



Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC A+ Accredited

Approved by AICTE, New Delhi, Govt. of Maharashtra

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



Department of Civil Engineering

DEPARTMENT OF CIVIL ENGINEERING

Structure & Curriculum

From

Academic Year 2022-23

Vision of Institute

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

Mission of Institute

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

Vision of the Department

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

Mission of the Department

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

Program Education Objectives (PEO)

Graduates will be able to

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

Program Outcomes (PO)

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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

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

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

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

Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

SCHEME OF INSTRUCTION & SYLLABI

Programme: Civil Engineering

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

Semester – III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	BSC	BCE2301	Mathematics-III (Transform & Discrete Mathematics)	3	1	-	4	4	15	15	10	60	100
2	ESC	BCE2302	Computer-aided Civil Engineering Drawing	1	1	-	2	2	7	7	6	30	50
3	BSC	BCE2303	Mechanics of Solids	3	1	-	4	4	15	15	10	60	100
4	PCC	BCE2304	Concrete Technology	3	-	-	3	3	15	15	10	60	100
5	PCC	BCE2305	Fluid Mechanics	3	-	-	3	3	15	15	10	60	100
6	ESC	BCE2306	Energy Science & Engineering	2	-	-	2	2	7	7	6	30	50
7	BSC	BCE2307	Mechanics of Solids Lab	-	-	2	2	1	-	-	25	25	50
8	PCC	BCE2308	Concrete Technology Lab	-	-	2	2	1	-	-	25	25	50
9	PCC	BCE2309	Fluid Mechanics Lab	-	-	2	2	1	-	-	25	25	50
10	MCC	BAU2303	Environmental Science	2	-	-	2	Audit	-	-	-	-	-
Total				17	3	6	26	21	74	74	127	375	650

L- Lecture

T-Tutorial

P-Practical

CT1- Class Test 1

TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2

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

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Eng. Sc.)	PCC (Programme Core Courses)	PEC (Programme Elective Courses)	OEC (Open Elective courses from other discipline)	Project / Seminar / Industrial Training	MCC (Mandatory Courses)
Credits	-	09	04	08	--	--	--	Yes
Cumulative Sum	03	27	18	08	--	--	--	--

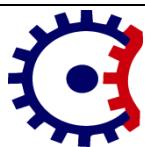
PROGRESSIVE TOTAL CREDITS :35+21 =56


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



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Program: B.E. Civil Engineering

Semester-III BCE2301 : Mathematics-III

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	CT-I	15Marks
Tutorial	1 Hrs/week	CT-II	15 Marks
Total Credits	4	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks
Pre-Requisites: Mathematics – I, Mathematics - II		Total Marks	100 Marks

Course Contents

Unit I	Fourier Series Periodic Function and their Fourier series expansion, Fourier Series for even and odd function, Change of interval, half range expansions. Practical Harmonic Analysis. Fourier Transform: Definition, Fourier Integral Theorem, Fourier Sine and Cosine Integrals, Finite Fourier Sine and Cosine Transform
Unit II	Partial Differential Equations Partial Differential Equations of first order first degree i.e. Lagrange's form, Linear Homogeneous Equations of higher order with constant coefficients. Method of separations of variables, Applications to simple problems of vibration of strings and beams, Elementary concept of double Fourier series and their application to simple problems of vibration of rectangular membrane.
Unit III	Matrices Linear dependence of vectors, Characteristics equations, Eigen values and Eigen vectors. Reduction to diagonal form, Sylvester's theorem, Quadratic form Transformation of co-ordinates, Transformation of forces and couples, Association of matrices with linear differential equation of second order with constant coefficients.
Unit IV	Numerical Methods 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 Jordon method. Gauss Seidel method, Crouts method, Numerical solution of ordinary differential equation: Taylor's series method, Picard's method, Runge Kutta 4th order method, Euler modified method.
Unit V	Introduction To Optimization Techniques Linear programming problem: Formulation, Graphical method, Simplex method.

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	Calculus of variation by Forrey

Reference Books

R.1	A Text Book of applied Mathematics, Volume I &II, by P.N. Wartikar & J.N. Wartikar, Poona Vidyarathi 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
Useful Links	
1	https://nptel.ac.in/courses/111/106/111106139/
2	https://nptel.ac.in/courses/111/106/111106111/
3	https://nptel.ac.in/courses/111/103/111103021/

	Course Outcomes	CL	Class Sessions
BCE2301.1	Relate integral transform (Fourier Transform) and should able to solve differential equation.	3	9
BCE2301.2	Interpret partial differential equation and should able to model and solve practical problems.	3	9
BCE2301.3	Apply complex variable and its application.	3	10
BCE2301.4	Formulate linear homogeneous PDE of n order with constant coefficient	4	10
BCE2301.5	Evaluate ability to understand Matrices and Eigen Value problem and should able to solve Differential Equations.	5	7


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Program: B.E. Civil Engineering

Semester-III BCE2302 : Computer-aided Civil Engineering Drawing

Teaching Scheme		Examination Scheme	
Theory	1 Hr/week	CT-I	7 Marks
Tutorial	1 Hr/week	CT-II	7 Marks
Total Credits	2	CA	6 Marks
Duration of ESE: 1 Hr 30 Min		ESE	30 Marks
Pre-Requisites: Engineering Graphics & Design		Total Marks	50 Marks

Course Contents

Unit I	INTRODUCTION: Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, coordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards
Unit II	SYMBOLS AND SIGN CONVENTIONS: Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards MASONRY BONDS: English Bond and Flemish Bond – Corner wall and Cross walls - One brick wall and one and half brick wall
Unit III	BUILDING DRAWING: Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan. Roof drainage plans. Depicting joinery, standard fittings & fixtures, finishes. Use of Notes to improve clarity PICTORIAL VIEW: Principles of isometrics and perspective drawing. Perspective view of building. Fundamentals of Building Information Modeling (BIM)

Text Books

T.1	Subhash C Sharma & Gurucharan Singh (2005), "Civil Engineering Drawing", Standard Publishers
T.2	Sham Tickoo Swapna D (2009), "AUTOCAD for Engineers and Designers", Pearson Education
T.3	Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria & Sons
T.4	Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd. New Asian

Reference Books

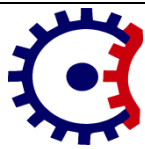
R.1	Balagopal and Prabhu (1987), "Building Drawing and Detailing", Spades Publishing, KDR building, Calicut
R.2	Venugopal (2007), "Engineering Drawing and Graphics + AUTOCAD", New Age International Pvt. Ltd.
R.3	AutoCAD 2021 For Beginners (2020), Kishore Publisher

R.4	Randy H. Shih (2020) 1 st edition, "AutoCAD 2021 Tutorial – First Level 2D Fundamentals", SDC Publications
Useful Links	
1	http://www.nptelvideos.in/2012/12/computer-aided-design.html
2	https://nptel.ac.in/courses/105/104/105104148/

	Course Outcomes	PO/PSO	CL	Class Sessions
BCE2302.1	Relate the basics of AutoCAD software & it's important commands	PO1,PO2,PO3, PO4, PO5, PO11, PO12, PSO1, PSO2	3	8
BCE2302.2	Apply the knowledge of symbols & sign conventions to edit & modify AutoCAD Drawings and prepare consisting masonry bonds	PO1,PO2,PO3, PO4, PO5, PO6, PO11, PO12, PSO1, PSO2, PSO3	3	12
BCE2302.3	Implement line drawings & detailed floor plan drawings plot Isometric & Perspective view of building	PO1,PO2,PO3, PO4, PO5, PO6, PO11, PO12, PSO1, PSO2, PSO3	3	12


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Program: B.E. Civil Engineering

Semester-III BCE2303 : Mechanics of Solids

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	CT-I	15Marks
Tutorial	1 Hrs/week	CT-II	15 Marks
Total Credits	4	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks
Pre-Requisites: Engineering Mechanics		Total Marks	100 Marks

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

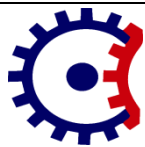
T.1	Bhavikatti S. S., Strength of Materials, 3rd Edition, Vikas Publication House Pvt. Ltd., Noida, UP, 2008.
T.2	“Strength Of Materials” author by Bedi,D.S 5 th Edition REVISE Khanna Book Publishing Co.Pvt.Ltd.
T.3	“Strength Of Materials” author by Ramamrutham,S.; Narayanan,R. 17 th Edition REPRIND 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. 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 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	Class Sessions
CE2303.1	Classify the behavior of materials under different stress and strain conditions.	3	8
CE2303.2	Determine the bending moment and shear force diagram and discuss the concept of shear force and bending moment	3	10
CE2303.3	Evaluate the bending stress and shear stress distribution for beams under the different conditions of loading.	5	10
CE2303.4	Calculate the torsional effect on circular and hollow circular section of shaft at different speed, angle of twist, power and torque.	3	9
CE2303.5	Analyze slope and deflection of beam under the different support condition and different loading condition.	4	8


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Program: B.E. Civil Engineering

Semester-III BCE2304 : Concrete Technology

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

Course Contents

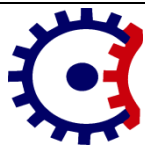
Unit I	Introduction to related Indian standard of cement and aggregates: Constituents of cements, Chemistry of Cement, Hydration of cement. Water requirement, Physical properties and testing of cement. Effect of fineness, Initial, final and false setting of cement, Soundness test. Hardening and compressive strength, Grades and different types of cement, Aggregates: Coarse and fine aggregate, normal, light and heavy weight aggregates. Aggregate characteristic sand their significance in properties of concrete. Sampling, Particle shape and texture, Bond of aggregate, size & grading of aggregate, strength of aggregate. Mechanical properties and tests as per IS, bulking of sand. Crushed sand. Alkali aggregate reaction,
Unit II	Fresh Concrete: Batching, Mechanical mixers, automatic batching and mixing plants. Efficiency of mixing, Workability and its Measurement, Factor affecting workability, setting time, Significance of w/c ratio, cohesiveness of concrete, Segregation, bleeding, voids, permeability. Hot weather concreting, Conveyance of concrete, placing of concrete, compaction, vibrators, curing of concrete, significance and methods, temperature effects on curing and strength gain, IS provisions, Maturity of concrete, Formwork for concrete- IS provisions. Introduction to Ready mix, pumped and self-compacting concrete. Introduction to relevant Indian standards, Underwater concreting.
Unit III	Strength of concrete: Strength gain, factors affecting compressive strength, Tensile and flexural strengths, relation between compressive and tensile strength. Failure modes in concrete, cracking in compression. Impact strength, fatigue strength, shear, elasticity, Poisson's ratio. Introduction to relevant Indian standards. Testing of hardened concrete: Compression test, cube strength and cylinder strength and their relation, effect of aspect ratio on strength. Flexural strength of concrete, determination of tensile strength, indirect tension test, splitting test, abrasion resistance, accelerated curing test. Introduction to relevant Indian standards. Non-Destructive test: Significance, rebound hammer, ultra-sonic pulse velocity test, Advanced concrete testing equipment. Introduction to relevant Indian standards.
Unit IV	Mix Design: Process, statistical relation between main and characteristic strength, variance, standard deviation, factors affecting mix properties, grading of aggregates, aggregate/cement ratio etc. Degree of quality control, design of mix by IS method, introduction to road Note No. 4 (BS) and ACI method, DOE method. Additives and admixtures: Types of admixtures, natural products, diatomaceous earth, calcined clays of shale, volcanic glasses, byproducts- pozzolana, fly ash, silica fume, rice husk ash, metakaolin, G.G. blast furnace slag, admixtures- air entraining, water reducing, accelerators, retarders, plasticizers and super

	plasticizers, permeability reducing, grouting agents, surface hardeners, Corrosion inhibitors & water proofing agents..
Unit V	Shrinkage: Early volume changes, drying shrinkage, mechanism and factors affecting shrinkage, influence of curing conditions, differential shrinkage, carbonation, creep- factors influencing, relation between creep and time, nature of creep, effect of creep. Durability of concrete: Significance, water as an agent of deterioration, permeability of concrete, sulphate attack and its control, sea water attack, acid attack, efflorescence, resistance to corrosion, abrasion and cavitations, process of rusting of steel, Special concrete : Self compacting concrete, High performance concrete, fiber reinforced & polymer concrete, Ferro cement, Shortcrete pumped concrete, Free flow concrete.
Text Books	
T.1	“Concrete Technology Theory and Practice “authored by M.S. Shetty 6 th edition, S. Chand & Company, Limited, 2008
T.2	“Concrete Technology” authored by Gambhir M.L.,Tata McGraw-Hill Education,2004
T.3	“Properties of Concrete” authored by AM Neville ELBS, Pearson, 28 October 2011
T.4	“Concrete Technology” authored by A R Santhakumar, Oxford higher education,2006
Reference Books	
R.1	“Concrete Micro strucutres: Properties and materials” authored by PK Mehta and PJ Monterio, McGraw Hills Professional, 2013.
R.2	“Concrete Technology”, authored by DF Orchard, Applied SciencesPublications,1976
R.3	“Concrete Technology and Good Construction Practices” authored by Y P Gupta, New age international publisher, 2013.
R.4	“Concrete Technology”, authored by R.S. Varshney, Oxford and IBH,1982
Useful Links	
1	https://nptel.ac.in/courses/105/102/105102012/
2	https://nptel.ac.in/courses/105/104/105104030/

	Course Outcomes	CL	Class Sessions
BCE2304.1	Determine the test on cement and aggregate which is used on the construction site.	3	9
BCE2304.2	Analyze properties of fresh concrete.	4	9
BCE2304.3	Analyze various tests on hardened concrete and working of Nondestructive testing equipment.	3	9
BCE2304.4	Apply the knowledge of prepare mix design at different grade of concrete and understanding of application of admixture and its effect on properties of concrete.	3	10
BCE2304.5	Predict the effect of process of manufacturing on different properties of concrete.	3	8


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Program: B.E. Civil Engineering

Semester-III BCE2305 : Fluid Mechanics

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

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

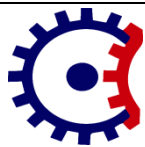
T.1	"Advanced Engineering Fluid Mechanics" authored by Muralidhar K. Biswas G., Narosa Publishing House, 1996.
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T.2	“Engineering Fluid Mechanics”, authored by Kumar K. L., Gupta S.K, S Chand Publications,2008.
T.3	“Hydraulics and Fluid Mechanics Including 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 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	Class Sessions
BCE2305.1	Relate the definitions and fundamentals of fluid mechanics involving fluid properties and shear force.	3	8
BCE2305.2	Determine fluid pressure using fluid measurement devices.	3	8
BCE2305.3	Apply basics of fluid statics and kinematics for hydrostatics forces related with fluid flow conditions.	3	10
BCE2305.4	Evaluate the fluid problem by using Bernoulli’s equation.	5	10
BCE2305.5	Use the concept of fluid measurement and its control through discharge.	3	9


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Wardha Road, Nagpur-441 108

NAAC Accredited with A+ Grade

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



Program: B.E. Civil Engineering

Semester-III | BCE2306 : Energy Science & Engineering

Teaching Scheme		Examination Scheme	
Theory	2 Hrs/week	CT-I	15Marks
Tutorial	-	CT-II	15 Marks
Total Credits	2	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks
Pre-Requisites: Basic Electrical Engineering		Total Marks	100 Marks

Course Contents

Unit I	Power generation – Wind mills, water wheels for shaft work, Industrial revolution – steam engine and coal fired boilers, Edison’s invention of electricity.
Unit II	Thermal power plant, Electricity generator, electric motor, super-critical power plants, Measures of performance and comparison of efficiency and costs for these technologies. Transportation – Bullock car, bicycle, IC engine, electric vehicle, fuel cell vehicle future car concepts – solar car, ethanol cars, lighting – candle kerosene lamp, incandescence lamp, fluorescent lamps, solid state lighting.
Unit III	Emergence of new technology, Identification of features propelling new developments, constraints imposed by fundamental basis, scarcity of energy resources and materials. Environmental constraints Identification of trends Use of sensors and instrumentation to quantify performance of energy devices.

Text Books

T.1	J. M. Fowler, Energy and the Environment, McGraw Hill, 2nd Edition, New York, 1984.
T.2	T. B. Johansson, H. Kelly, A. K. N. Reddy and R. H. Williams (Ed), Renewable Energy: sources for fuel and electricity, Island Press, Washington DC, 1993.

Reference Books

R.1	M. K. Gupta, Power Plant Engineering, ISBN 978-81-203-4612-3, PHI learning Private limited. New Delhi, 2012.
R.2	Energy and the Challenge of Sustainability, World Energy Assessment, UNDP, New York, .
R.3	D.Y. Goswami, F.Kreith and J.F. Kreider, Principles of Solar Engineering, Taylor and Francis, Philadelphia, 2000.

Useful Links

1	https://onlinecourses.nptel.ac.in/noc21_ch11/preview
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	Course Outcomes	CL	Class Sessions
CE2306.1	Relate the challenges in field of energy engineering	3	8
CE2306.2	Explore the perspective on energy technology, and various dimensions of the energy problem and Review historical perspective on energy technology and system development	3	12
CE2306.3	Connect technology development for power generation, transportation and energy application, and proposing innovative solutions	3	12


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Program: B. E. Civil Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
III	BCE2307	Mechanics of Solids Lab	-	-	2	1

Pre-Requisites: Engineering Mechanics, Mathematics

Course Contents		CO
1	To analyse various types of Strain Gauge apparatus.	CO 1
2	To determine the Tensile Strength of Steel specimen.	CO 2
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).	CO 3
6	Compression test on bricks and stones.	CO 4
7	To determine the spring constant of Closely Coiled Spring.	CO 4
8	To determine water absorption of roofing tiles, flooring tiles and bricks and determine its flexural Rigidity	CO 4
9	To perform fatigue test on mild steel bar.	CO 4
10	To perform the bending test on wooden beam and find its Flexural Rigidity	CO 3

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 Reprint Thanpatrai Publications (P) Ltd.
T.4	"Strength Of Materials" author by Subramanian 2 nd edition REPRINT Oxford University Press.

Reference Standards

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., Kivisalaas J. Mechanics of Material, Cengage Learning, (Indian Edition), 2010
R.3	Pytel A., Kivisalaas 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
R.5	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

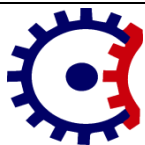
Useful Links

1	https://nptel.ac.in/courses/105/105/105105108/
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	Course Outcomes	CL	Class Sessions	Lab Sessions
CE2307.1	Apply the principles of strain gauges in measuring strain and deformation in materials.	3	8	4
CE2307.2	Justify stress-strain relationships and material behavior under tensile loading.	3	10	2
CE2307.3	Elaborate the behavior of materials under torsional and impact loading.	5	10	4
CE2307.4	Investigate the endurance limit and fatigue behavior of materials.	6	9	8


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Program: B.E Civil Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
III	BCE2308	Concrete Technology Lab	-	-	2	1

Pre-Requisites: Concrete Technology Theory

Course Contents

1	To determine the Normal consistency, initial and final setting times of cement	CO1
2	To determine soundness of cement	CO1
3	To determine compressive strength and tensile strength of cement.	CO1
4	To determine particle shape, texture and elongation/ flakiness index of aggregate.	CO5
5	To perform Sieve analysis and particle size distribution of aggregate.	CO5
6	To determine Bulking and Percentage silt in sand.	CO5
7	To determine Workability - Slump test, Compaction factor of concrete.	CO2
8	Concrete mix design :Using IS code/DOE Method.	CO4
9	To determine Compressive strength of concrete cube.	CO2
10	To determine the quality of concrete by using Rebound hammer/ Ultrasonic Pulse Velocity Instrument	CO3

Text Books

T.1	“Concrete Technology Theory and Practice “authored by M.S. Shetty 6 th edition, S. Chand & Company, Limited, 2008
T.2	“Concrete Technology” authored by Gambhir M.L.,Tata McGraw-Hill Education,2004
T.3	“Properties of Concrete” authored by AM Neville ELBS, Pearson, 28 October 2011
T.4	“Concrete Technology” authored by A R Santhakumar, Oxford higher education,2006

Reference Books

R.1	“Concrete Microstructures: Properties and materials” authored by PK Mehta and PJ Monterio, McGraw Hills Professional, 2013.
R.2	“Concrete Technology”, authored by DF Orchard, Applied SciencesPublications,1976
R.3	“Concrete Technology and Good Construction Practices” authored by Y P Gupta, New age international publisher, 2013.
R.4	“Concrete Technology”, authored by R.S. Varshney, Oxford and IBH,1982
R.5	Relevant IS Codes: IS: 5513 – 1976, IS 4031 (Part 1 to 6)-1988, IS: 2386 (Part 1)-1963, IS: 2386 Part-4 (1963), IS: 2386 (Part 4)-1963, IS 2386-3 (1963), IS 1199-1959, IS 10262 (2009), IS 516 (1959). IS 13311-2 (1992)

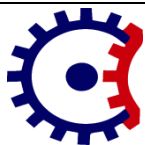
Useful Links

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	Class Sessions	Lab Sessions
BCE2308.1	Determine the test on cement which is used on the construction site.	3	9	6
BCE2308.2	Analyze workability tests on fresh concrete and various tests on hardened concrete.	4	9	2
BCE2308.3	Analyze working of Nondestructive testing equipment.	3	9	2
BCE2308.4	Apply the knowledge of prepare mix design at different grade of concrete and understanding of application of admixture and its effect on properties of concrete.	3	10	2
BCE2308.5	Evaluate the test on aggregate which is done on the construction site.	5	8	8


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Program: B. E Civil Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
III	BCE2309	Fluid Mechanics Lab	-	-	2	1

Pre-Requisites: Engineering mechanics, Engineering applied physics

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 Distributorsl, 2005.
R.5	Relevant IS Codes:

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	Class Sessions	Lab Sessions
BCE2309.1	Relate the definitions and fundamentals of fluid mechanics involving fluid properties and shear force.	3	8	-
BCE2309.2	Determine fluid pressure using fluid measurement devices.	3	8	2
BCE2309.3	Apply basics of fluid statics and kinematics for hydrostatics forces related with fluid flow conditions.	3	10	2
BCE2309.4	Evaluate the fluid problem by using Bernoulli's equation.	5	10	2
BCE2309.5	Use the concept of fluid measurement and its control through discharge.	3	9	10


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