful Links

1	https://nptel.ac.in/courses/105/101/105101004/
2	https://nptel.ac.in/courses/105/102/105102016/
3	https://nptel.ac.in/content/syllabus_pdf/105101004.pdf

	Course Outcomes	CL	Class Sessio ns
BCE4707.1	Differentiate between Earthquake and Tsunami	4	9
BCE4707.2	Analyze earthquake loading effect on structures.	4	9
BCE4707.3	Design of structures against earthquake loading.	6	9
BCE4707.4	Evaluate the earthquake loading for multi-storey structure using different methods like Equivalent Static Lateral Load Method and Response Spectrum Method	5	9
BCE4707.5	Use the knowledge in practical situation and Understand the different seismic retrofitting techniques and its implementation.	3	9

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•••	(4	An Autonomous	Institute Affiliated to RT	M Nagpur Univo	ersity, Nagpur		
Program	n: B.'	Tech. Civil E	gineering				
Semester	-VII	BCE4708:Prog	am Elective-VI (Industrial	Structure)			
Tea	ching	Scheme			Examination	on Scheme	
Theor	у	3 Hrs/week			CT-I	15 Marks	
Tutori	al	-			CT-II	15 Marks	
Total Cro	edits	3			CA	10 Marks	
Duration of	of ESE	: 3Hrs			ESE	60 Marks	
Pre-Requ	isites	•			Total Marks	100 Marks	
			Course Conten	nts			
Unit I	Indu: wind	strial Building: S l loads on purlin a	ructural layout of industrial d trusses, bracing systems, co	building, Design o olumns	of roof with tru	sses, Effect of	
Unit II	Desi	gn of Gantry Gird	r with Static and Moving loa	ds			
Unit III	Tran cons	smission and Conidered, Analysis a	munication towers: Types a d design of tower & foundation	nd configuration, I ions	Loads & load co	ombinations be	
Unit IV	Chin temp chim	nneys: Loads an perature differenc nney	stresses in chimney shaft, combined effect of loads	, Earthquake and and temperature,	wind effect, S , temperature. 1	tresses due to Design of RC	
Unit V	Bunk circu	cers & Silos: Intro llar/cylindrical bu	duction, Jassen's theory, Air kers, silos using Jensen's the	y's theory, Shallow ory as per IS.	v and deep bins,	Design of RC	
Text Boo	ks						
T.1	Punm Laxm	ia, B.C.; Jain, Asł i Publications.	k Kumar; Jain, Arun Kumar	, "Limit State Desig	gn Of Reinforced	d Concrete",	
T.2	Vargh	nese P. C., "Limit	tate Design Of Reinforced C	oncrete", Prentice l	Hall Of India.		
Т.3	Ghosł	h, Karuna Moy, "l	actical Design Of Reinforce	d Concrete Structur	e", Prentice Hal	l Of India.	
T.1	Punmia, B.C.; Jain, Ashok Kumar; Jain, Arun Kumar, "Limit State Design Of Reinforced Concrete", Laxmi Publications.						
Reference	e Bool	ks					
R.1	Punmia,B.C.;Jain Ashok Kumar;Jain,Arun Kumar, "Reinforced Concrete Structure",Laxmi Publications						
R.2	Pillai,S.Unnikrishna., "Reinforced Concrete Design",Tata McGraw Hill.						
Useful Li	nks						
1	https:/	//nptel.ac.in/conte	t/storage2/courses/10510510	4/pdf/m11128.pdf			
2	https:/	//nptel.ac.in/cours	s/105/105/105105039/				

	Course Outcomes	CL	Class Sessio ns
BCE4708	Design the circular and rectangular water tank resting on the ground by working stress method.	6	9
BCE4708	Design of elevated water tank by working stress method.	6	9
BCE4708	Design of staging of Intze water tank by working stress method.	6	9
BCE4708	Design of members of Raft foundation by Limit state method.	6	9
BCE4708	Design of members of Pile foundation by Limit state method.	6	9

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	(4	An Autonomous	s Institute Affiliated to RTM Nagpur Univ	versity, Nagpur	·)
Program	n: B.	Tech. Civil E	ngineering		
Semester	-VII	BCE4709: Pro	gram Elective-VI (Prestressed Concrete)		
Теа	nching	Scheme		Examinati	on Scheme
Theor	y	3 Hrs/week		CT-I	15 Marks
Tutor	al	-		CT-II	15 Marks
Total Cr	edits	3		CA	10 Marks
Duration	of ESE	2: 3Hrs		ESE	60 Marks
Pre-Required Technolog	uisites gy	: Reinforced cerr	nent concrete structures, Concrete	Total Marks	100 Marks
			Course Contents		
Unit I	Desi of IS mon	gn of high streng 5 1343, Analysis nent, untensioned	th concrete mixes. Loss of pre-stress in single s Limit State Design of beams for Tension Type reinforcement, Partial pre-stressing, Stress Corre	pan and continuc e II and III probl osion.	bus beams. Use lems, Cracking
Unit II	Tran Bond	sfer of pre-stress ded and unbounde	by bond, Transverse tensile stresses, End zor ad pre-stressed concrete beams.	ne reinforcement	Behaviour of
Unit III	III Deflection of Pre-stressed concrete members, short and long term, control of deflections. Crack width considerations. Flexural strength of pre-stressed concrete sections: Types of flexural failures, Limit state concept.				
Unit IV	Shear resistance of pre-stressed concrete members: Principal stresses and ultimate shear Resistance, Design of shear reinforcement, pre-stressed concrete members in Torsion, Design of reinforcement in torsion shear and bending			ear Resistance, inforcement in	
Unit V	Stress distribution in end block, Analysis and Anchorage Zone reinforcement. Composite Construction of pre-stressed precast and cast in situ concrete. Statically Indeterminate structures: Continuous beams, primary and secondary moments, Continuity, concordant cable profile, Analysis and Design of continuous beams			nt. Composite nate structures: ofile, Analysis	
Text Boo	ks				
T.1	Raju I	N. Krishna, "Pre-s	stressed Concrete", Tata McGraw Hill, 2002.		
T.2	Lin,T	Y;Burns,Ned .H,	"Design of Pre-stressed Concrete Structures",	Wiley India.	
T.3	Nildo	Nildon, Arthur. H, " Design of Pre-stressed Concrete", Wiley India .			
Reference	e Boo	ks			
R .1	N Kri	shna Raju, "Prest	ressed Concrete: Problems and Solutions", CBS	, 2017	
R.2	2 M.K.Hurst, "Prestressed Concrete Design", CRC Press, 2019				
Useful L	inks				
1	https:	://nptel.ac.in/cours	ses/105/106/105106117/		
2	https:/	//nptel.ac.in/cours	es/105/106/105106118/		
3	<u>http://</u>	www.nptelvideos	.in/2012/11/prestressed-concrete-structures.html	<u>l</u>	

	Course Outcomes	CL	Class Sessions
BCE4709.1	Understand the design of high strength concrete mixes and basic properties of pre-stressed concrete.	2	9
BCE4709.2	Analyze the pre-stressed beams for bonded and unbounded by Limit state method.	4	9
BCE4709.3	Analyze the flexural behavior of Pre-stressed concrete members by Limit state concept.	4	9
BCE4709.4	Design of reinforcement in torsion shear and bending of pre-stressed concrete members.	6	9
BCE4709.5	Design of Composite Construction of pre-stressed precast and cast in situ concrete members.	6	9

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Program	n: B.'	Tech. Civil E	ngineering		
Semester	-VII	BCE4710: Pro	gram Elective-VI (Earthquake Engineering))	
Tea	ching	Scheme		Examinati	on Scheme
Theor	у	3 Hrs/week		CT-I	15 Marks
Tutori	al	-		CT-II	15 Marks
Total Cr	edits	3		CA	10 Marks
Duration of	of ESE	: 3Hrs		ESE	60 Marks
Pre-Requ	isites	Geology, Geote	chnical Engineering	Total Marks	100 Marks
	r		Course Contents		
Unit I	Engi plate	neering seismolog . Seismic waves.	gy, Elastic rebound theory, Theory of plate tecto Seismic intensity, Richter scale.	nics and moveme	nt of Indian
Unit II	Introduction to tsunami, Seismic zoning maps of India, Response spectra, Strong motion characteristics				
Unit III	Earthquake effects on the structures, classification of loads, Seismic damages during past earthquakes, effect of irregularities and building architecture on the performance of RC structures				
Unit IV	Seismic methods of analysis, seismic design methods, Mathematical modeling of multistoried RC buildings with modeling of floor diaphragms and soil foundation, (Winkler model.)			storied RC	
Unit V	Concept of earthquake Resistant design, design philosophy, Four virtues of EQRD: Stiffness, Strength, ductility and Configurations, Introduction to Capacity design concepts.			fness,	
Text Boo	ks				
T.1	Hector	r Estrada, Luke S	Lee, "Introduction to Earthquake engineering"	, CRC Press, 2017	7.
T.2	Shaba	na, Ahmed, "The	cory of Vibrations", Springer, 2019.		
Т.3	Amrs.	Elnashai, Luigi I	Di Samo"Fundamentals of Earthquake Engineer	ing", Willey, 200	5.
Referenc	e Bool	KS			
R .1	Anil F	K Chopra, "Dynar	nics of Structures", Pearson, 1981.		
R.2	S Rajasekaran, "Structural Dynamics of Earthquake Engineering", Woodhead, 2009.				
Useful Li	nks				
1	http://	/www.cdeep.iitk.a	nc.in/nptel		
2	<u>http://</u>	wwwnptel.iitm.ac	. <u>in</u>		

	Course Outcomes	CL	Class Sessions
BCE4710.1	Illustrate the concept of inertia and damping with static and dynamic forces and response of SDOF systems.	4	9
BCE4710.2	Analyze the response of SDOF systems and natural frequencies and mode shapes.	4	9
BCE4710.3	Analyze the response of MDOF systems and mode shapes and Elements of seismology.	4	9
BCE4710.4	Asses the response of structures and difference between the magnitude, intensity and acceleration of earthquake.	5	9
BCE4710.5	Analyze structure for earthquake forces according to IS code provisions	4	9

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Program	n: B.'	Tech. Civil E	ngineering			
Semester	-VII	BCE4715: Pro	ogram Elective-VII (l	Foundation Engineering))	
Teaching	Scher	me			Examination	Scheme
Theory		3 Hrs/week			CT-I	15 Marks
Tutorial		-			CT-II	15 Marks
Total Cre	dits	3			СА	10 Marks
Duration of	of ESE	: 3Hrs			ESE	60 Marks
Pre-Requ	isites	Geotechnical E	ngineering		Total Marks	100 Marks
Course C	onten	ts				
Unit I	Anal groun data, Prob	lysis of foundation nd movements du Proportioning co lems and Remedio	ons , types of founda te to construction; Bea of footing based on es.	tions, bearing capacity a aring Capacity from SPT settlement criteria. Found	nd settlement of and SCPT and l dations on Prol	of foundations; Plate load Test blematic soils:
Unit II	Well Grip and S Foun	Foundations: C length, Bearing of Shifts, idation Failures - '	aissons – Types, adva capacity and settlemen Types and causes of fa	intages and disadvantages it, Forces acting, Sinking ilures, Remedial measures.	, Shapes and co of wells, Rectifi , Shoring and Ur	mponent parts, ication of Tilts
Unit III	Raft Foundation: Settlement and Bearing Capacity analysis, Analysis of flexible and rigid raft as per IS 2950. Computation of settlements (Immediate & Consolidation); Permissible settlements, Allowable total and differential settlement of structures. Proportioning of footing, Inclined & Eccentric loads, Sattlement of footings on structified density					
Unit IV	Shallow Foundation: Terzaghi's bearing capacity equation, General bearing capacity equation, different bearing capacity theories, I.S. Code method, Effect of foundation shape, eccentricity and inclination of load, Influence of soil compressibility and water table, Footing pressure for settlement on sand, Soil pressure at a depth, Boussinesq's & Westergaard methods, Limit state design of					
Unit V	 Pile Foundations; Pile Foundations; Classification and Uses, Carrying capacity of Single pile, Pile load tests, cyclic pile load test, pull out resistance, laterally loaded Piles; Pile groups – Group efficiency, Settlement of single pile and pile groups, Negative skin friction, sharing of loads, : Limit state design of reinforced concrete in foundations; 					
Text Boo	ks					
T.1	B. M]	Das, Principles of	Foundation Engineering	ng, Thomson Brooks/Cole		
T.2	J. E. E	Bowles, Foundatio	on Analysis and Design	, McGraw-Hill Book Com	ipany	
Т.3	N.P. H	Kurien, Design of	Foundation Systems :	Principles & Practices, Na	rosa, New Delhi	1992
T.4	H. F. `	Winterkorn and H	Y Fang, Foundation E	Engineering Hand Book, G	algotia Booksou	irce
Reference	Books	5				
R.1	A. Si 1999	ingh, Modern Geo	otechnical Engineering	, 3rd Ed., CBS Publishers,	New Delhi,	
R.2	B.M. 2003.	. Das, Principles of	of Foundation Engineer	ring, 5th Ed., Thomson Asi	ia, Singapore,	

R.3	N. Som, Theory and Practice of Foundation Design, Prentice Hall, New Delhi, 2003
R.4	W. C. Teng, "Foundation Design", Prentice Hall of India Ltd.
Useful L	inks
1	https://nptel.ac.in/courses/105/104/105104162/
2	https://nptel.ac.in/courses/105/105/105105176/
3	https://nptel.ac.in/courses/105/105/105105185/

	Course Outcomes	CL	Class Sessions
BCE4715.1	Contrast foundations, types of foundations, bearing capacity and settlement of foundations; ground movements due to construction, Foundations on Problematic soils: Problems and Remedies.	4	9
BCE4715.2	Explain Well Foundations: Caissons – Types, advantages and disadvantages, Shapes and component parts, Foundation Failures, Remedial measures, Shoring and Underpinning.	4	9
BCE4715.3	Infer Raft Foundation: Settlement and Bearing Capacity analysis, settlements. Proportioning of footing, Inclined & Eccentric loads. Settlement of footings on stratified deposits.	4	9
BCE4715.4	Create Shallow Foundation: General bearing capacity equation, I.S. Code method, Effect of foundation shape, eccentricity and inclination of load, Influence of soil compressibility and water table, Limit state design .	6	9
BCE4715.5	Design Pile Foundations; Classification and Uses, Carrying capacity, Pile groups – Group efficiency, Negative skin friction, sharing of loads, : Limit state design.	6	9

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Program	• R '	Tech Civil E	ngineering		ersity, rappur	/
Somostor-	VII	BCE/716 DE	VII (Geotechnical D	asign)		
Tooching	v II Sohor	DCL4710. 11		(Sigil)	Evamination	Sahama
Teaching	Schei	2 Hrg/wook				15 Morko
Tutorial		5 HIS/Week				15 Morks
Tutorial	ita	-				10 Morks
Duration of	IIIS FESE	3 • 3Urs				10 Marks
Duration of		. SHIS			ESE Total Marks	100 Morks
Course Co	isites: onten	s Geotechnical El	igineering		I otal Marks	100 Iviai KS
Unit I	Shall differ Influ	low Foundations rent bearing capa ence of soil comp	Terzaghi's bearing c city theories, Effect of ressibility and water tab	capacity equation, Gener foundation shape, eccer ble.	ral bearing capa atricity and incli	acity equation, nation of load,
Unit II	Deep conce	foundation: Pile ept of negative sk	foundation design for c in friction, soil structure	compressive load, uplift la e interaction and introduc	ateral load, desig tion.	n of pile group,
Unit III	Desig agair	gn of retaining w ast overturning, sli	alls: Design of retaining ding, bearing capacity a	ng wall with or without su and drainage.	urcharge loads, I	Factor of safety
Unit IV	Sheet Pile wall design : Failure mode, preliminary data for the design, Cantilever wall penetrating cohesion less soil and cohesive soil				all penetrating	
Unit V	Soil : beari	nail wall design ng capacity failur	Initial design paramete	er and condition, Global	stability failure,	sliding failure,
Text Book	s					
T.1	J. E. E	Bowles, "Foundati	on Analysis & Design",	, Mc.Graw Hill Book Co.	, 2001	
T.2	Swam Delhi.	i Saran, Analysis 2018	and Design of Sub strue	ctures, Oxford and IBH P	Publishing Co. P	VT. Ltd, New
Т.3	B. M]	Das, Principles of	Foundation Engineerin	g, Thomson Brooks/Cole	2,2002	
T.4	S.K.Khurana, Principles, Practice and Design of Highway Engineering,2015					
Reference	Bool	KS				
R.1	N.P. Kurien, Design of Foundation Systems : Principles & Practices, Narosa, New Delhi 1992					
R.2	Punmia,B.C.;Jain, Ashok;Jain,Arun K.,Soil Mechanics And Foundations,LaTxmi Publications,2005					
R.3	Arora, Distril	K.R.Soil Mechan outors,2008	ics And Foundation Eng	gineering, TStandard Publ	lishers	
R.4	Kuma	r,Srinivasa. R,Pav	ement Design, Universi	ties Press,2013		
Useful Lir	nks					

1	https://www.digimat.in/nptel/courses/video/105105185/L01.html
2	https://www.digimat.in/nptel/courses/video/105105168/L01.html
3	https://www.digimat.in/nptel/courses/video/105101084/L01.html

	Course Outcomes	CL	Class Sessions
BCE4716 .1	Analyze shallow foundation bearing capacity and its affection by shape size, water, loads and types of soil.	4	9
BCE4716 .2	Construct rectangular, mat or raft footing in isolate and combined condition to carry superimpose load of structure	6	9
BCE4716 .3	Create retaining wall with and without surcharge load also use pile foundation consideration	6	9
BCE4716 .4	Compile flexible pavementby various methods, classify its types with limitations	6	9
BCE4716 .5	Compose flexible and rigid pavement by using stress distribution and effective methods	6	9

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Tulsiramji Gaikwad-Patil College of Engineering and TechnologyWardha Road, Nagpur-441 108NAAC Accredited (A+ Grade)(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)



Program	n: B.'	Tech. Civil E	ngineering	<i>,</i> / 31	/
Semester	-VII	BCE4717: P	E VII (Structural Geology)		
Teaching	g Schei	me		Examination	Scheme
Theory		3 Hrs/week		CT-I	15 Marks
Tutorial		-		CT-II	15 Marks
Total Cre	dits	3		CA	10 Marks
Duration	of ESE	: 3Hrs		ESE	60 Marks
Pre-Requ	isites	: Geotechnical E	ngineering	Total Marks	100 Marks
Course C	Conten	its			
Unit I	Stru conti section and sedir	ctural Geology: inental crust can on by integrating map reading, fiel nentary, metamor	Description, classification, and origin of eart deform; link scales of structure from the field analytical techniques with practical examples, d techniques of structural mapping, scale of phic and igneous rock, differentiation of sedime	h structures. Way l, outcrops, hand principles of geolo map, top and bot entary and tectonic	s in which the specimen, thin ogical mapping tom criteria of c structures.
Unit II	Theo beha criter defor	ory of stress and vior of minerals ria, role of fluid rmation.	strain : stress and strain relationship of elas and rocks under deformation condition, diffe 1 in deformation processes, time relationsh	tic, plastic and vi rent types of failu ip between crys	scous material, are and sliding tallization and
Unit III	Stress analysis: description, classification,compressive and shear stresses, Mohr's circle, 2D and 3D analysis, mean and deviatoric stress, stress on plane, principle stress, stress ellipsoid, paleo stress analyses, maximum shear stress, fundamental stress equation,				
Unit IV	Strain analysis: kind of strain, strain ellipsoid, strain markers, techniques of strain analysis, strain measurements, progressive strain history and methods for its determination, practical 2D strain analysis, 3D strain concepts; incremental strain,kinematics and polyphase deformations.				
Unit V	Geological fold and faults : fold construction and classes; fault evolution and section balancing; fault rock microstructures; fault and fold mechanics, current concepts in plate tectonics, cross-section construction techniques, structural interpretation of seismic data, structural styles in different tectonic settings (thrust and fold belts, rifts, strike and slip, gravity tectonics, inversion), structural geology of reservoir units, stereographic projection and their use in structural analysis, structure and major testonic fortunes of Indian subcontinent.				
Text Boo	ks				
T.1	Terzag	ghi, K., and Peck,	R.B., Soil Mechanics in Engineering Practice,	John Wiley& Son	s, 1967
T.2	R. Jur	nikis, Theoretical	Soil Mechanics, Van Nostrand Reinhold Com	oany, New York, 1	969
Т.3	Das, I	B.M., Advanced S	oil Mechanics, Taylor and Francis, 2nd Editior	ı, 1997	
T.4	Craig,	, R.F., Soil Mecha	nics, Van Nostrand Reinhold Co. Ltd., 1987		
Referenc	e Bool	ks			
R.1	Ranja	n, Gopal; Rao, A.	S.R., Basic And Applied Soil Mechanics, TNev	w Age Internation	al,1991
R.2	Lamb	e T. William;Whi	tman Robert V., Soil Mechanics ; Si Version, W	Viley India,2012	

R.3	Arora K R, Soil Mechanics And Foundation Engineering : Geotechnical Engineering Standard Publishers Distributors,2008
R.3	Punmia,B.C.;Jain,Ashok;Jain,Arun B K.,Soil Mechanics And Foundations, Laxmi Publications,2005
Useful L	inks
1	https://nptel.ac.in/courses/105/104/105104191/
2	https://nptel.ac.in/courses/105/104/105104147/
3	https://www.digimat.in/nptel/courses/video/105104191/L01.

	Course Outcomes	CL	Class Sessions
BCE4717.1	Discriminate origin, classification and deformation of earth structure with its mapping its mapping and scale.	4	9
BCE4717.2	Contrast stress strain relationship of elastic plastic and viscous material its failure conditions.	4	9
BCE4717.3	Evaluate compressive and shear stress with its classification, plane and ellipsoid peleostress 2D and 3D analysis.	5	9
BCE4717.4	Estimate compressive and shear strain with its classification, plane and ellipsoid peleostress 2D and 3D analysis.	5	9
BCE4717.5	Prioritize geological fold and fault construction, evolution, section, balancing, mechanics and curranttectonic concept.	4	9

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Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade) (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur) Program: B.Tech. Civil Engineering Semester-VII BCE4718: Program Elective-VII (Rock Mechanics) Examination Science

C	<i>,</i>						
Theory		3 Hrs/week	CT-I 15 I		15 Marks		
Tutorial		-			CT-II	15 Marks	
Total Cre	dits	3		СА	10 Marks		
Duration of ESE: 3Hrs ESE 60 Mark						60 Marks	
Pre-Requ	Pre-Requisites: Geotechnical Engineering Total Marks 100 Marks						
Course C	Conten	ts				·	
Unit I	Unit IFoundation Geology: Methods of rock investigation for major Civil engineering projects, Geological Drilling Method, borehole logs, Correlation, percent recovery and Rock quality designation, Engineering classification of Rock based on RMR, RQD, Strength and Weathering resistance.						
	Rock	Strengthening:	Defects in rock masses, Grouting	method and ma	aterial, Design o	f Rock bolts	
Unit II	and a	inchors. Water pe	colation tests at foundation site. C	Case studies of	Civil Engineerin	ng projects in	
Unit III	India Groundwater Hydrology: Groundwater and well Hydraulics, Determination of permeability, storage capacity, transmissivity, specific capacity, safe yield. Groundwater trends and fluctuations. Construction of Wells						
Unit IV	nit IV Groundwater Exploration: Surface and sub-surface investigations of Groundwater. Geological, Geophysical methods and remote sensing; Water balance technique, Artificial recharge of groundwater Methods of Improving Rock Mass properties: Rock Reinforcement – Rock bolting – Mechanism of Rock bolting – Principles of design – Types of rock bolts. Pressure grouting – grout curtains and consolidation grouting						
Unit V	 Environmental Geology: - Land use/cover planning; pollution of surface and groundwater; waste disposal site selection for solid and liquid wastes. Geological Hazards: Natural Disaster Management with emphasis on Earthquakes, Stability of slopes and landslides. Prediction, Prevention and Rehabilitation 						
Text Boo	ks						
T.1	Fundamentals of Engineering Geology- F.G. Bell Publisher BS Publications Edition 2005						
T.2	R. E. Goodman, "Introduction to Rock Mechanics" John Wiley & Sons, New York, 1989						
T.3	Wakter Wittke, "Rock Mechanics" Springer Verlag, New York, 1990						
T.4	Kiyoo Mogi "Experimental Rock Mechanics" Taylor & Francis Group, UK, 2007						
Referenc	e Book	(S					

R .1	Engineering Geology- Parbin Singh, S K Katariya& Sons Edition Sixth Edition.
R.2	Principles of Physical Geology- Homes Arthur and Homles Doris, ElBS Publications Edition 1987.

R.3	Engineering Geology- Parbin Singh, S K Katariya& Sons Edition Sixth Edition.
R.4	Daryl L. Logan, A First Course in the Finite Element Method, Cengage Learning, 2010.
Useful L	inks
1	https://nptel.ac.in/courses/105/106/105106055/
2	https://nptel.ac.in/courses/105/107/105107208/
3	https://nptel.ac.in/courses/105/105/105105212/

	Course Outcomes	CL	Class Sessions
BCE4718.1	Use knowledge of existing rocs, its failure and its remedial methods.	3	9
BCE4718.2	Analyze the Rock Strengthening	4	9
BCE4718.3	Classify the application of Geological fundamentals in various fields of Civil Engineering.	4	9
BCE4718.4	Point out different Geological Hazards on earth and	4	9
BCE4718.5	Plan Preparation for the mitigation of such hazards.	6	9

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Program: B. Tech. Civil Engineering						
Semester	Course Code Name of Course L T P				Credits	
VII	BCE4719	Estimating and costing Lab	-	-	2	1
Pre-Requ	uisites:					
Course Contents C						
1	Preliminary estimat	e using Plinth area method.				CO5
2	Detailed estimate o	f Load bearing structure.				CO5
3	Detailed estimate o	f Frame structure.				CO5
4	Calculation of steel	with Bar bending Schedule.				CO4
5	Draft Detailed spec	ification for 8 major items.				CO4
6	Analysis the unit ra	te of 8 major items of work contained.				CO4
7	Draft a short tender	notice for proposed work.				CO1
8	Calculation of annu	al and total Depreciation and book value of the	end of	each yea	ar.	CO2
9	Fixation of standard	d rent of property.				CO4
10	Market survey for n	naterial and labour rates for various items.				CO4
11	Detailed planning a	nd estimate of plumbing work.				CO5
12	Estimation of M.D.R with C.D. works					CO4
Text Books						
T.1	"Estimating, Costing UBS Publication, Ca	g, Specification & valuation in Civil Engineering Ilcutta, 2010	g", auth	ored by	Chakra	borti M.,
T.2	"Estimating and cost	ting "authored by Dutta B.N.,S, Dutta & Co, I	Lucknov	w-I(199	5)	
Т.3	"Civil Estimating, co Katson Publishing, 1	osting and valuation", authored by Amarjit Agg 984.	garwal,	R.C. Cł	audhar	y, S. Kumar
T.4	"Textbook of estima	ting and costing", authored by Birdie G.S.", Dh	nanpat r	ai and s	ons, De	lhi-1996
Referenc	e Books					
R.1	"Estimating & Costing" authored by , Chandola S.P. &Vazirani V.N, Khanna Publishers 2-B, Nath market, Naisarak, Delhi, 2010					
R.2	"Estimating & Costing in civil Engineering", authored by Dutta B.N, UBS Publishers distributors ltd., 5 Ansari road, NewDelhi, February 1999					
R.3	3 "Estimating, Costing And Valuation" authored by Rangawala S.C. ,Charotar publishing Pvt ltd. Anand(1998)					
R.4	R.4 "Estimate ,costing and Valuation " authored by Dr. R P Rathaliya , Mayur Rathaliya ,Atul Prakashan Gandhi road, Ahmedabad,2018.					
Useful Links						
1	https://nptel.ac.in/content/storage2/courses/105103023/pdf/mod5.pdf					
2	https://nptel.ac.in/co	urses/105/103/105103093/				

	Course Outcomes	CL	Lab Sessions
BCE4719.1	Prepare the tender documents; fill the contracts by using the knowledge of contract submission and opening in awarding the work to the contractor.	6	2
BCE4719.2	Remember the concept of SD, EMD, MAS, Running Bill, Final Bill during the entire project.	1	2
BCE4719.3	Apply the preliminary estimate for administrative approval and technical sanction for a civil engineering project.	3	2
BCE4719.4	Apply the technique of Rate analysis in estimating the exact cost of material and manpower and hence the entire project.	3	4
BCE4719.5	Analyze the bill of quantities using the typesof preliminary techniques and detailed estimation of buildings and roads.	4	8

Sparshyarcan

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Program: B. Tech. Civil Engineering							
Semester	Course Code	Name of Course	L	T P Credits			
VII	BCE4720	Advanced Design of Reinforced Concrete Structure Lab	-	-	1		
Pre-Requ	iisites:						
	-	Course Contents		CO			
1	Design of Circular	Water Tank		CO1			
2	Design of Rectang	ular Tank		C01			
3	Design of RCC Co	lumn subjected to biaxial moment			CO	2	
4	Design of Retaining	g Wall: Cantilever			CO.	3	
5	Design of Retaining	g Wall: Counter-fort			CO.	3	
6	Design of Combine	ed Footing: Rectangular Footing			CO	4	
7	Design of Combine	ed Footing: Trapezoidal Footing			CO	4	
8	Analysis and Desig	gn of Portal Frame			CO	5	
Text Boo	ks						
T.1	"Concrete Technolo	gy "author by Gambhir M.L 4 th Edition,: Tata Me	cGraw	Hill Pu	olication	n 1995.	
T.2	"Concrete Technology" author by Neville A. M. ; Brooks J. J., Pearson Education publication.						
Т.3	"Design of Concrete McGraw-Hill Public	e Structures" author by Nilson, A. H., D. Darwin, cation, 2004.	, and C	C. W. Do	lan, 13t	h edition.	
T.4	"Reinforced Concrete Structural Elements: Behaviour Analysis and Design" author by Purushothaman, P. 1 st edition, Tata McGraw Hill Publication, 1986						
Reference	e Books						
R.1	Bhavikatti S. S., Advanced R. C. C. Design Volume-II, New age international publisher, New Delhi, Ist edition – 2006.						
R.2	R.2 Krishna Raju N, Advanced R. C. C. Design, CSB Publisher and Distributor, New Delhi, 2nd edition- 2005						
R.3	R.3 ^{(Fundamentals of RC Design"} author by M L Gambhir, Prentice Hall India Learning Private Limited 2006						
R.4	"Brook Properties of Concrete" author by 1 st edition Neville A.M., J.J. Addison Wesley publisher 1999.						
Useful Li	nks						
1	https://nptel.ac.in/co	urses/105/105/105105104/					

	Course Outcomes	CL	Lab Sessions
BCE4720.1	Design of all components of water tank by applying the knowledge of is code .	6	9
BCE4720.2	Design of column for Structural conditions.	6	9
BCE4720.3	Design of RCC Cantilever and Counter-fort Retaining wall	6	9
BCE4720.4	Design of combined rectangular & combined trapezoidal footing	6	9
BCE4720.5	Design of Portal frames with hinged or fixed end conditions.	6	9

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