



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

B.Tech. Civil Engineering

III Semester

Teaching Scheme & Syllabus

Considering

National Education Policy (NEP) – 2020

From

Academic Year 2024-25

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: B. Tech Civil Engineering

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

Semester – III



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	III	PCC	CE	BCE32301	Mechanics of Solids	T	3	0	3	3	30	10	60	3 Hrs.	100
2	III	PCC	CE	BCE32302	Fluid Mechanics	T	3	0	3	3	30	10	60	3 Hrs.	100
3	III	MDM	SH	BSH32302	Numerical Methods for Engineers	T	2	0	2	2	14	06	30	2 Hrs.	50
4	III	HSSM	BA	BBA32306	Engineering Economics	T	2	0	2	2	14	06	30	2 Hrs.	50
5	III	VEC	SH	BSH32308	Ethics in Engineering Practice	T	2	0	2	2	14	06	30	2 Hrs.	50
6	III	OEC		B\$\$323XX	Open Elective-I	T	4	0	4	4	30	10	60	3 Hrs.	100
7	III	PCC	CE	BCE32303	Mechanics of Solids - Lab	P	0	2	2	1	-	25	25	-	50
8	III	PCC	CE	BCE32304	Fluid Mechanics - Lab	P	0	2	2	1	-	25	25	-	50
9	III	CEP	CE	BCE32305	Community Engineering Project	P	0	4	4	2	-	50	-	-	50
Total							16	08	24	20	132	148	320	15 Hrs.	600

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	--	08	--	06	--	04	02	--
Cumulative Sum	16 / 13	10	--	06	04	08	02	04

PROGRESSIVE TOTAL CREDITS: 43+20=63

				June, 2024	1.00	Applicable for AY 2024-25 Onwards
Chairperson	Dean Academics	Vice Principal	Principal	Date of Release	Version	

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 VIII	Semester VIII
BCE33506 - Water Resources Engineering	BCE33606 - Rural Water Supply and Sanitation	BCE33610 - Building Construction Practice	BCE34802 - Pavement Design	BCE34806 - High Rise Structures
BCE33507 - Water Quality Engineering	BCE33607 - Environmental Laws and Policy	BCE33611 - Advanced Building Construction Methods	BCE34803 - Urban Transportation Planning	BCE34807 - Industrial Structures
BCE33508 - Surface Hydrology	BCE33608 - Solid and Hazardous Waste Management	BCE33612 - Structural Audit & Retrofitting of Structures	BCE34804 - Airport Planning and Design	BCE34808 - Prestressed Concrete
BCE33509 - Flood Control & Drainage Engineering	BCE33609 - Air and Noise Pollution Control	BCE33613 - Construction Equipment & Automation	BCE34805 - High Speed Rail Engineering	BCE34809 - Earthquake Engineering

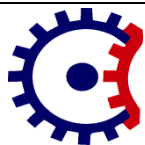
Program: Civil Engineering

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

Course Category	BSC (Basic Science Course)	ESC (Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	VSEC (Skill Course)	Humanities SocialScience & 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	--	--	10	06	02	02	--	--	--	20
Semester -VII	--	--	08	--	--	--	--	12	--	20
Semester -VIII	--	--	03	07	04	--	--	08	--	22
Cumulative Sum	16	13	52	16	22	08	14	22	04	167

				June, 2024	1.00	Applicable for AY 2024-25 Onwards
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B.Tech. Civil Engineering - Second year (Semester-III)

BCE32301: Mechanics of Solids

Teaching Scheme		Examination Scheme	
Lectures	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.	To make students determine and apply basic principles and concepts of equilibrium, Bending Moment, shear force in frames and frames, shear stress, bending stress, torsional stress and stress-strain laws to different materials for different conditions of loading
2.	To make students learn and understand the theory and concept of deflection of Frames, Beam, trusses and also apply the deflections in beams by given methods which is an important criteria in design.
3.	To determine the state of stress in three dimensions and various theories of failure in designing the structural members.
4.	To classify the failure pattern of metal under different action and provide knowledge about the torsional shaft for various section.
5.	To understand the nature of stresses developed in simple geometries such as cantilevers, bars, cylinder, shaft and spheres for various types of simple loads.

Course Contents

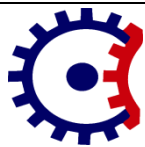
Unit I	Mechanical properties and uniaxial problems: Types of force distribution, concept of stress, strain and their relationship, stress strain behavior of ductile and brittle material in uniaxial state of stress, elastic constants, relation between elastic constants Uniaxial loading and deformation of simple cases of statically indeterminate problems under axial loading. Stress due to variation of temperature., Thin wall pressure vessels cylindrical and spherical subjected to internal pressure.
Unit II	Axial force, shear force and bending moment diagram Concepts of free body diagrams, types of loads, Determination of axial forces, shear forces and bending moment at a section, axial force, shear force and bending moment in beams and simple frames, Differential relations between shear force and bending moment, Relation between load and shear force.
Unit III	Stress in beams Bending stresses in simple beams, Assumptions and derivation of simple bending theory relation between bending moment, bending stress and curvature of homogeneous and composite beams, Shear stresses in simple beams, Shear flow and shear stress distribution, shear stress in composite beams, combined effect of bending moment and axial force, State of stress in two dimensions, principal stresses, maximum shear stresses.
Unit IV	Torsion of Shaft: Torsion of circular sections, assumptions and derivation of relation between torsional moment, shear stress and angle of twist. Torsional stress in solid and hollow circular sections. Introduction to Torsion in rectangular section, Torsion in thin walled hollow section

Unit V	Deflection of Beams: Derivation of differential equation of elastic curve, Differential Equation relating deflection moment, shear and load, Introduction to Deflection of linearly varying beams by integration Deflection of simple beams by double integration method. Compound stresses, combined effect of Bending and Shear, Moment area method, Conjugate Beam Method
Text Books	
T.1	Bhavikatti S. S., Strength of Materials, 3rd Edition, Vikas Publication House Pvt. Ltd., Noida, UP, 2008.
T.2	“Strength Of Materials” author by Bedi,D.S 5 th Edition REVISE Khanna Book Publishing Co.Pvt.Ltd.
T.3	“Strength Of Materials” author by Ramamrutham,S.; Narayanan,R. 17 th Edition REPRIND Thanpatrai Publications (P) Ltd.
T.4	“Strength Of Materials” author by Subramanian 2 nd edition REPRINT Oxford University Press.
Reference Books	
R.1	“Foundation Vibration Analysis: a Strength-of-Materials Approach” author by Wolf John. P;Deek S ,Andrew. J Reprint Elsevier Publication
R.2	Pytel A., Kivsalaas J. Mechenics of Material, Cengage Learning, (Indian Edition),2010
R.3	Pytel A., Kivsalaas J. Mechenics of Material, Cengage Learning, (Indian Edition),2010. 3.
R.4	Shah Y.L., Ogale R.A., Strength of Materials and Machine Element, 2nd edition, Jain book agency, New Delhi
Useful Links	
1	https://nptel.ac.in/courses/105/105/105105108/

	Course Outcomes	CL
BCE32301.1	Classify the behavior of materials under different stress and strain conditions.	2
BCE32301.2	Determine the bending moment and shear force diagram and discuss the concept of shear force and bending moment	3
BCE32301.3	Evaluate the bending stress and shear stress distribution for beams under the different conditions of loading.	5
BCE32301.4	Calculate the torsional effect on circular and hollow circular section of shaft at different speed, angle of twist, power and torque.	3
BCE32301.5	Analyze slope and deflection of beam under the different support condition and different loading condition.	4

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B.Tech. Civil Engineering - Second year (Semester-III)

BCE32302: Fluid Mechanics

Teaching Scheme		Examination Scheme	
Lectures	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.	Learn the basics of fluid properties, Fluid static, pressure measuring devices, various energy equations. To analyze the forces and to compute the pressure acting on different surfaces.
2.	Understand the concept of Bernoulli's equation, Euler's equation and momentum equation. Apply the concept of Flow measuring devices and various hydraulic coefficients.
3.	Calculate the discharge and velocity through using various devices, introduced to motion of fluid with and without reference of force.
4.	Find the behavior of flow using Reynolds Apparatus which is used in every problem of fluid Mechanics.
5.	Learn the basics of fluid properties, Fluid static, pressure measuring devices, various energy equations. To analyze the forces and to compute the pressure acting on different surfaces.

Course Contents

Unit I	Fluids and Their Properties: Definition of fluid, Differences between solids, liquids and gases, fluid properties, Newton's equation, Rheological Diagram, Ideal and real fluids. Compressibility and bulk modulus, Surface tension, capillarity, pressure inside a bubble and cylindrical jet, vapor pressure and cavitations Effect of pressure and Temperature on fluid properties.
Unit II	Fluids Pressure and its Measurement: Fluid pressure, law of fluid pressure, variation of fluid pressure with depth, pressure and head, Atmospheric pressure and vacuum. Gauge and absolute pressures Pressure measurement by manometers.
Unit III	Hydrostatics: Total pressure & center of pressure, Forces on a Horizontal, Vertical, Inclined, Curved, submerged surfaces, Buoyancy and Floatation: Buoyant force and centre of buoyancy, Archimedes principle, Metacenter and Metacentric height - its determination by analytical and experimental methods. Stability of floating bodies and three states of equilibrium. Kinematics of Flow-I: Lagrangian and Eulerian approaches in fluid flow description. Steady, unsteady, uniform, Non-uniform flow. One, two and three dimensional flow, Rotational & Irrotational flow. Streamline, path line, streak line.
Unit IV	Kinetics of Flow: Forces influencing motion, Euler's equations of motion for one dimensional flow, Bernoulli's equation for ideal fluids, Assumptions, derivation, limitation and application, Kinetic energy correction factor. Momentum equation, forces on pipe bent Impact of jet on different types of plate. Determination of Reynolds no using Reynolds apparatus.

Unit V	Flow through Orifices and mouthpieces: Definition, types, hydraulic coefficients, and factors affecting them and their experimental determination, time for emptying tank by orifices. Discharge through large and submerged orifices, external and internal mouth pieces, running free and running full, pressure at vena contracta, Discharge Through a convergent-divergent mouthpiece. Notches and weirs: Definition and type, flow over rectangular notch, triangular notch end contraction, coefficient of discharge and its determination. Error in measurement of head. Velocity of approach and its effects, Cippoletti, Broad crested and submerged weirs. Types non-conventional weirs.
Text Books	
T.1	“Advanced Engineering Fluid Mechanics” authored by Muralidhar K. Biswas G., Narosa Publishing House, 1996.
T.2	“Engineering Fluid Mechanics”, authored by Kumar K. L., Gupta S.K, S chand Publications, 2008.
T.3	“Hydraulics and Fluid Mechanics Including Hydraulics Machines authored by “Modi P.N., Seth S.M, 14 th edition, Standard Book House Publishers, New Delhi, 2009
T.4	“Fluid Mechanics” authored by R. K Bansal and R K Rajput, Laxmi Publication, LTD, 1989
Reference Books	
R.1	“Engineering Fluid Mechanics” authored by Graebel, W.P, 1th Edition, Taylor And Francis , 2001.
R.2	“Fundamental Mechanics Of Fluids ”, authored by Currie, I.G ,4th edition, Taylor And Francis, 1974
R.3	“Engineering Fluid Mechanics” authored by R.J Garde, A.J Mirajgaonkar, SCITECH Publication, 2010
R.4	“Fluid Mechanics, Hydraulics And Hydraulic Machines” authored by Arora K.R., NT Standard Publishers Distributorsl, 2005.
Useful Links	
1	https://nptel.ac.in/courses/105/103/105103192/
2	https://nptel.ac.in/courses/105/103/105103095/
3	http://nptel.ac.in/courses/117103064

	Course Outcomes	CL
BCE32302.1	Recognize the definitions and fundamentals of fluid mechanics involving fluid properties and shear force.	1
BCE32302.2	Determine fluid pressure using fluid measurement devices.	3
BCE32302.3	Apply basics of fluid statics and kinematics for hydrostatics forces related with fluid flow conditions.	3
BCE32302.4	Evaluate the fluid problem by using Bernoulli’s equation.	5
BCE32302.5	Use the concept of fluid measurement and its control through discharge.	3

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Program: B. Tech Second Year (CE)

Semester-III		BSH32302: Numerical Methods for Engineers			
Teaching Scheme		Examination Scheme (Th)		Examination Scheme(P)	
Theory (Th)	2 Hrs/week	CT-I	7 Marks	-	-
Practical (P)		CT-II	7 Marks	-	-
Total Credits	2	CA	6 Marks	-	-
Duration of ESE: 2Hrs		ESE	30 Marks	-	-
		Total Marks	50 Marks	-	-

Course Outcome:

- Analyze** numerical techniques to find the roots of equations different types of equations
- Apply** the knowledge of Numerical techniques to solve ordinary differential equations in engineering problems.
- Formulate** simple optimization problem and learn to solve it by Graphical method and Simplex method.

Course Contents

Unit I	Numerical Method I Error in numerical calculations, Errors in series approximation, Rounding of errors, Solution of Algebraic and Transcendental Equation: Bisection method, False position method, Newton –Raphson method and their convergence, Solution of system of simultaneous linear equations: Gauss elimination method, Gauss Jordan method. Gauss Seidel method, Crout’s method,
Unit II	Numerical Method II Numerical Methods (Differential Equations) Numerical solution of ordinary differential equation by Taylor series method, Runge- Kutta method of 4th order, Euler modified method, Milne’s Predictor corrector method. Runge- Kutta method to solve simultaneous first order Differential Equation.
Unit III	INTRODUCTION TO OPTIMIZATION TECHNIQUES: Linear programming problem: Formulation, Graphical method, Simplex method, Transportation Problems.

Text Books

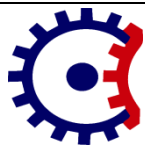
T.1	Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication
T.2	Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition, Wiley India
T.3	Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville
T.4	Introduction to Operation Research by Dr. Gupta, Prem kumar, Dr. Hira D.S., S. Chand & Co.

Reference Books

R.1	A Text Book of applied Mathematics, Volume I & II, by P.N. Wartikar & J.N. Wartikar, Poona Vidyarthi Griha Prakashan
R.2	Introductory methods of Numerical Analysis, by S.S. Sastry, PHI
R.3	Mathematics for Engineers by Chandrika Prasad
R.4	A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication

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B.Tech. Civil Engineering - Second year (Semester-III)

BBA32306: Engineering Economics

Teaching Scheme			Examination Scheme	
Lectures	2 Hrs./week		CT-I	7 Marks
Tutorial	-		CT-II	7 Marks
Total Credits	2		CA	6 Marks
Duration of ESE: 2Hrs		ESE	30 Marks	
			Total Marks	50 Marks

Course Objectives:

1.	Students will gain a foundational understanding of managerial economics, cost analysis, and the factors influencing business decisions.
2.	Students will be able to apply the time value of money concepts to evaluate investment alternatives and make informed financial decisions.
3.	Students will be able to use advanced financial analysis techniques to compare investment options and evaluate the economic viability of public projects.

Course Contents

Unit I	Objectives of Managerial Economics, Firm, Cost Estimation, Costing, Cost Accounting, Factors Influencing Managerial Decisions & Theoretical Concepts, Classification and Elements of cost.
Unit II	Time value of money, Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.
Unit III	Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, IRR misconceptions. Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost – effectiveness analysis

Text Books

T.1	"A Textbook of Engineering Economics" by Dr. T. R. Jain and Dr. O. P. Khanna
T.2	"Fundamentals of Engineering Economics" by S.K. Jain
T.3	"Principles of Engineering Economics with Applications" by Nayyar Shamsi
T.4	"A Textbook of Engineering Economics" by Dhaneesh Kumar K.K.

Reference Books

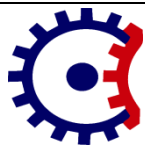
R.1	"Engineering Economics" by R. Panneerselvam
R.2	"Engineering Economy" by V. L. Mote, Samuel Paul, and G. S. Gupta

R.3	"Engineering Economics and Costing" by Sasmita Mishra
R.4	"Principles of Engineering Economic Analysis" by John A. White, Kenneth E. Case, and David B. Pratt (Indian Edition)
Useful Links	
1	https://archive.nptel.ac.in/courses/112/107/112107209/

	Course Outcomes	CL
BBA32306.1	Demonstrate the application of cost estimation techniques in various business scenarios.	2
BBA32306.2	Apply the concepts of present worth and future worth comparisons in evaluating investment opportunities.	3
BBA32306.3	Evaluate different projects using cost-effectiveness analysis and benefit/cost applications.	5

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B.Tech. Civil Engineering - Second year (Semester-III)

BSH32308: Ethics in Engineering Practice

Teaching Scheme		Examination Scheme	
Lectures	2 Hrs./week	CT-I	7 Marks
Tutorial	-	CT-II	7 Marks
Total Credits	2	CA	6 Marks
Duration of ESE: 2Hrs		ESE	30 Marks
		Total Marks	50 Marks

Course Objectives:

1.	Students will develop a strong foundation in professional ethics, personal well-being, and stress management strategies for achieving professional excellence.
2.	Students will gain a foundational understanding of engineering ethics frameworks, moral dilemmas, and ethical theories to navigate complex ethical issues in engineering practice.
3.	Students will develop a comprehensive understanding of their professional responsibilities as engineers, including ethical codes, safety considerations, and their rights and obligations in the workplace.

Course Contents

Unit I	Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.
Unit II	Senses of _Engineering Ethics,, – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg,,s theory – Gilligan,,s theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.
Unit III	Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law. Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

Text Books

T.1	Mike W. Martin and Roland Schinzinger, —Ethics in Engineering , Tata McGraw Hill, New Delhi, 2003.
T.2	Govindarajan M, Natarajan S, Senthil Kumar V. S, —Engineering Ethics , Prentice Hall of India, New Delhi, 2004.

Reference Books

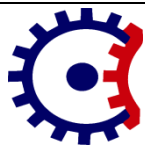
R.1	Charles B. Fleddermann, — Engineering Ethics , Pearson Prentice Hall, New Jersey, 2004.
R.2	Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, —Engineering Ethics – Concepts and Cases , Cengage Learning, 2009.

R.3	John R Boatright, Ethics and the Conduct of Business, Pearson Education, New Delhi, 2003
R.4	Edmund G Seebauer and Robert L Barry, —Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, Oxford, 2001.

	Course Outcomes	CL
BSH32308.1	Define and differentiate between morals, values, and ethics.	2
BSH32308.2	Analyze variety of moral issues that arise in engineering practice.	4
BSH32308.3	Assess safety and risk factors associated with engineering projects	5

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

[Signature]
 Dean Academics
 Tulsi Ramji Geikwad-Patil
 College Of Engineering
 and Technology, Nagpur



Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited with A+ Grade

(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)



B.Tech. Civil Engineering - Second year (Semester-III)

BCE32303: Mechanics of Solids Lab

Teaching Scheme		Examination Scheme	
Practical	2 Hrs./week	CA	25 Marks
Tutorial	-		
Total Credits	1	ESE	25 Marks
Duration of ESE:			
		Total Marks	50 Marks

Course Objectives:

1.	To study suitability of various materials for civil engineering construction
2.	To study the resistance offered by various materials against the external forces on the structures.
3.	Students will be able to understand the importance and the concept of elastic properties of different metals.
4.	Students will be able to know the behavior of different metals under structural loading conditions such as tension, bending, torsion, shear etc and observe the failure pattern
5.	Students will be able to know the concept of different properties of brick and their applications.

Course Contents

1	To study various types of Strain Gauge apparatus.	CO 1
2	To determine the Tensile Strength of Steel specimen.	CO 1
3	To perform Hardness test on various metals. (Brinell's hardness test & Rockwell Hardness test).	CO 2
4	To perform standard Torsion test on metals.	CO 3
5	To perform the Impact test on metal (Izod/ Charpy).	CO3
6	Compression test on Bricks and Stones.	CO 4
7	To determine the spring constant of Closely Coiled Spring.	CO 4
8	To perform shear test on different metals.	CO4
9	To determine water absorption of roofing tiles, flooring tiles and bricks and determine its flexural Rigidity	CO 4
10	To study fatigue test on mild steel bar.	CO 5
11	To perform the bending test on wooden beam and find its Flexural Rigidity	CO5
12	To determine the compressive strength of timber/bricks.	CO5

Text Books

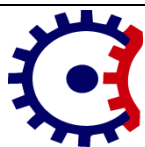
T.1	Bhavikatti S. S., Strength of Materials, 3rd Edition, Vikas Publication House Pvt. Ltd., Noida, UP, 2008.
T.2	"Strength Of Materials" author by Bedi, D.S 5 th Edition REVISE Khanna Book Publishing Co.Pvt.Ltd.
T.3	"Strength Of Materials" author by Ramamrutham, S.; Narayanan, R. 17 th Edition REPRIND Thanpatrai Publications (P) Ltd.

T.4	“Strength Of Materials” author by Subramanian 2 nd edition REPRINT Oxford University Press.
Reference Books	
R.1	“Foundation Vibration Analysis: A Strength-Of-Materials Approach” author by Wolf, John. P; Deek s, Andrew. J REPRINT Elsevier publication
R.2	Pytel A., Kivsalaas J. Mechanics of Material, Cengage Learning, (Indian Edition), 2010
R.3	Pytel A., Kivsalaas J. Mechanics of Material, Cengage Learning, (Indian Edition),2010. 3.
R.4	Shah V.L., Ogale R.A., Strength of Materials and Machine Element, 2nd Edition, Jain Book Agency, New Delhi
IS Codes	
1	Relevant IS Codes: IS 1608-2005, IS 5816-1999, IS 1500-2005, IS 1598-1977, IS 3495 (Part 1 to 4) 1992, IS 7906-5 (2004), IS 5242-1979, IS 1608-2005, IS 2408-1963
Useful Links	
1	https://nptel.ac.in/courses/105/105/105105108/

	Course Outcomes	CL
BCE32303.1	Classify the behavior of materials under different stress and strain conditions.	2
BCE32303.2	Determine the bending moment and shear force diagram and discuss the concept of shear force and bending moment	3
BCE32303.3	Evaluate the bending stress and shear stress distribution for beams under the different conditions of loading.	5
BCE32303.4	Design the torsional effect on circular and hollow circular section of shaft at different speed, angle of twist, power and torque.	6
BCE32303.5	Analyze slope and deflection of beam under the different support condition and different loading condition.	4

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B.Tech. Civil Engineering - Second year (Semester-III)

BCE32304: Fluid Mechanics Lab

Teaching Scheme		Examination Scheme	
Practical	2 Hrs./week	CA	25 Marks
Tutorial	-	ESE	25 Marks
Total Credits	1	Total Marks	50 Marks
Duration of ESE:			

Course Objectives:

1.	Learn the basics of fluid properties, Fluid static, pressure measuring devices, various energy equations. To analyze the forces and to compute the pressure acting on different surfaces.
2.	Understand the concept of Bernoulli's equation, Euler's equation and momentum equation. Apply the concept of Flow measuring devices and various hydraulic coefficients.
3.	Calculate the discharge and velocity through using various devices, introduced to Motion of fluid with and without reference of force.
4.	Find the behavior of flow using Reynolds Apparatus which is used in every problem of fluid Mechanics.

Course Contents

1	To verify Bernoulli's theorem	CO4
2	To determine the coefficient of discharge of Venturimeter	CO5
3	To determine the coefficient of discharge of Orifice meter	CO5
4	To determine the coefficient of discharge of Rectangular Notch	CO5
5	To determine the coefficient of discharge of Triangular Notch	CO5
6	To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice and mouth piece.	CO5
7	To verify the momentum equation using the experimental set-up on diffusion of submerged air jet.	CO2
8	To determine the variation of friction factor 'f' for turbulent flow in commercial pipes.	CO3
9	To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number	CO3
10	Determination of Metacentric height of a given ship model.	CO1
11	To determine force exerted by jet on flat surface.	CO2
12	To determine velocity distribution profile using Pitot Tube.	CO5

Text Books

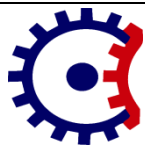
T.1	"Advanced Engineering Fluid Mechanics" authored by Muralidhar K. Biswas G. Narosa Publishing House, 1996.
T.2	"Engineering Fluid Mechanics ", authored by Kumar K. L., Gupta S.K, S chand Publications,2008.

T.3	“Hydraulics and Fluid Mechanics Including Hydraulics Machines authored by “Modi P.N., Seth S.M,14 th edition,Standard Book House Publishers, New Delhi, 2009
T.4	“Fluid Mechanics” authored by R. K Bansal and R K Rajput,Laxmi Publication, LTD,1989
Reference Books	
R.1	“Engineering Fluid Mechanics” authored by Graebel,W.P, 1th Edition, Taylor And Francis , 2001.
R.2	“Fundamental Mechanics Of Fluids”, authored by Currie,I.G ,4th edition, Taylor And Francis, 1974
R.3	“Engineering Fluid Mechanics” authored by R.J Garde, A.J Mirajgaonkar, SCITECH Publication, 2010
R.4	“Fluid Mechanics, Hydraulics and Hydraulic Machines” authored by Arora K.R., NT Standard Publishers Distributors, 2005.
Useful Links	
1	https://nptel.ac.in/courses/105/103/105103192/
2	https://nptel.ac.in/courses/105/103/105103095/
3	http://nptel.ac.in/courses/117103064

	Course Outcomes	CL
BCE32304.1	Recognize the definitions and fundamentals of fluid mechanics involving fluid properties and shear force.	1
BCE32304.2	Determine fluid pressure using fluid measurement devices.	3
BCE32304.3	Apply basics of fluid statics and kinematics for hydrostatics forces related with fluid flow conditions.	3
BCE32304.4	Evaluate the fluid problem by using Bernoulli’s equation.	5
BCE32304.5	Use the concept of fluid measurement and its control through discharge.	3

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BCE32306: Green Structures & Smart Cities (Open Elective-I)

Teaching Scheme		Examination Scheme	
Lectures	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.	Demonstrate a solid understanding of the core concepts related to embodied energy in buildings.
2.	Discuss the aspects of green construction and their contribution to building sustainability.
3.	Explain the development process and challenges associated with smart city projects.
4.	Discuss the strengths and weaknesses of singular and hybrid smart city models
5.	Explain the importance of sustainable practices within smart city development.

Course Contents

Unit I	Introduction to Embodied Energy Introduction to embodied energy, operational energy in building and life cycle energy, ecological foot print, bio-capacity and calculation of planet equivalent, introduction to civil engineering materials with embodied energy minimization concept and utilization.
Unit II	Green Construction Practices Introduction to green construction practices, operational energy reduction and net zero building, introduction to optimization for design of building for energy efficiency, examples of optimization, introduction to radiation budget, surface water balance, effects of trees and microclimatic modification through greening, importance of rating and rating systems.
Unit III	Introduction to Smart Cities Introduction to smart cities, introduction to city planning, dimensions of smart cities, phases, stages of project & their approval status, conventional Vs. smart city components, energy demand, green approaches to meet energy demand, index of Indian cities towards smartness, introduction to statistical analysis
Unit IV	Singular-Hybrid Smart Cities Conventional cities, consequences, alternative resources, reliability on predictability scale, solar options, PV and thermal; singular or hybrid, global experience of smart cities, smart cities, global standards and performance benchmarks, practice codes, India “100 smart cities” policy and mission, smart city planning and development.
Unit V	Sustainable Smart City Swachh Bharat mission and smart cities program, financing smart cities development, smart city case studies, governance of smart cities, introduction to artificial intelligence (AI) in smart cities, introduction to (sustainable development goal) SDG, the importance of SDG 11.

Text Books	
T.1	Green Building Materials: A Guide to Product Selection and Specification, 3rd Edition, Ross Spiegel, Dru Meadows
T.2	Smart Cities: Foundations, Principles, and Applications, Houbing Song, Ravi Srinivasan, Tamim Sookoor, Wiley
T.3	Beyond Smart Cities: How Cities Network, Learn and Innovate, Tim Campbell, Routledge
T.4	Mindful Smart Cities: Rethinking Smart Cities with Mindfulness Engineering, Shima Beigi PhD, VUB PRESS
Reference Books	
R.1	Energy and the Environment, J M Fowler, McGraw Hill, New York, 2nd Edition
R.2	Climate responsive architecture (A design hand book for energy efficient buildings), Arvind Krishnana, Simos Yannas, Nick Baker, S V Szokolay, McGraw hill Education, Seventh reprint
R.3	Time-Saver Standards For Building Types, Joseph De Chiara, Michael J. Crosbie, McGraw-Hill
IS Codes	
IS.1	Handbook on functional requirements of buildings (SP41), Bureau of Indian Standards, New Delhi, New Delhi, 1987
IS.2	Energy Conservation Building Code (ECBC), Bureau of energy efficiency, 2017
IS.3	Sustainable Building Design Manual- Volume I & II, TERI, 2009
IS.4	Green Rating for Integrated Habitat Assessment (GRIHA) guidelines
Useful Links	
1	https://archive.nptel.ac.in/courses/105/102/105102195/
2	https://onlinecourses.nptel.ac.in/noc19_ce40/preview
3	http://ndl.iitkgp.ac.in/he_document/nptel/IN_N_1_C_E_6797_N_S_M_a_G_B_7313_7314

	Course Outcomes	CL
BCE32306.1	Analyze the relationship between embodied energy and building materials.	4
BCE32306.2	Compare the trade-offs between the green construction practices	4
BCE32306.3	Examine the potential benefits and challenges associated with smart city initiatives	4
BCE32306.4	Outline the suitability of singular vs. hybrid approaches for urban contexts.	4
BCE32306.5	Interpret the importance of sustainable practices within smart city development.	3

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