TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY
Wardha Road, Nagpur - 441108
Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)
Approved by AICTE, New Delhi, Govt. of Maharashtra
(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)
Department of Civil Engineering

DEPARTMENT OF CIVIL ENGINEERING

B.Tech. Civil Engineering

VII Semester

Teaching Scheme & Syllabus

Considering

National Education Policy (NEP) – 2020

From

Academic Year 2026-27

Vision of Institute

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

Mission of Institute

- **M1:** To strive for rearing standard and stature of the students by practicing high standards of Professional ethics, transparency and accountability
- **M2:** To provide facilities and services to meet the challenges of Industry and Society
- **M3:** To facilitate socially responsive research, innovation and entrepreneurship
- **M4:** To ascertain holistic development of student and staff members by inculcating knowledge and profession as work practices.

Vision of the Department

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

Mission of the Department

- **M1:** To promote academic and ethical development while upholding high standards.
- **M2:** To provide advance facilities with the skills needed to face Industry and societal challenges.
- **M3:** To promote socially responsible research, innovation, and entrepreneurship in the field of Civil Engineering.
- **M4:** 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 Educational Objectives (PEO)

PEO 1: Analyze and design civil engineering structures while keeping social awareness and ethical responsibilities in mind.

PEO 2: Demonstrate leadership abilities in supporting sustainable practices in Civil Engineering

PEO 3: Exhibit a commitment to lifelong learning, staying updated on developing technologies and industry trends, and adjusting to the evolving world of Civil Engineering.

PEO 4: Execute 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.

Program Specific Outcomes (PSO)

PSO1: Competency to manage large infrastructure projects while providing safe and cost-effective project execution, along with expertise of rapid construction and project management.

PSO2: Plan, execute, manage, maintain and rehabilitate civil engineering systems and processes.

PSO3: Apply innovative construction and management techniques to compete with modern structural design and construction within the budget and time frame.

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SCHEME OF INSTRUCTION & SYLLABI

Programme: Civil Engineering

Scheme of Instructions: Fourth Year B.Tech. in Civil Engineering (As Per NEP 2020)

Semester – VII

SN	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs.		CT/IA	CA	ESE		
1	VII	PCC	CE	BCE34701	Estimating & Costing	T	3	0	3	3	30	10	60	3 Hrs.	100
2	VII	PEC	CE	BCE34702-05	Program Elective – IV	T	3	0	3	3	30	10	60	3 Hrs.	100
3	VII	PEC	CE	BCE34706-09	Program Elective – V	T	3	0	3	3	30	10	60	3 Hrs.	100
4	VII	MDM	BA	BBA34701	Professional Practices, Laws & Ethics	T	4	0	4	4	30	10	60	3 Hrs.	100
5	VII	PCC	CE	BCE34711	Foundation Engineering	T	3	0	3	3	30	10	60	3 Hrs.	100
6	VII	PCC	CE	BCE34712	Construction Management	T	3	0	3	3	30	10	60	3 Hrs.	100
7	VII	PCC	CE	BCE34713	Sustainable Development Goals	T	2	0	2	2	14	06	30	2 Hrs.	50
8	VII	PROJ	CE	BCE34710	Project	P	0	8	8	4	-	50	50	-	100
							21	**8**	**29**	**25**	**194**	**116**	**440**	**20 Hrs.**	**750**

Course Category	BSC/ ESC (Basic Science Course/ Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	SEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses
Credits (7th sem)	--	11	06	04	--	--	04	--
Cumulative Sum	16 / 13	53	15	22	07	14	06	04

PROGRESSIVE TOTAL CREDITS: 125+25=150

Chairperson	Vice Principal/ Director Academics	Director Administration	Principal	Aug, 2023	1.00	Applicable for AY 2023-24 Onwards
				Date of Release	Version	

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Program: Civil Engineering

List of **Program Electives** offered By Civil Engineering Department

Program Elective- I	Program Elective-II	Program Elective- III	Program Elective- IV	Program Elective- V
Semester V	**Semester VI**	**Semester VI**	**Semester VII**	**Semester VII**
BCE33506-Water Resources Engineering	BCE33606-Rural Water Supply and Sanitation	BCE33610- Building Construction Practice	BCE34702-Pavement Design	BCE34706-High Rise Structures
BCE33507-Water Quality Engineering	BCE33607-Environmental Laws and Policy	BCE33611- Advanced Building Construction Methods	BCE34703-Urban Transportation Planning	BCE34707-Industrial Structures
BCE33508-Surface Hydrology	BCE33608-Solid and Hazardous Waste Management	BCE33612- Structural Audit & Retrofitting of Structures	BCE34704-Airport Planning and Design	BCE34708-Prestressed Concrete
BCE33509-Flood Control & Drainage Engineering	BCE33609-Air and Noise Pollution Control	BCE33613- Construction Equipment & Automation	BCE34705-High Speed Rail Engineering	BCE34709-Earthquake Engineering

List of **Open Electives** offered By Civil Engineering Department

Open Elective-I	Open Elective-II	Open Elective-III
Semester-III	**Semester-IV**	**Semester-V**
BCE32306: Green Structures and Smart Cities	BCE32406: Plastic Waste Management	BCE33510: Railways & Airport Engineering

List of **Multidisciplinary Minor Courses** offered By Civil Engineering Department

SN	Sem	Type	BoS/ Dept	Sub. Code	Subject
1.	III	MDM-I	S&H	BSH32302	Numerical Methods for Engineers
2.	IV	MDM-II	ECE	BEC32406	Instrumentation & Sensor Technologies for Civil Engineering Applications
3.	V	MDM-III	IT	BIT33516	Cyber Security & Laws
4.	VI	MDM-IV	EE	BEE33613	Green Energy Technology
5.	VIII	MDM-V	BA	BBA34801	Professional Practices, Laws & Ethics

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				Date of Release	Version	

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Program: Civil Engineering

Course Category	BSC (Basic Science Course)	ESC (Engineering Science Course.)	PCC (Program Core courses	PEC (Program Elective courses)	Multidisciplinary courses	VSEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses	Semester Wise Credits
Semester -I	08	05	02	--	--	02	02	--	02	**21**
Semester -II	08	08	--	--	--	02	02	--	02	**22**
Semester -III	--	--	08	--	06	--	04	02	--	**20**
Semester -IV	--	--	10	--	04	02	06	--	--	**22**
Semester -V	--	--	11	03	06	--	--	--	--	**20**
Semester -VI	--	--	11	06	02	01	--	--	--	**20**
Semester -VII	--	--	11	06	04	--	--	04	--	**25**
Semester -VIII	--	--	--	--	--	--	--	16	--	**16**
Cumulative Sum	**16**	13	53	**15**	**22**	**07**	14	**22**	**04**	**166**

Chairperson	Vice Principal/ Director Academics	Director Administration	Principal	Aug, 2023	1.00	Applicable for AY 2023-24 Onwards
				Date of Release	Version	

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Program: B.Tech. Civil Engineering

Semester-VII	BCE34701: Estimating & Costing

Teaching Scheme		**Examination Scheme**	
Theory	3 Hrs/week	**CT-I**	15 Marks
Tutorial		**CT-II**	15 Marks
Total Credits	**3**	**CA**	10 Marks
Duration of ESE: 3Hrs		**ESE**	60 Marks
Pre-Requisites: 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	Specifications: Purpose and principles of specifications writing, Types of specifications, writing and developing detailed specifications. Tenders and Contracts: Methods of carrying out works, tender notice, acceptance of tender, essentials of contract, type of contracts, contract documents, land acquisition act, BOQ.
Unit IV	Rate Analysis: Introduction, Purpose and principles of CSR, Factors affecting analysis of rates, labour guidelines from National Building Organization, market rates of materials and labor, Rate analysis of major items of work.
Unit V	Valuation: Purpose of valuation, Factors affecting property price and cost, Types of Value. Real Estate, Tenure of land, Free hold and lease hold, sinking fund, Depreciation, and its methods, Capitalized value, Methods of valuation, Net & Gross income, Rent fixation

Text Books

T.1	"Estimating, Costing, Specification & valuation in Civil Engineering", authored by Chakraborti M., UBS Publication, Calcutta, 2010
T.2	"Estimating and costing" authored by Dutta B.N., S, Dutta & Co, Lucknow-I (1995)
T.3	"Civil Estimating, costing and valuation", authored by Amarjit Aggarwal, R.C. Chaudhary, S. Kumar Katson Publishing, 1984.

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

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**
BCE34701.1	**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
BCE34701.2	**Relate** the concept of SD, EMD, MAS, Running Bill, Final Bill during the entire project.	4	9
BCE34701.3	**Apply** the preliminary estimate for administrative approval and technical sanction for a civil engineering project.	3	9
BCE34701.4	**Apply** the technique of Rate analysis in estimating the exact cost of material and manpower and hence the entire project.	3	9
BCE34701.5	**Analyze** the bill of quantities using the types of preliminary techniques and detailed estimation of buildings and roads.	4	9

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Program: B.Tech. Civil Engineering

Semester-VII	**BCE34702**: Program Elective-IV (Pavement Design)

Teaching Scheme			**Examination Scheme**	
Theory	3 Hrs/week		**CT-I**	15 Marks
Tutorial	-		**CT-II**	15 Marks
Total Credits	**3**		**CA**	10 Marks
Duration of ESE: 3Hrs			**ESE**	60 Marks
Pre-Requisites: Transportation Engineering, Structural Analysis, Advanced Structural Analysis, Reinforced Concrete Structure			**Total Marks**	**100 Marks**

Course Contents

Unit I	**Types of pavement** – Factors affecting design of pavements – wheel loads –ESWL Concept- tyre pressure – contact pressure, Material characteristics – Environmental and other factors
Unit II	**Material characteristics:** AASHO subgrade soil classification. Group index, CBR, North Dakota cone bearing value, plate load test for K, modulus of rupture, elasticity, poisons's ratio and coefficient of thermal expansion of concrete. Layer equivalent concepts.
Unit III	**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, joints 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 Books

T.1	Principles of Pavement Design *by* Yoder, E. J& Witczak, M.W., John Wiley and Sons, USA
T.2	Pavement analysis and Design by Huang, Y. H. (1993), Prentice Hall, Englewood Cliffs, New Jersey
T.3	Highway Engineering – S.K. Khanna & C.J. Justo, Nemchand & Bros., 7th Edition (2000)
T.4	Principles and Practices of Highway Engineering – Dr. L. R. Kadiyali & Dr.N.B.Lal – Khanna publishers – (2003)

Reference Books

R.1	Highway Engg *by* S.K. Khanna & C.E.G. Justo, Nem Chand Bros., Roorkee.
R.2	Relevant IRC Code: 37, 58, (latest) and BIS standards

R.3	Principles and Practice of Highway Engg. byL.R.Kadiyali, Khanna Publishers, 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
BCE34702.1	**Analyze** and Design pavement and under different loading conditions for highways and airfields taking into consideration different characteristics.	4	9
BCE34702.2	**Show** a pavement management system framework.	3	9
BCE34702.3	**Design** of highway appurtenance and highway drainage.	6	9
BCE34702.4	**Experiments** Performance considering different field conditions	3	9
BCE34702.5	**Recommend** to increase the strength of pavements along with its economy point of view	5	9

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Program: B.Tech. Civil Engineering

Semester-VII	**BCE34703:** Program Elective-IV (Urban Transportation Planning)

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

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 Books

T.1	Urban Transportation Planning: A Decision-Oriented Approach (McGraw-Hill Series in Transportation) Hardcover – Import, 1 January 2001
T.2	Urban Transportation: Planning, Operation and Management Hardcover – 25 September 2012
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
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 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
BCE34703.1	**Illustrate** to Urban transportation planning; systems approach, types of models; concept of travel demand and supply;	3	9
BCE347032	**Infer** the Urban land use, network, and transport system characteristics affecting urban transportation planning; study area definition, zoning principles	4	9
BCE34703.3	**Appraise** Data collection through sources, sampling techniques; modelling approach; trip generation; trip distribute, trip assignment;	4	9
BCE34703.4	**Defend** land use-transport models; public transport planning, integration of different modes; travel demand its management with case study.	5	9
BCE34703.5	**Modify** Path assignment**,** Capacity restrained assignment and Multi path assignment - Route-choice behavior; Land use transportation models .	6	9

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Program: B.Tech. Civil Engineering

Semester-VII | **BCE34704** : Program Elective-IV (Airport Planning and Design)

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

Course Contents

Unit I	**History and organisation** of air transport, Aircraft characteristics related to airport design, Airport configuration, Airport planning and air travel demand forecasting, Classification of airports- ICAO standards ; Zoning laws ;
Unit II	**Air Traffic Management**: Navigational aids: ground based systems, satellite based systems**,** air traffic control, Grading, Environmental guidelines for airport projects, air-traffic demand estimation. Airport hangars- their planning and design criteria ; Airport landscaping, grading and drainage-general aspects ; Airport terminal and amenities ;
Unit III	**Taxiway** and Gate Capacity, Taxi way design, Taxiways- alignment- geometry and turning radius- exit taxiways - Aprons- planning and design ; Holding Aprons - Terminal Aprons – Airport drainage - Function of Airport Passenger and Cargo Terminal - Design of Air Freight Terminals - Airport access - Airport Landside planning - Capacity
Unit IV	**Runway** Capacity and configuration, Runway design, Runway sorientation and geometric design- Runway patterns, Design principles of critical, semi-critical, non-critical airport pavements, FAA and PCA methods ; maintenance and rehabilitation of airfield pavements,
Unit V	**Airport terminal area**, Airport airside capacity and delay, Planning and design of the terminal area, terminal area lay-out, Airport access, airport lighting and marking, Financial strategies for 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
T.4	Shahin, M. Y., Pavement Management for Airports, Roads and Parking Lots, Chapman and Hall, New York, 1994

Reference Books

R.1	R. Horonjeff and F. X. Mckelvey, Planning & Design of Airports, 5th Edition, Mc Graw Hill, New York, 2010
R.2	N. Ashford, S. Mumayiz and P. H. Wright, Airport Engineering, 4th Edition, John Wiley, New York, 2011.

R.3	Khanna, Arora and Jain, Planning and Design of Airports, Nemchand Bros., 2001

R.4	De N. Richard, & Odoni, Airport Systems: Planning, Design, and Management, McGraw Hill Amedeo, 1st Edition, 2004.
Useful Links	
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 Sessions
BCE34704.1	**Infer** Airport planning and air travel demand forecasting, ICAO standards ; Zoning laws	4	9
BCE34704.2	**Explain** Air Traffic Management: Navigational aids: ground based systems, satellite based systems, air traffic control, Grading,	4	9
BCE34704.3	**Compile** Taxi way , Aprons- planning and design ; Airport drainage - Design of Air Freight Terminals	6	9
BCE34704.4	**Modify** Runway, - critical airport pavements, FAA and PCA methods ; maintenance and rehabilitation of airfield pavements,	6	9
BCE34704.5	**Compose** of the terminal area, terminal area lay-out, Airport access, airport lighting and marking,	6	9

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Program: B.Tech. Civil Engineering

Semester-VII	BCE34705: Program Elective-IV (High Speed Rail Engineering)

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

Course Contents

Unit I	Formulation of HSR Basic Plan in India, Necessity of HSR System in India, Traffic Frequency, Basic Technical Standard and System Selection, Loading gauge and Structural gauge, Platform Clearance, Track Spacing, Gradients, Track Structure, Rolling Stock.
Unit II	Key elements of HSR systems and subsystems including: core systems (trains, power, signal, communication and control), Polyamide guide plate, Static response, Rail pad, Anchorage components, Construction of the catenary, Testing, Loss prevention.
Unit III	Track system and civil infrastructure (earthwork, bridges, viaducts and tunnels).General loss experience from tunnels building, Channel Tunnel Rail Link, Loss prevention Tunneling risks,
Unit IV	basic design and construction of HSR stations and rolling stock maintenance facilities, Design Parameters, Construction Method, Operation Method, Interoperability and Gauge Selection, Required Levels on Services / Facilities
Unit V	High speed rail engineering : definition, network, comparison with other mode, Development, engineering, design and construction of high speed rail (HSR) passenger transport systems with particular emphasis on the unique engineering elements of HSR technology.

Text Books

T.1	High Speed Trains Hardcover – Import, 1 November 2011.
T.2	Construction and management of high speed rail, 2015
T.3	Design of High-Speed Railway Turnouts,ping wang, 2015
T.4	A Text Book Of Railway Engineering, by S.C. Saxena, S.P.Arora,

Reference Books

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	Railway Engineering by Satish Chandra, Aqarwal,2008
Useful Links	

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
BCE34705.1	**Explain** High speed rail engineering, network, comparison, Development, design and construction, passenger transport systems , elements of HSR technology.	4	9
BCE34705.2	**Infer** Key elements and subsystems including: communication and control, Polyamide guide ,Construction Testing , Loss prevention - Lessons learnt and recommendations,	4	9
BCE34705.3	**Contrast** track system and civil infrastructure loss, Channel Tunnel Rail Link, Loss prevention – lessons learnt and recommendation, Tunnelling risks,	4	9
BCE34705.4	**Compose** HSR stations and rolling stock maintenance facilities, Parameters, Construction Method , Operation Method, Interoperability and Gauge Selection, Levels on Services / Facilities	6	9
BCE34705.5	**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. Civil Engineering

Semester-VII	BCE34706: Program Elective-V (High Rise Structures)

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

Course Contents

Unit I	Performance of buildings, behaviors of various types of buildings in past earthquakes. Modes of failures influence of unsymmetrical, infill walls, foundations, soft story & detailing of reinforcements in buildings.
Unit II	Frames shear walled buildings, mathematical modeling of building with different structural systems Analysis of frames shear walled buildings, Analysis of coupled shear walled building
Unit III	Special aspects in Multi-story buildings, Effect of torsion, flexible first story ,P-delta effect, soilstructure interaction on building response, drift limitation
Unit IV	Strength, ductility and energy absorption, ductility of reinforced members subjected to flexure, axial loads & shear. Detailing of RCC members, beam, column, Beam-column joints for ductile behaviors, IS code provisions.
Unit V	Design of multi-story buildings with bracings & infills. Tall Buildings, Structural Concept, Configurations

Text Books

T.1	Seismology Committee (1999). *Recommended Lateral Force Requirements and Commentary*. Structural Engineers Association of California.
T.2	Design of Seismic Isolated Structures- Farzad Naeim, James M. Kelly, Published 2 DEC 2007
T.3	A K. Chopra, Dynamics of Structures: Theory and Applications to Earthquake Engineering (3rd Edition), Prentice-Hall of India.
T.4	Housner, G. W. &Jenning, P.C. “Earthquake Design Criteria”, Earthquake Engineering Research Institute, Oakland, California, USA, 1982

Reference Books

R.1	IS 13920, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice, 1993.
R.2	A.K. Chopra, Dynamics of Structures, 3rd Edition, Pearson, 2007.
R.3	PankajAgarwal and Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall India, 2006.

R.4	Kramer, S. L. “Geotechnical Earthquake Engineering”, Prentice Hall, New Jersey, 1996.
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 Sessions
BCE34706.1	**Differentiate** between Earthquake and Tsunami	4	9
BCE34706.2	**Analyze** earthquake loading effect on structures.	4	9
BCE34706.3	**Design** of structures against earthquake loading.	6	9
BCE34706.4	**Evaluate** the earthquake loading for multi-storey structure using different methods like Equivalent Static Lateral Load Method and Response Spectrum Method	5	9
BCE34706.5	**Use** the knowledge in practical situation and Understand the different seismic retrofitting techniques and its implementation.	3	9

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Program: B.Tech. Civil Engineering

Semester-VII	BCE34707:Program Elective-V (Industrial Structure)

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

Course Contents

Unit I	Industrial Building: Structural layout of industrial building, Design of roof with trusses, Effect of wind loads on purlin and trusses, bracing systems, columns
Unit II	Design of Gantry Girder with Static and Moving loads
Unit III	Transmission and Communication towers: Types and configuration, Loads & load combinations be considered, Analysis and design of tower & foundations
Unit IV	Chimneys: Loads and stresses in chimney shaft, Earthquake and wind effect, Stresses due to temperature difference, combined effect of loads and temperature, temperature. Design of RC chimney
Unit V	Bunkers & Silos: Introduction, Jassen's theory, Airy's theory, Shallow and deep bins, Design of RC circular/cylindrical bunkers, silos using Jensen's theory as per IS.

Text Books

T.1	Punmia, B.C.; Jain, Ashok Kumar; Jain, Arun Kumar, "Limit State Design Of Reinforced Concrete", Laxmi Publications.
T.2	Varghese P. C., "Limit State Design Of Reinforced Concrete", Prentice Hall Of India.
T.3	Ghosh, Karuna Moy, "Practical Design Of Reinforced Concrete Structure", Prentice Hall Of India.
T.1	Punmia, B.C.; Jain, Ashok Kumar; Jain, Arun Kumar, "Limit State Design Of Reinforced Concrete", Laxmi Publications.

Reference Books

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 Links

1	https://nptel.ac.in/content/storage2/courses/105105104/pdf/m11l28.pdf
2	https://nptel.ac.in/courses/105/105/105105039/

	Course Outcomes	CL	Class Sessions
BCE34707.1	**Design** the circular and rectangular water tank resting on the ground by working stress method.	6	9
BCE34707.2	**Design** of elevated water tank by working stress method.	6	9
BCE34707.3	**Design** of staging of Intze water tank by working stress method.	6	9
BCE34707.4	**Design** of members of Raft foundation by Limit state method.	6	9
BCE34707.5	**Design** of members of Pile foundation by Limit state method.	6	9

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Program: B.Tech. Civil Engineering

Semester-VII	BCE34708: Program Elective-V (Prestressed Concrete)

Teaching Scheme		**Examination Scheme**	
Theory	3 Hrs/week	**CT-I**	15 Marks
Tutorial	-	**CT-II**	15 Marks
Total Credits	**3**	**CA**	10 Marks
Duration of ESE: 3Hrs		**ESE**	60 Marks
Pre-Requisites: Reinforced cement concrete structures, Concrete Technology		**Total Marks**	**100 Marks**

Course Contents

Unit I	Design of high strength concrete mixes. Loss of pre-stress in single span and continuous beams. Use of IS 1343, Analysis Limit State Design of beams for Tension Type II and III problems, Cracking moment, untensioned reinforcement, Partial pre-stressing, Stress Corrosion.
Unit II	Transfer of pre-stress by bond, Transverse tensile stresses, End zone reinforcement. Behaviour of Bonded and unbounded pre-stressed concrete beams.
Unit 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.
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.

Text Books

T.1	Raju N. Krishna, “Pre-stressed Concrete”, Tata McGraw Hill, 2002.
T.2	Lin,T.Y;Burns,Ned .H, “Design of Pre-stressed Concrete Structures”, Wiley India.
T.3	Nildon,Arthur.H, “ Design of Pre-stressed Concrete”, Wiley India .

Reference Books

R.1	N Krishna Raju, “Prestressed Concrete: Problems and Solutions”, CBS, 2017
R.2	M.K.Hurst, “ Prestressed Concrete Design”, CRC Press, 2019

Useful Links

1	https://nptel.ac.in/courses/105/106/105106117/
2	https://nptel.ac.in/courses/105/106/105106118/
3	http://www.nptelvideos.in/2012/11/prestressed-concrete-structures.html

	Course Outcomes	CL	Class Sessions
BCE34708.1	**Understand** the design of high strength concrete mixes and basic properties of pre-stressed concrete.	2	9
BCE34708.2	**Analyze** the pre-stressed beams for bonded and unbounded by Limit state method.	4	9
BCE34708.3	**Analyze** the flexural behavior of Pre-stressed concrete members by Limit state concept.	4	9
BCE34708.4	**Design** of reinforcement in torsion shear and bending of pre-stressed concrete members.	6	9
BCE34708.5	**Design** of Composite Construction of pre-stressed precast and cast in situ concrete members.	6	9

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Program: B.Tech. Civil Engineering

Semester-VII	BCE34709: Program Elective-V (Earthquake Engineering)

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

Course Contents

Unit I	Engineering seismology, Elastic rebound theory, Theory of plate tectonics and movement of Indian plate. Seismic waves. Seismic intensity, Richter scale.
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.)
Unit V	Concept of earthquake Resistant design, design philosophy, Four virtues of EQRD: Stiffness, Strength, ductility and Configurations, Introduction to Capacity design concepts.

Text Books

T.1	Hector Estrada, Luke S. Lee, “Introduction to Earthquake engineering”, CRC Press, 2017.
T.2	Shabana, Ahmed, “Theory of Vibrations”, Springer, 2019.
T.3	Amrs. Elnashai, Luigi Di Samo“Fundamentals of Earthquake Engineering”, Willey, 2005.

Reference Books

R.1	Anil K Chopra, “Dynamics of Structures”, Pearson,1981.
R.2	S Rajasekaran, “Structural Dynamics of Earthquake Engineering”, Woodhead, 2009.

Useful Links

1	http://www.cdeep.iitk.ac.in/nptel
2	http://wwwnptel.iitm.ac.in

	Course Outcomes	CL	Class Sessions
BCE34709.1	**Illustrate** the concept of inertia and damping with static and dynamic forces and response of SDOF systems.	4	9
BCE34709.2	**Analyze** the response of SDOF systems and natural frequencies and mode shapes.	4	9
BCE34709.3	**Analyze** the response of MDOF systems and mode shapes and Elements of seismology.	4	9
BCE34709.4	**Asses** the response of structures and difference between the magnitude, intensity and acceleration of earthquake.	5	9
BCE34709.5	**Analyze** structure for earthquake forces according to IS code provisions	4	9

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B.Tech. Civil Engineering - Fourth Year (Semester-VII)

BBA34701: Professional Practices, Laws & Ethics

Teaching Scheme		Examination Scheme	
Theory	4 Hrs./week	**CT-I**	15 Marks
Tutorial		**CT-II**	15 Marks
Total Credits	**4**	**CA**	10 Marks
Duration of ESE: 3Hrs.		**ESE**	60 Marks
		Total Marks	**100 Marks**

Course Objectives:

1.	Explain the fundamental principles of professional ethics and liability in engineering.
2.	Describe the essential elements of a valid contract and the role of GST.
3.	Discuss the legal framework and procedures of arbitration under the UNCITRAL model.
4.	Summarize the labor laws and RERA regulations governing the construction industry.
5.	Introduce the scope of Intellectual Property Rights and ethical decision-making frameworks.

Course Contents

Unit I	Professional Practice and Ethics: Definition of Professional Ethics - Engineering Ethics, Personal Ethics, Code of Ethics - Profession, Professionalism, Professional Responsibility, Professional Liability.
Unit II	Law of Contract: Nature of Contract and Essential elements of the valid Contract, offer and Acceptance, Consideration, Capacity of Contract and Free Consent, Legality of Object, Distinction between negotiation, mediation and arbitration and Introduction to GST and Various roles of various stake holders
Unit III	Arbitration: Arbitration Agreements, Arbitration Tribunals, Tribunal: appointment, challenges jurisdiction of arbitral Tribunal, Powers, ground of challenge, procedure and Court assistance and Extent of Court intervention. UNCITRAL Model law.
Unit IV	Industrial Employment: Role of Labour, Methods of engaging Labour - on rolls, labour sub-contract Workmen Compensation Act, 1923, Industrial Employment Act, 1946, RERA Act 2017,
Unit V	Law relating to Intellectual Property: Introduction, Scope of IPR, WIPO and TRIPS in IPR, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets, Law relating to Copyright in India. Agencies responsible for IPR Registration and Importance of the Semi-Conductor Integrated Circuits Layout Design Act, 2000. Ethical Decision Making

Text Books

T.1	R. Subramanian - Professional Ethics, Oxford University Press, 2015.
T.2	Intellectual property right by Deborah E Bouchoux.
T.3	Intellectual property rights by N.K Acharya.
T.4	Fundamentals of IPR for engineers, BY Komal Bansal.

Reference Books

R.1	Intellectual property rights by P. Radhakrishnan
R.2	Wadhera - IPR, Universal Law Publishing Co., 2004.
R.3	RERA Act, 2017.

	Course Outcomes	CL
BBA34701.1	**Apply** professional codes of ethics to resolve liability issues in engineering practice.	3
BBA34701.2	**Distinguish** between negotiation, mediation, and arbitration processes within contract law.	4
BBA34701.3	**Analyze** the jurisdiction and powers of arbitral tribunals in dispute resolution.	4
BBA34701.4	**Evaluate** industrial employment acts and RERA compliance for labour management.	5
BBA34701.5	**Categorize** different forms of Intellectual Property Rights and their registration requirements.	4

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Program: B.Tech. Civil Engineering

Semester-VII	BCE34711: Foundation Engineering

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

Course Contents

Unit I	**Analysis of foundations**, types of foundations, bearing capacity and settlement of foundations; ground movements due to construction; Bearing Capacity from SPT and SCPT and Plate load Test data, Proportioning of footing based on settlement criteria. Foundations on Problematic soils: Problems and Remedies.
Unit II	**Well Foundations: Caissons** – Types, advantages and disadvantages, Shapes and component parts, Grip length, Bearing capacity and settlement, Forces acting, Sinking of wells, Rectification of Tilts and Shifts, Foundation Failures - Types and causes of failures, Remedial measures, Shoring and Underpinning.
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. Settlement of footings on stratified deposits.
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 reinforced concrete in foundations;
Unit V	**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 Books

T.1	B. M Das, Principles of Foundation Engineering, Thomson Brooks/Cole
T.2	J. E. Bowles, Foundation Analysis and Design, McGraw-Hill Book Company
T.3	N.P. Kurien, Design of Foundation Systems : Principles & Practices, Narosa, New Delhi 1992
T.4	H. F. Winterkorn and H Y Fang, Foundation Engineering Hand Book, Galgotia Booksource

Reference Books

R.1	A. Singh, Modern Geotechnical Engineering, 3rd Ed., CBS Publishers, New Delhi, 1999

R.2	B.M. Das, Principles of Foundation Engineering, 5th Ed., Thomson Asia, Singapore, 2003.

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 Links	
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**
BCE34711.1	**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
BCE34711.2	**Explain** Well Foundations: Caissons – Types, advantages and disadvantages, Shapes and component parts, Foundation Failures, Remedial measures, Shoring and Underpinning.	4	9
BCE34711.3	**Infer** Raft Foundation**:** Settlement and Bearing Capacity analysis, settlements. Proportioning of footing, Inclined & Eccentric loads. Settlement of footings on stratified deposits.	4	9
BCE34711.4	**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
BCE34711.5	**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: B.Tech. Civil Engineering

BCE34712: Construction Management

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

Course Objectives:

1.	Analyze the productivity and economic feasibility of heavy construction machinery and specialized equipment.
2.	Evaluate the impact of automation on infrastructure projects like highways, canals, and concrete technology.
3.	Leverage drone technology and photogrammetry for real-time monitoring and advanced site surveying.
4.	Integrate robotics and 3D printing to enhance speed, safety, and precision in construction activities.
5.	Implement digital innovations like BIM, AR/VR, and Mivan technology to modernize project management.

Course Contents

Unit I	**Introduction:** Unique features of construction equipment, Need of construction equipment, past history. **Construction Equipment:** Capacity, Feasibility, owning and operating cost and Productivity of Different Equipment: Excavators, Pavers, Plastering machines; Pre-stressing jacks and grouting equipment; Cranes and Hoists, Concrete Batching Plants, etc.
Unit II	**Automation in Construction Industry:** Need and Benefit of automation, Automation in Canal lining, Automation in Construction of Highway, Automation in concrete technology
Unit III	**Drones:** Photogrammetry, Project Monitoring- real time data, aerial mapping, land survey, quantity survey, quality survey, structural health monitoring survey, underwater survey.
Unit IV	**Robotics in Construction:** Introduction, Benefits of robots in construction industry with respect to time, cost, quality, safety. Use of robots for construction activities like Brick laying, Demolition, Material Handling, Structural steel cutting, Rebar tying/bending, Form work mould making, 3D printing- print complex, layered, parts and objects of homes, buildings, bridges and roads 3D Scanner for surveying and project management
Unit V	**Introduction to Advanced Technologies:** Virtual Reality, Augmented Reality, Building Information Modeling (BIM), Mivan Construction Technology.

Text Books

T.1	"Construction Planning, Methods and Equipment", R L Peurifoy, McGraw Hill, 2011.
T.2	“Construction Project management, Theory & Practice”, Kumar Neeraj Jha, Pearson Education India, 2011

Reference Books

R.1	"Construction Equipment and its Planning and Application" author by Dr. Mahesh Varma, 1st edition, Metropolitan Book Company, New Delhi-, 1983
R.2	"BIM and Construction Management: Proven Tools, Methods, and Workflows", By Brad Hardin, Dave McCool, John Wiley & Sons, 2nd Edition, 2015
R.3	"Automation in Construction Management: Automated management of Construction Materials Using RFID Technology", Javad Majrouhi Sardroud, Scholars' Press, 2014
R.4	"Enhancing BIM Methodology with VR Technology", Open access peer
R.5	"Robotics and Automation in Construction", Open access peer- reviewed edited volume
Useful Links	
1	https://nptel.ac.in/courses/105/102/105102088/
2	https://nptel.ac.in/courses/105/106/105106053/
3	https://nptel.ac.in/courses/105103206

	Course Outcomes	CL
BCE34712.1	**Derive** feasibility of specific equipment in construction project conditions	3
BCE34712.2	**Selection** of Automation techniques in construction industry	4
BCE34712.3	**Select** suitable Drone technology for surveying and project management	4
BCE34712.4	**Analyze** benefits of robotics versus conventional construction equipment	4
BCE34712.5	**Classify** application of Virtual Reality, Augmented Reality, BIM in construction industry	3

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Program: B.Tech. Civil Engineering

BCE34713 : Sustainable Development Goals

Teaching Scheme		Examination Scheme	
Lectures	2 Hrs./week	**CIE**	20 Marks
Tutorial	-	**ESE**	30 Marks
Total Credit	2	**Total**	50 Marks
		Duration of ESE: 02 Hrs. 00 Min.	

Course Objectives:

1.	To develop a comprehensive understanding of the UN Sustainable Development Goals (SDGs) and their interconnections.
2.	To analyze the global challenges addressed by the SDGs and their impact on various sectors.
3.	To explore innovative solutions and best practices for implementing the SDGs.
4.	To evaluate the progress made towards achieving the SDGs at national and international levels.
5.	To foster a sense of global citizenship and social responsibility among students.

Course Contents		Hours
Unit I	**Introduction to Sustainable Development Goals (SDGs):** Definition of Sustainability, Aspects of sustainability, historical perspective of sustainable development, Climate Change Conferences and Summits, the Brundtland Commission Report, transition from Millennium Development Goals (MDGs) to SDGs, the role of UN and the need for SDGs and Adoption by the World, scope and inclusion of the 2030 Agenda for Sustainable Development.	**(7)**
Unit II	**Framework & Structuring of the 17 SDGs:** SDG 1: No Poverty, SDG 2: Zero Hunger, SDG 3: Good Health and Well-being, SDG 4: Quality Education, SDG 5: Gender Equality, SDG 6: Clean Water and Sanitation, SDG 7: Affordable and Clean Energy, SDG 8: Decent Work and Economic Growth, SDG 9: Industry, Innovation and Infrastructure, SDG 10: Reduced Inequalities, SDG 11: Sustainable Cities and Communities, SDG 12: Responsible Consumption and Production, SDG 13: Climate Action, SDG 14: Life below Water, SDG 15: Life on Land, SDG 16: Peace, Justice and Strong Institutions, SDG 17: Partnerships for the Goal	**(7)**
Unit III	**SDGs Implementation and Future Perspectives:** Interconnections between the SDGs, the role of technology and innovation in SDG implementation, financing the SDGs, measuring SDG progress, future challenges and opportunities, Climate change and its impact on sustainable development, Case studies of successful SDG implementation – India, World	**(7)**

Text Books

1	Hazra, Somnath., Bhukta, Anindya (2020) Sustainable Development Goals An Indian Perspective, Springer International Publishing, Switzerland

2	Ziai, Aram (2016) Development Discourse and Global History from colonialism to the sustainable development goals. Routledge, London & New York

Reference Books	
1	TEXTBOOKS FOR SUSTAINABLE DEVELOPMENT A GUIDE TO EMBEDDING, by the Mahatma Gandhi Institute of Education for Peace and Sustainable Development, 35 Ferozshah Road, New Delhi 110001, India (2017) 1st edition https://d1c337161ud3pr.cloudfront.net/files%2F6d6a3320-cea1-487b-910d-1eb62f5f86ad_Embedding%20Guidebook.pdf
2	Introduction to the Sustainable Development Goals (SDGs) by Jocelyn Baker https://ecampusontario.pressbooks.pub/sdgintro/
3	Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G., Woelm, F. 2020. The Sustainable Development Goals and COVID-19. Sustainable Development Report 2020. Cambridge: Cambridge University Press.
4	OECD (2019), Sustainable Results in Development: Using the SDGs for Shared Results and Impact, OECD Publishing, Paris, https://doi.org/10.1787/368cf8b4-en.

Useful Links
1. https://nptel.ac.in/courses/109106200
2. https://www.un.org/sustainabledevelopment/

	Course Outcomes	**CL**
BCE34713.1	**Explore** the historical origins and evolution of the UN-SDGs.	2
BCE34713.2	**Apply** the framework of the 17 SDGs and their interlinkages to solve practical problems within diverse global scenarios.	3
BCE34713.3	**Analyze** the role of technology and innovation in achieving the SDGs along with future challenges and opportunities.	4

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