DGCT AUTONOMOUS REGULATION – 2024
IV SEMESTER

24TCE401	STRENGTH OF MATERIALS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

i To know the method concept of analysing indeterminate beams.

ii To understand the concept energy principles and the state of stresses and various theories for failure of material.

iii To know about Unsymmetrical bending and to analyse plane and space trusses.

Unit - I ENERGY PRINCIPLES 9

Strain energy and strain energy density – strain energy due to axial load, shear, flexure andtorsion – Castigliano's theorems – Maxwell's reciprocal theorems - Principle of virtual work –application of energy theorems for computing deflections in beams and trusses - Williot Mohr's Diagram.

Unit - II INDETERMINATE BEAMS 9

Concept of Analysis - Propped cantilever and fixed beams-fixed end moments and reactions – Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

Unit - III STATE OF STRESS IN THREE DIMENSIONS 9

Determination of principal stresses and principal planes – Volumetric strain –Theories of failure – Principal stress - Principal strain – shear stress – Strain energy and distortion energy theories – application in analysis of stress, load carrying capacity.

Unit – IV ADVANCED TOPICS IN BENDING OF BEAMS 9

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre -curved beams – Winkler Bach formula.

Unit - V ANALYSIS OF TRUSSES 9

Determinate and indeterminate trusses - Analysis of pin jointed plane determinate trusses by method of joints, method of sections and tension coefficient – Analysis of Space trusses by tension coefficient method.

Total Periods: 45

OUTCOMES:

i Determine the strain energy and compute the deflection of determinate beams, frames and trusses using energy principles.

ii Analyze propped cantilever, fixed beams and continuous beams using theorem of three moment equation for external loadings and support settlements.

iii Determine principal stresses and planes for an element in three dimensional state of stress and study various theories of failure

iv Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and find the stresses in curved beams.

v Analyze the pin jointed plane and space trusses

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TEXT BOOK:

i Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2015.

ii Basavarajiah and Mahadevapa, Strength of Materials, University press, Hyderabad, 2016

iii Bansal. R.K. "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 2010

REFERENCE BOOK:

i Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003

ii William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, Tata McGraw Hill Publishing company, 2007.

iii Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2016

iv Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012

COs- PO's & PSO's MAPPING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design / development of solutions	2	2	2	3	3	2
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	2	1	1	1	1
PO6	Engineer and Society	3	2	3	2	2	3
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	2	1	2	1	2
PO9	Individual and Team work	2	2	2	2	2	2
PO10	Communication	1	1	1	1	1	1
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	3	3	3	3	3	3
PROGRAM SPECIFIC OUTCOMES(PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	2	2	2	2
PSO3	Conceptualization and evaluation of Engineering solutions to Civil engineering issues	2	2	3	3	3	3

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IV SEMESTER

24TCE402	APPLIED HYDRAULICS ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

i To introduce students to various construction materials and the techniques that are commonly used in civil engineering construction.

Unit - I UNIFORM FLOW **9**

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties ofopen channel - Velocity distribution in open channel - Steady uniform flow: Chezy equation,Manning equation - Best hydraulic sections for uniform flow – Wide open channel - Specific energyand specific force – Critical flow.

Unit - II GRADUALLY VARIED FLOW **9**

Dynamic equations of gradually varied - Water surface flow profile classifications: Hydraulic Slope,Hydraulic Curve - Profile determination by Numerical method: Direct step method and Standard stepmethod – Change in Grades.

Unit - III RAPIDLY VARIED FLOW **9**

Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation – Celerity – Rapidly varied unsteady flows (positive and negative surges).

Unit - IV TURBINES **9**

Turbines - Classification - Impulse turbine – Pelton wheel - Reaction turbines - Francis turbine - Kaplan turbine - Draft tube - Cavitation - Performance of turbine - Specific speed – Minimum Speed to start the pump.

Unit - V PUMPS **9**

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitation's in pumps – Operatingcharacteristics - Multistage pumps - Reciprocating pumps - Negative slip - Indicator diagrams andits variations - Air vessels - Savings in workdone.

Total Periods: 45

OUTCOMES:

i Describe the basics of open channel flow, its classification and analysis of uniform flow in steady state conditions with specific energy concept and its application.

ii Analyse steady gradually varied flow, water surface profiles and its length calculation using direct and standard step methods with change in water surface profiles due to change in grades.

iii Derive the relationship among the sequent depths of steady rapidly varied flow and estimating energy loss in hydraulic jump with exposure to positive and negative surges.

iv Design turbines and explain the working principle

v Differentiate pumps and explain the working principle with characteristic curves and design centrifugal and reciprocating pumps.

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TEXT BOOK:

i Jain. A.K., Fluid Mechanics, Khanna Publishers, Delhi,2010.

ii Chandramouli P N, Applied Hydraulic Engineering, Yes Dee Publisher, 2017

REFERENCE BOOK

i Ven Te Chow, Open Channel Hydraulics, McGraw Hill, New York, 2009.

ii Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 19th edition, 2013.

iii Mays L. W., Water Resources Engineering, John Wiley and Sons (WSE), New York, 2019

iv Subramanya K., Flow in open channels, Tata McGraw Hill, New Delhi, 2019.

COs- PO's & PSO's MAPPING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design / development of solutions	2	2	2	3	3	2
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	2	1	1	1	1
PO6	Engineer and Society	2	2	2	2	2	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	2	2	2	2	2	2
PO10	Communication	1	1	1	1	1	1
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	3	3	3	3	3	3
PROGRAM SPECIFIC OUTCOMES(PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	2	2	2	2
PSO3	Conceptualization and evaluation of Engineering solutions to Civil engineering issues	2	2	3	3	3	3

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IV SEMESTER

24TCE403	SOIL MECHANICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

i. To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification.
ii. To familiarize about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils.
iii. To impart knowledge of design of both finite and infinite slopes.

Unit - I SOIL PROPERTIES AND CLASSIFICATION 9

Formation of soil - Soil description – Particle – Size shape and colour – Composition of gravel, sand, silt, clay particles – Particle behaviour – Soil structure – Phase relationship – Index properties – Significance – BIS classification system – Unified classification system.

Unit - II EFFECTIVE STRESS AND PERMEABILITY 9

Soil - water – Static pressure in water - Effective stress concepts in soils – Capillary phenomena– Permeability interaction – Hydraulic conductivity – Darcy's law – Determination of Hydraulic Conductivity – Laboratory Determination (Constant head and falling head methods) and field measurement pumping out in unconfined and confined aquifer – Factors influencing permeability of soils – Seepage - Two dimensional flow – Laplace's equation – Introduction to flow nets – Simple problems.

Unit - III STRESS DISTRIBUTION AND SETTLEMENT 9

Stress distribution in homogeneous and isotropic medium – Boussinesq theory – (Point land, Line land and udl) Use of New marks influence chart –Components of settlement – Immediate and consolidation settlement – Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. - $\sqrt{t}$ and log t methods– e-log p relationship.

Unit - IV SHEAR STRENGTH AND COMPACTION 9

Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory – Measurement of shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests – Compaction of soils – Theory, Laboratory and field tests – Field Compaction methods – Factors influencing compaction of soils.

Unit - V SLOPE STABILITY 9

Stability Analysis - Infinite slopes and finite slopes – Total stress analysis for saturated clay – Friction circle method – Use of stability number – Method of slices – Fellenious method – Slope protection measures.

Total Periods: 45

OUTCOMES:

i Demonstrate an ability to identify various types of soils and its properties, formulate and solve engineering Problems
ii Understanding of flow through soil medium and its impact of engineering solution

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iii Understand the basic concept of stress distribution in loaded soil medium and soil settlement due to consolidation

iv Understanding of shear strength of soils and its impact of engineering solutions to the loaded soil medium and also will be aware of contemporary issues on shear strength of soils.

v Demonstrate an ability to design both finite and infinite slopes, component and process as per needs and specifications.

TEXT BOOK:

i Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2015

ii Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age Ltd. International Publisher New Delhi (India) 2006.

REFERENCE BOOK:

i McCarthy, D.F., "Essentials of Soil Mechanics and Foundations". Prentice-Hall, 2006.

ii Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt.Ltd. New Delhi, 2010.

iii Das, B.M., "Principles of Geotechnical Engineering". Brooks / Coles / Thompson Learning Singapore, 8th Edition, 2013.

iv Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 2005.

v Arora, K.R, "Soil Mechanics and Foundations", Standard Publications Distributors. New Delhi.

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COs- PO's & PSO's MAPPING

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	2	3	3	2	3	3
PO2	Problem analysis	3	2	3	3	3	3
PO3	Design / development of solutions	2	3	2	3	2	2
PO4	Investigation	2	2	2	2	2	2
PO5	Modern Tool Usage	3	3	2	2	2	2
PO6	Engineer and Society	1	1	2	1	1	1
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	2	2	2	1	1	2
PO10	Communication	1	1	1	1	1	1
PO11	Project Management and Finance	2	2	2	2	1	2
PO12	Life Long Learning	3	3	3	3	3	3
PROGRAM SPECIFIC OUTCOMES(PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	2	2	2	2	2
PSO2	Critical analysis of Civil Engineering problems and Innovation	3	2	2	2	3	2
PSO3	Conceptualization and evaluation of Engineering solutions to Civil engineering issues	2	3	3	3	2	3

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DGCT AUTONOMOUS REGULATION – 2024
IV SEMESTER

24TCE404	WASTE WATER ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

i Acquire knowledge about wastewater characteristics, their disposal, treatment methods and to design sewers.

Unit - I INTRODUCTION AND DESIGN OF SEWER 9

Definitions of waste water engineering, methods of domestic waste water disposal, types of sewage systems and their suitability and its applications. Design of Sewers- Hydraulic formulae for velocity, effects of flow variations on velocity, self- cleansing and non-scouring velocities, design of hydraulic elements for circular sewers flowing full and flowing partially full.

Unit - II MATERIALS OF SEWERS AND SEWER APPURTENANCE 9

Sewer materials and Types, shapes of sewers, laying of sewers, testing of sewers, ventilation &cleaning of sewers. Sewer appurtenance-Catch basins, manholes, oil and grease traps, drainage traps. Basic principles of house drainage (Single and Dual stack). Typical layout plan showing house drainage connections.

Unit - III WASTEWATER CHARACTERISTICS AND DISPOSAL OF EFFLUENT 10

Sampling, significance, techniques and frequency. Physical, chemical and biological characteristics, Aerobic and anaerobic activity. BOD and COD. Numerical on BOD and COD.
Effluent disposal standards for land, surface water & ocean. Disposal of Effluent-Disposal of effluents by dilution, self-purification phenomenon. Oxygen sag curve, Zones of purification, sewage farming sewage sickness, Numerical problems on disposal of effluents. Streeter Phelps equation (No derivation)

Unit - IV Treatment of Waste Water 10

Flow diagram of municipal waste water treatment plant. Preliminary & primary treatment: Screening, grit chambers, skimming tanks, and primary sedimentation tanks, design criteria & design examples and its applications.
Suspended growth and fixed film bioprocess. Tricking filter–theory and operation, types and designs. Activated sludge process – principle and flow diagram, F/M ratio. Design of ASP and its applications Solid Waste management: Introduction to solid waste management

Unit - V ADVANCE TREATMENT AND SLUDGE TREATMENT 7

Wastewater Treatment - UASB – Waste Stabilization Ponds, SBR, MBBR, MBR. Nitrogen and phosphorus removal and its applications. Discharge standards-sludge treatment -Disposal of sludge.

Total Periods: 45

OUTCOMES:

i Assess the characteristics and properties of wastewater which aids selection of appropriate treatment and disposal methods.
ii Select suitable sewer material and sewer appurtenance for the design and laying of sewers.
iii Design various components of wastewater treatment units.
iv Conduct experiments to determine water and waste water characteristics.

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TEXT BOOK:

i Santosh Kumar Garg, "Water Supply Engineering: Environmental Engineering - Vol. I",Khanna Publisher, 2017

ii B.C. Punmia and Ashok Jain, "Environmental Engineering, I-Water Supply Engineering", Laxmi Publications (P)Ltd., New Delhi, 2010.

REFERENCE BOOK:

i Howard S. Peavy, Donald R. Rowe, George T, "Environmental Engineering", McGraw Hill International Edition, New York, 2017.

ii Bendat and Piersol, "Water & Waste Water Technology". John Wiley & Sons Inc., New York,2008.

iii Ministry of Urban Development, Government of India, New Delhi, "CPHEEO Manual onwater supply and treatment engineering", Akalank Publications, 2018

COs- PO's & PSO's MAPPING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design / development of solutions	2	2	3	2	3	3
PO4	Investigation	2	2	2	2	2	2
PO5	Modern Tool Usage	-	2	2	2	2	2
PO6	Engineer and Society	2	2	-	-	2	2
PO7	Environment and Sustainability	2	3	2	3	3	3
PO8	Ethics	-	-	-	-	-	-
PO9	Individual and Team work	-	-	-	-	-	-
PO10	Communication	-	-	-	-	-	-
PO11	Project Management and Finance	-	-	2	-	-	2
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES(PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and Innovation	2	3	3	3	3	3
PSO3	Conceptualization and evaluation of Engineering solutions to Civil engineering issues	2	3	3	3	2	3

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IV SEMESTER

24MCE405	CONCRETE TECHNOLOGY	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

i To study the properties of concrete making materials.

ii To have better knowledge about the chemical and mineral admixtures in concrete.

iii To familiarize with the IS method of mix design as per the latest code.

iv To understand the fresh and hardened properties of concrete. To know the importance and applications of special concretes

Unit - I CONSTITUENT MATERIALS 6

Cement — Different types — Chemical composition and Properties — Hydration of cement — Tests on cement — IS Specifications — Aggregates — Classification —properties _tests— Water — Quality of water for use in concrete.

Unit - II CHEMICAL AND MINERAL ADMIXTURES 6

Accelerators — Retarders — Plasticizers — Super plasticizers — Water proofers — Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline — Effects on concrete properties.

Unit - III PROPORTIONING OF CONCRETE MIX 6

Principles of Mix Proportioning — Properties of concrete related to Mix Design — Physical properties of materials required for Mix Design — Design Mix and Nominal Mix — BIS Method of Mix Design — Mix Design Examples.

Unit - IV FRESH AND HARDENED PROPERTIES OF CONCRETE 6

Workability — Tests for workability of concrete — Segregation and Bleeding — Determination of strength Properties of Hardened concrete — Compressive strength — split tensile strength — Flexural strength — Stress-strain curve for concrete — Modulus of elasticity — durability of concrete — water absorption — permeability — corrosion test — acid resistance.

Unit - V SPECIAL CONCRETES 6

Light weight concretes — foam concrete- self compacting concrete — vacuum concrete — High strength concrete — Fibre reinforced concrete — Ferrocement — Ready mix concrete — SIFCON — Shotcrete — Polymer concrete — High performance concrete — Geopolymer Concrete.

Total Periods: 30

PRACTICAL EXERCISE

Ex 1 Test on Cement

Ex 2 Tests on Aggregate

Ex 3 Process of making concrete

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Ex 4	Tests on Fresh Concrete
Ex 5	Tests on Hardened concrete

Total Periods: 30

OUTCOMES:

i	Understand the requirements of cement, aggregates and water for concrete
ii	Select suitable admixtures for enhancing the properties of concrete
iii	Design concrete mixes as per IS method of mix design
iv	Determine the properties of concrete at fresh and hardened state.
v	Know the importance of special concretes for specific requirements.

TEXT BOOK:

i	Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
ii	Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003

REFERENCE BOOK:

i	Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London,1995
ii	Gambhir.M.L.Concrete Technology,Fifth Edition, McGraw Hill Education,2017.
iii	Job Thomas., Concrete Technology, Cencage learning India Private Ltd, New Delhi, 2015.
iv	IS10262-2019 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhii.
v	IS 456: Plain and Reinforced Concrete - Code of Practice

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COs- PO's & PSO's MAPPING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	1	1	2	1	1	1
PO3	Design / development of solutions	1	1	3	1	1	2
PO4	Investigation	2	1	3	1	1	2
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	3	3	3	3	3	3
PO8	Ethics	2	1	1	2	2	2
PO9	Individual and Team work	1	1	1	1	1	1
PO10	Communication	1	1	1	1	1	1
PO11	Project Management and Finance	1	1	1	1	2	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES(PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	2	2	2	2
PSO3	Conceptualization and evaluation of Engineering solutions to Civil engineering issues	3	3	3	3	3	3

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DGCT AUTONOMOUS REGULATION – 2024
IV SEMESTER

24TCH401	ENVIRONMENTAL SCIENCE AND SUSTAINABILITY	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

i To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
ii To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
iii To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
iv To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
v To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

Unit - I **ENVIRONMENT AND BIODIVERSITY** **6**

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

Unit - II **ENVIRONMENTAL POLLUTION** **6**

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection acts.

Unit - III **RENEWABLE SOURCES OF ENERGY** **6**

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Solar energy conversion: Principle, working and applications of solar cells; recent developments in solar cell materials and Wind energy. Applications of- Hydrogen energy, Ocean energy resources (OTE), Tidal energy, Concept, origin and power plants of geothermal energy.

Unit - IV **SUSTAINABILITY AND MANAGEMENT** **6**

Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from un sustainability to sustainability-millennium development goals, and protocols-87. Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

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Unit - V SUSTAINABILITY PRACTICES 6

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment.

Sustainable habitat: Green buildings, Green materials, Energy efficiency, Food wastage, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles, carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio economically and technological change.

Total Periods: 30

OUTCOMES:

i To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.

ii To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.

iii To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.

iv To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development

v To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

TEXT BOOK:

i Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.

ii Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.

iii Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

iv Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.

v Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

vi Environment Impact Assessment Guidelines, Notification of Government of India, 2006.

vii Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCE BOOK:

i R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. Edition 2010.

ii Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.

iii Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.

iv Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.

v Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

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CO's-PO's & PSO's MAPPING

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	-	-	-	2	3	-	-	-	-	2	-	-	-
2	3	2	-	-	-	3	3	-	-	-	-	2	-	-	-
3	3	-	1	-	-	2	2	-	-	-	-	2	-	-	-
4	3	2	1	1	-	2	2	-	-	-	-	2	-	-	-
5	3	2	1	-	-	2	2	-	-	-	-		-	-	-
Avg.	2.8	1.8	1	1	-	2.2	2.4	-	-	-	-	1.8	-	-	-

1-low, 2-medium, 3-high, '-"- no correlation

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IV SEMESTER

24S001	EMPLOYABILITY SKILLS – I	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

i. To solve basic math problems like time, speed, work, and percentages.

ii. To improve communication, teamwork, and time management skills.

iii. To write programs to solve problems using coding and algorithms.

iv. To prepare for placements with better technical and soft skills.

MODULE – I APTITUDE - I 9

Number Systems – LCM & HCF – Work & Wages – Time, Distance and Speed – Pipes and Cisterns – Trains, Boats and Streams – Averages and Percentages – Allegations and Mixtures – Profit and Loss

MODULE – II SOFT SKILLS - I 9

Goal Setting - Motivation – Problem Solving – Cognitive Skills – Personal Qualities – Ethics – Effective Communication – Interpersonal Skills – Teamwork – Time Management – Positivity – Role Play – Emotional Maturity – Emotional Health

MODULE – III PROBLEM SOLVING -I 9

Mathematical – Bit Manipulation – Design Pattern – - Counting - Arrays - Matrix - Searching – Sorting – Strings – Stack – Queue – Pointer – Series - Online Preparation - Leetcode - Codechef – Hackerrank – Geeks for geek

Total Periods : 27

OUTCOMES: Upon successful completion of the course, the students will be able to

i. Develop students' ability to solve quantitative problems for placement tests.
ii. Enhance soft skills like communication, teamwork, and time management for professional growth.
iii. Build problem-solving skills using programming and algorithms
iv. Prepare students for technical assessments and interviews in campus placements.

TEXT BOOKS:

1. R.S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", S. Chand Publishing, 2001
2. Stephen R. Covey,"The 7 Habits of Highly Effective People", Free Press (Simon & Schuster), 1989

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REFERENCE BOOKS:

1. https://www.geeksforgeeks.org/
2. https://leetcode.com/
3. https://www.hackerrank.com/

CO's-PO's & PSO's MAPPING

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	1	3	-	-	-	-	-	1	-	-	-	-	-	-
2	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-
3	-	1	3	-	-	-	-	-	1	1	-	-	-	-	-
4	-	1	3	-	-	-	-	-	1	1	-	-	-	-	-
Avg.	-	1	3	-	-	-	-	-	1	1	-	-	-	-	-

1-low, 2-medium, 3-high, '-"- no correlation

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IV SEMESTER

24LCE401	HYDRAULICS ENGINEERING LABORATORY	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES

i To provide hands on experience in calibration of flow meters, performance characteristics of pumps and turbines.

LIST OF EXPERIMENTS

I FLOW MEASUREMENT

a. Calibration of Rotameter
b. Flow through Orifice meter/mouthpiece, Venturimeter and Notches
c. Bernoulli's Experiment

II LOSSES IN PIPES

a. Determination of friction factor in pipes.
b. Determination of minor losses

III PUMPS

a. Characteristics of Centrifugal pumps
b. Characteristics of Gear pump
c. Characteristics of Submersible pump
d. Characteristics of Reciprocating pump

IV TURBINES

a. Characteristics of Pelton wheel turbine
b. Characteristics of Francis turbine
c. Characteristics of Kaplan turbine

V STUDY EXPERIMENTS

a. Determination of Metacentric height of floating bodies
b. Determination of the velocity of a fluid by Prandl pitot tube
c. Study of Multistage centrifugal pump

Total Periods: 45

OUTCOMES:

i Apply Bernoulli equation for calibration of flow measuring devices.
ii Measure friction factor in pipes and compare with Moody diagram
iii Determine the performance characteristics of rotodynamic pumps.
iv Determine the performance characteristics of positive displacement pumps.
v Determine the performance characteristics of turbines.

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REFERENCE BOOK:

i Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, 2015.

ii Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House. New Delhi, 2017.

iii Subramanya K, Fluid Mechanics and Hydraulic Machines, Tata McGraw Hill Edu. Pvt. Ltd. 2011

CO's-PO's & PSO's MAPPING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	2	3	3	3	3	3
PO2	Problem analysis	2	2	3	3	3	3
PO3	Design / development of solutions	1	1	2	2	2	2
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	2	2	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	2	2	3	3	3	2
PO10	Communication	1	1	1	1	1	1
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	1	1	2	1	1	1
PROGRAM SPECIFIC OUTCOMES(PSO)							
PSO1	Knowledge of Civil Engineering discipline	2	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	1	1	2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	1	1	1	1	1

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IV SEMESTER

24LCE402	WATER AND WASTEWATER ANALYSIS LABORATORY	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES

i This subject includes the list of experiments to be conducted for characterization of water and municipal sewage. At the end of the course, the student is expected to be aware of the procedure for quantifying quality parameters for water and sewage.

LIST OF EXPERIMENTS

I ANALYSIS OF WATER SAMPLE

a. Sampling and preservation methods for water and wastewater (Demonstration only)
b. Measurement of Electrical conductivity and turbidity
c. Determination of fluoride in water by spectrophotometric method /ISE
d. Determination of iron in water (Demo)
e. Determination of Sulphate in water
f. Determination of Optimum Coagulant Dosage by Jar test apparatus
g. Determination of available Chlorine in Bleaching powder and residual chlorine in water

II ANALYSIS OF WASTEWATER SAMPLE

a. Estimation of suspended, volatile and fixed solids
b. Determination of Sludge Volume Index in waste water
c. Determination of Dissolved Oxygen
d. Estimation of B.O.D.
e. Estimation of C.O.D.
f. Determination of TKN and Ammonia Nitrogen in wastewater
g. Determination of total and faecal coliform (Demonstration only)

Total Periods: 45

OUTCOMES:

i Calibrate and standardize the equipment
ii Collect proper sample for analysis
iii To know the sample preservation methods
iv To perform field oriented testing of water, wastewater
v To perform coliform analysis

REFERENCE BOOK:

i APHA, "Standard Methods for the Examination of Water and Waste water", 22nd Ed. Washington, 2012
ii "Laboratory Manual for the Examination of water, wastewater soil Rump", H.H. and Krist,H. – Second Edition, VCH, Germany, 3rd Edition, 1999.
iii "Methods of air sampling & analysis",James P.Lodge Jr(Editor) 3rd Edition, Lewis publishers,Inc,USA,1989.

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CO's-PO's & PSO's MAPPING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	2	2	1	3	2	2
PO2	Problem analysis	1	1	1	3	3	2
PO3	Design / development of solutions	1	1	1	3	3	2
PO4	Investigation	1	1	1	3	3	2
PO5	Modern Tool Usage	2	1	1	3	3	2
PO6	Engineer and Society	1	2	2	2	2	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	2	2	2	3	3	3
PO9	Individual and Team work	1	1	2	3	2	2
PO10	Communication	1	1	2	2	2	2
PO11	Project Management and Finance	1	2	2	3	2	2
PO12	Life Long Learning	3	3	2	2	3	3
PROGRAM SPECIFIC OUTCOMES(PSO)							
PSO1	Knowledge of Civil Engineering discipline	1	2	2	3	2	2
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	2	3	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	2	2	2	3	2	2

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