Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

NEP Compliant Structure & Syllabus

of

Department of Civil Engineering

S. Y. B. Tech.

Effective from Academic Year 2025-26

by: - Board of Studies in Civil Engineering

Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Chairman- BoS **Chairman – Academic Board**

Contents

Program Outcomes

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 modelling 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

Academic Information – Please visit www.vit.edu

Program Specific Outcomes (PSO):

PSO1: Engineering graduates will be able to plan and execute the activities of construction projects

PSO2: Engineering graduates will be able to analyze and design components of Civil Engineering Systems.

Title: Course Structure **FF No. 653**

Branch: Civil Year: SY A.Y. 2025-26 Semester: III Pattern: 2024

Sub. No.	Sub. Code	Subject Name	Teaching Scheme (Hrs/Week)			Examination Scheme												Total	Credits
			Th	Lab	Tut	CA			MSE (O)	T1(O)	T2(O)	ESA							
						CP	Lab	HA				CVV	GD/ PPT	ESE TH (W)	ESE TH (O)	Prac + CVV (40+20)	ESE		
S1	CV2003	Fluid Mechanics	2	2	0	-	-	-	-	-	-	30	30	40	-	-	-	100	3
S2	CV2004	Water Supply Engineering	2	2	0	30	10	-	-	-	-	-	-	-	-	60**	-	100	3
S3	CV2005	Concrete Technology	2	2	0	30	10	-	-	-	-	-	20		40	-	-	100	3
S4	CV2006	Mechanics of Solids	2	2	0	30	10	-	-	-	-	20	-	40	-	-	-	100	3
S5	CVM001	Climatology*	2	0	1	-	-	30	-	35	35	-	-	-	-	-	-	100	3
S6	HS2002	From Campus to Corporate 1*	2	0	0	-	-	-	50	-	-	-	-	-	50	-	-	100	2
S7	HS2001	Reasoning and Aptitude Development 3*	0	0	1	-	-	-	-	-	-	-	-	-	-	-	100	100	1
S8	CV2001	Design Thinking 3	0	0	1	-	-	-	-	-	-	-	-	-	-	-	100	100	1
S9	CV2002	Engineering Design and Innovation 3	0	4	0	-	-	-	30	-	-	-	-	-	-	-	70**	100	2
		TOTAL	**12**	**12**	**3**	**90**	**30**	**30**	**80**	**35**	**35**	**50**	**50**	**80**	**90**	**60**	**270**	**900**	**21**

*Conducted Online **External Examiner

Title: Course Structure **FF No. 653**

Branch: Civil Year: SY A.Y. 2025-26 Semester: IV Pattern: 2024

Sub. No.	Sub. Code	Subject Name	Teaching Scheme (Hrs/Week)			Examination Scheme												Total	Credits
			Th	Lab	Tut	CA			MSE (O)	T1(O)	T2(O)	ESA							
						CP	Lab	HA				CVV	GD/ PPT	ESE TH (W)	ESE TH (O)	Prac + CVV (40+20)	ESE		
S1	CV2009	Structural Analysis	2	2	0	30	10	-	-	-	-	20	-	40	-	-	-	100	3
S2	CV2010	Geomatics Engineering	2	2	0	30	10	-	-	-	-	-	-	-	-	60**	-	100	3
S3	CV2011	Wastewater Engineering	2	2	0	-	-	-	-	-	-	30	30	40	-	-	-	100	3
S4	CV2012	Geotechnical Engineering	2	2	0	30	10	-	-	-	-	-	20	-	40	-	-	100	3
S5	CVM001	Climatology*	2	0	1	-	-	30	-	35	35	-	-	-	-	-	-	100	3
S6	HS2004	From Campus to Corporate 2*	2	0	0	-	-	-	50	-	-	-	-	-	50	-	-	100	2
S7	HS2003	Reasoning and Aptitude Development 4*	0	0	1	-	-	-	-	-	-	-	-	-	-	-	100	100	1
S8	CV2007	Design Thinking 4	0	0	1	-	-	-	-	-	-	-	-	-	-	-	100	100	1
S9	CV2008	Engineering Design and Innovation 4	0	4	0	-	-	-	30	-	-	-	-	-	-	-	70**	100	2
		TOTAL	**12**	**12**	**3**	**90**	**30**	**30**	**80**	**35**	**35**	**50**	**50**	**80**	**90**	**60**	**270**	**900**	**21**

*Conducted Online **External Examiner

FF No.: 654

FLUID MECHANICS

Course Code: CV2003

Credits: 3	**Teaching Scheme: Theory: 2 Hours / Week** **Laboratory: 2 Hours / Week**

Unit I (6 Hours)

Properties of Fluid; fluid pressure analysis and measurement; Hydrostatic forces on plane and curved surfaces; Buoyancy and flotation; metacentric height; Dimensional analysis using Buckingham's π theorem.

Unit II: (6 Hours)

Types of flow; Equation of Continuity; flow visualization, Potential function and stream function, flow net, Energy (Bernoulli) and momentum equations; Venturimeter, orifice meter

Unit III: (6 Hours)

Navier Stokes equation, Laminar Flow through pipes, Hagen Poiseuille equation; Turbulent flow through pipes, Darcy-Weisbach equation for flow through pipes, friction factor, Moody diagram, pipes in series and parallel, minor losses

Unit IV: (6 Hours)

Boundary layer concept, Development of boundary layer on flat plate, drag on flat plate, boundary layer separation, drag and lift on cylinder and air foil

Laboratory:

Students should complete any 8-experiment mentioned below.
1. Measurement of surface tension in a given liquid
2. Determination of metacentric height.
3. Drawing of flow net by electrical analogy for flow below weir (with / without sheet pile)
4. Experimental verification of Bernoulli's theorem with reference to loss of energy
5. Calibration of Venturimeter
6. Study of laminar flow using Heleshaw's apparatus
7. Determination of friction factor for a given pipe
8. Flow around a Circular Cylinder
9. Flow around an aerofoil

Text Books:

1. F.M. White, Fluid Mechanics, McGraw Hill, 1994
2. V.L. Streeter and E.B. Wylie, Fluid Mechanics, McGraw Hill, 1997
3. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics, Standard Book House, 1998

Reference Books:

1. M.K. Goyal, Fluid Mechanics and Hydraulic Machines, PHI Learning Pvt. Ltd., 2015
2. K. S. Massey, Mechanics of Fluids, Van Nostrand Reinhold Co., 1979
3. J. Frabzini, Fluid Mechanics with Engineering Applications, McGraw Hill, 1997
4. J.H. Spurk, Fluid Mechanics – Problems and Solutions, Springer, 2003

MOOCs Links and additional reading material:

1. https://ekumbh.aicte-india.org/book.php
2. https://archive.nptel.ac.in/courses/105/101/105101082/
3. https://archive.nptel.ac.in/courses/105/103/105103192/

Course Outcomes:

Students will be able to
1. Determine fluid density, Specific Weight, viscosity, compressibility surface tension, capillary rise and establish relation between various fluid, flow, geometrical properties using Buckingham Pi Theorem
2. Determine fluid pressure at a point, total pressure, centre of pressure, metacentric height using principles of fluid statics
3. Determine velocity, acceleration, discharge of fluid flow using principles of fluid kinematics.
4. Determine velocity, acceleration, discharge of fluid flow using energy equation and momentum equation.
5. Determine velocity, discharge, shear stress for laminar flow through circular pipes
6. Determine velocity, discharge, for turbulent flow through pipes, pipes in series, pipes in parallel.
7. Determine drag, lift forces on flat plate, cylinder and air foil by applying boundary layer theory

FF No.: 654

WATER SUPPLY ENGINEERING

Course Code: CV2004

Credits: 3 **Teaching Scheme: Theory: 2 Hours / Week**

Laboratory: 2 Hours / Week

Unit I: Water demand, quality, quantity and Conveyance (6 Hours)

Water supply system: Introduction, components Water demand: Usage and rates, governing factors, variation, estimation (present, intermediate, and ultimate) Water Quality: Physical, chemical, and biological parameters, IS 10500-2012, quantity of water required, population forecasting

Source works: Intake (types and location), types of river intake, jack well, pumping system, power and capacity of pump, conveyance system, forces acting, materials (Ductile Iron, Mild steel, and Plastic), laying of pipes, hydraulic analysis. Appurtenances: Valves type, thrust block concept.

Unit II: Water treatment (Aeration, mixing and settling) (6 Hours)

Treatment: Philosophy, unit processes and operations Aeration: process, types of aerators, design of cascade aerator Coagulation: Physics and chemistry, practice, design of rapid mixer Flocculation: Theory, design of clariflocculator. Settling: Theory, types of settling tanks, design of rectangular and circular types sedimentation tank. Concept of for type 1 and 2 settling.

Unit III: Water treatment (Filtration and disinfection) (6 Hours)

Granular Filtration: Classification, theory of deep mono and dual bed filter, components of deep bed filter, clean filter bed head loss, filter operation, problems in filtration.

Disinfection: Types, kinetics, chlorination, chemistry of chlorination, Chicks law, chlorine demand, chlorination practice, UV and Ozone disinfection

Unit IV: Advanced water treatment, Water distribution and Operation-Maintenance (6 Hours)

Membrane filtration: Types, basic concepts, applications. Adsorption: Introduction, basics of carbon **Adsorption. Ion Exchange**: Theory and principal of softener, package drinking water plant concept, concept of 24x7 water supply and SCADA system.

Water distribution: Methods, system configurations, hydraulic and functional requirements. Service reservoirs: Necessity, components, location, head, and capacity

Leakage: Causes, detection and control Water quality in distribution, Operation and maintenance: Water supply system

Laboratory:

List of practical – (Any Six of the following)

1. Determination of pH and Alkalinity from water.
2. Determination of Hardness from water.
3. Determination of chlorides from water.
4. Determination of optimum dose of alum.
5. Determination of chlorine dose and chlorine demand.
6. Determination of Iron or Manganese from water.
7. Determination of sulphate from water.
8. Determination of fluoride from water.
9. Design of 1MLD WTP in spread sheet or any software.
10. Site Visit on WTP describing Unit Operations in Water Treatment.

List of Assignments

1. Study of Plumbing fixture and accessories.
2. Types of Intake Structures.
3. Automation in Water Supply.

Oral Exam based on Practical's

Text Books:

1. S.K. Garg, Water Supply Engineering Vol. -1, Khanna Publication, New Delhi
2. B C Punmia, Environmental Engineering Vol. -1, Laxmi Publication, New Delhi

Reference Books:

1. G.S. Birdi -, Water supply & Sanitary Engg. Laxmi publications (p) Ltd. New Delhi
2. Mark J., Water & waste Water technology. Hammer, Prentice – Hall of India, New Delhi
3. H.S. Paeavy& D.R. Rowe, Environmental Engineering. McGraw Hill Book Co. New Delhi
4. G.M. Fair & J.C. Geyer, 1968, Water & Waste Water Technology. New York, NY, John Wiley &Sons Incorporated

Course Outcomes:

1. Explain water supply system, characteristics of water and estimate water requirements along with its conveyance
2. Explain the process of aeration, coagulation, flocculation, sedimentation.
3. Understand the process of filtration and disinfection
4. Explain advanced treatment systems through Membrane filtration, adsorption, Ion Exchange Process, and packaged drinking water plant and to explain the water distribution system, leakage, and maintenance.

Practical Outcome:

1. Determine chemical characteristics of water such as pH, alkanity, hardness, chloride, chlorine demand, iron or manganese, sulphate, fluoride, design of 1 MLD WTP by using excel or any software and site visit

FF No.: 654

CONCRETE TECHNOLOGY

Course Code: CV2005

Credits: 3	**Teaching Scheme: Theory: 2 Hours /Week** **Laboratory: 2 Hours/Week**

Unit I: Introduction to Concrete as a Construction Material (6 Hours)

Cement – manufacture of Portland cement, basic chemistry of cement, hydration of cement, classification of cement, types of cement, tests on cement-field tests & laboratory tests Fly Ash: Classification of fly ash, properties of fly ash, tests on fly ash.

Aggregate and water – Different classifications, Fine aggregate, coarse aggregate, mechanical properties, physical properties, deleterious materials, soundness, alkali-aggregate reaction, sieve analysis: fineness tests on aggregates, artificial and recycled aggregate, mixing water, curing water, tests on water. Admixtures – functions, classification, types: mineral and chemical, IS: specifications (9103 and 456), compatibility of admixtures.

Unit II: Properties, Production and Placement of Concrete (6 Hours)

Fresh concrete: Workability – factors affecting workability, cohesion and segregation, Bleeding, Laitance, mixing, handling, placing and compaction of concrete, Influence of temperature, maturity rule

Introduction to concrete related equipment's – Batching plants, hauling, pumps, Types of concrete mixers: Tilting, non-tilting and Reversible drum mixer, Types of vibrators Tests of fresh concrete – Workability by Slump cone, Compaction factor, Vee Bee consistometer and flow table test, Marsh cone test.

Unit III: Properties and tests on hardened concrete and Special Concretes (6 Hours)

Hardened concrete and its Testing – Strength of concrete, factors affecting strength, micro-cracking and stress-strain relationship, other strength properties, relation between tensile and compression strength, impact strength, abrasion resistance, elasticity and creep, shrinkage and swelling. Compression test on cube and cylinder, flexural test, indirect tensile strength, core test. Introduction to Nondestructive testing: Rebound hammer, Ultrasonic pulse velocity, Pullout test and Impact echo test, Rebar locator. Special concreting techniques: pumping of concrete, under water concreting, ready mix concrete, roller compacted concrete Cold weather concreting, hot weather concreting.

Special concretes – Lightweight concrete, Cellular light weight concrete-Form concrete and autoclave C.L.C, polymer concrete, types of fibers, fiber reinforced Concrete, high density concrete, self-compacting concrete, and applications. Ferrocement: Definition, Basic concepts in forming ferrocement composites.

Unit IV: Concrete Mix Design and Deterioration and repairs (6 Hours)

Concepts of Mix Design, Factors for proportioning of concrete. Factors to be considered, Statistical quality control, Laboratory trial mixes and guidelines to improve mix, methods of Mix Design for M25 and above grades by IS (10262:2019, IS456:2000) with and Without fly ash, Deterioration, and repairs of concrete.

Laboratory:

List of Experiments

The term work shall consist of a journal giving details of all the following experiments.

1. Fineness and standard consistency of cement.
2. Initial and final setting time and soundness of cement.
3. Compressive strength of cement.
4. Moisture content, silt content, and Specific gravity of fine aggregate
5. Fineness modulus by sieve analysis of fine aggregate.
6. Moisture content, water absorption, and Specific gravity of coarse aggregate
7. Density of coarse aggregate and Fine Aggregate.
8. Fineness modulus by sieve analysis and gradation of fine aggregates.
9. Workability of concrete by slump test, compaction factor, Vee Bee test, effect of admixture and retarders on setting time concrete.
10. Compressive strength test of concrete by crushing and Rebound hammer.
11. Indirect tensile strength and flexural strength of hardened concrete
12. Concrete mix design by IS code method and DOE method. Demonstration and application of concrete mix design software.
13. Site visit to RMC plant

Oral: Based on above syllabus and term work.

IS Codes :

IS 456, IS 383, IS 9103, IS 10262 Latest revised editions.

Text Books:

1. Concrete Technology by M. S. Shetty, S Chand, New Delhi-110055.
2. Concrete Technology by M. L. Gambhir, Tata McGraw-Hill.

Reference Books:

1. Properties of concrete by A. M. Neville, Longman Publishers.
2. Concrete Technology by R.S. Varshney, Oxford and IBH.
3. Concrete technology by A. M. Neville, J.J. Brooks, Pearson.
4. Ferrocement Construction Manual by Dr. D. B. Divekar-1030, Shivaji Nagar, Model Colony, Pune.
5. Concrete Mix Design by A. P. Remideos, Himalaya Publishing House.
6. Learning from Failures: Deficiencies in Design, Construction and Service, R& D Center, 1987.

Course Outcomes:

After completion of the course the students will have an ability to:

1. Identify the materials used to make concrete; including their sources, production, and properties.
2. Assess and practice standard tests relevant to the use and QAQC norms of fresh concrete and identify and select concrete handling equipment
3. Suggest suitable testing method of hardened concrete
4. Design concrete mix as per standard codes
5. Examine the durability requirements of concrete and choose suitable measures.

FF No.: 654

MECHANICS OF SOLIDS

Course Code: CV2006

Credits: 3 **Teaching Scheme: Theory: 2 Hours /Week**
Laboratory: 2 Hours/week

Unit 1: Shear Force Diagram and Bending Moment Diagram (5 Lectures)

Calculation of Bending moment (BM) and shear force (SF) for statically determinate beams.BM and SF diagrams and salient features, Concept of axial force/thrust diagram

Unit 2: Shear and Bending Stresses in Beams (7 Lectures)

Theory of simple bending, Assumptions, Determination of bending stresses and its distribution, Section modulus of rectangular and circular sections (Solid and Hollow), I, T, L sections. Shear stress formula, Determination of shear stress and its distribution for beam sections of rectangular and circular sections (Solid and Hollow), I, T, L sections

Unit 3: Direct and Bending Stresses and Introduction to Principal Stresses and Strains (6 Lectures)

Short and Long Columns: Direct and Bending Stresses Combined direct and bending stresses, eccentric load on short columns, kern of a section, eccentricity of load about both axes of section.
Introduction to Principal Stresses and Strains: Normal and tangential stresses, stress at a point on a plane, Principal stress, Principal planes, normal and shear stresses on oblique plane. (Numerical for ISA and not for ESA)

Unit 4: Deflection due to Bending and Torsion of circular shafts (6 Lectures)

Deflection of beams: Relationship between moment, slope and deflection, Macaulay ‘s method, unit load method. Concept of Moment Area Method and Conjugate Beam Method.

Laboratory:

List of Experiments
Any 6 experiments from the following:
1. Compression Test on Timber
2. Bending Test on Timber
3. Torsion test on mild steel and Aluminum
4. Izod and Charpy Impact test on mild steel, aluminum, brass and copper
5. Abrasion test on tile
6. Bending test on tile
7. Compression test on bricks
8. Experiment using Virtual Laboratory

Text books:

1. S.S. Rattan; Strength of Materials; Tata Mc Graw Hill Education Pvt. Ltd. New Delhi; 2011
2. S.Ramamrutham; Strength of Materials; Dhanapat Rai Publishing Company;2011
3. Dr. Sandhu Singh; Strength of Materials; Khanna Publishers;2013
4. S.B. Junnerkar and H.J. Shaha; Mechanics of Structures Vol. I; Charotar Publishing House;2012
5. Dr. R.K.Bansal ; Strength of Materials; Laxmi Publications (P) Ltd;2018

Reference Books:

1. S. Timoshenko and D.H.Young;Elements of Strength of Materials; East-West Press Ltd;2003
2. R.C.Hibbler; Structural Analysis”, Pearson; 2017
3. E.P.Popov,; Mechanics of Materials; Prentice Hall Publishers;2017
4. F.L.Singer and Andrew Pytel; Strength of Materials; Harper and Row Publication;1987

Course Outcomes:

Upon the completion of the course, students will be able to
1. Apply equilibrium equations to calculate the internal forces namely axial shear forces and bending moments for determinate beams and draw SFD and BMD
2. Determine and plot bending stress and shear stress distribution in determinate beams
3. Determine direct and bending/buckling stresses for columns
4. Determine slope and deflection of determinate beams

FF No.: 654

CLIMATOLOGY

Course Code: CVM001

Credits: 3	**Teaching Scheme: Theory: 2 Hours /Week** **Tutorial: 1 Hour/Week**

Unit I - Atmospheric Structure and Climate (6 Hours)

Atmospheric structure and composition, Solar radiation and global energy budget, External and internal forcing, Climate feedbacks, Account of past climate, Environmental indicators and instrumental records

Unit II – Global Warming and Impact of Climate Change (6 Hours)

Human footprints on global warming, Predicting future climate, Temperature regimes, Extreme climate events Impact of climate change on agriculture, Impact of climate change on Livestock, Impact of climate change on biodiversity, Impact of climate change on water resources, Impact of climate change on livelihood, Impact of climate change on human health

Unit III– Climate Change and its mitigation (6 Hours)

Climate change vulnerability assessment, IPCC, Life Cycle Assessment, Geoinformatics in Climate Change Studies, Concept of mitigation and adaptation

Unit IV - International and national level initiatives on Climate Change (6 Hours)

Climate smart agriculture, Soil carbon sequestration, Biofuels, Climate Refugees, Climate Justice, Climate Change and Gender, International Initiatives, National Level Action Plan, State Level

Tutorials:

Two Assignments on each unit

Text Books:

1. Global Warming and Climate Change by Agarwal S. K., First Edition, A P H Publishing Corporation, 2004
2. Foundations of Climatology by E.T. Stringer, Surjeet Publications, Delhi,1989
3. Impact of climate change on water resources Climate by Raju, K. Srinivasa, and D. Nagesh Kumar, 2018

Reference Books:

1. The rough guide to climate change by Robert Henson, London, New York, 2008. 2nd edition

2. Primer on Climate Change and Sustainable Development by Mohan Munasinghe and Rob Swart, Cambridge University Press, 2005

3. Barry RG and Chorley RJ. (2010). Atmosphere, weather and climate. 8th Edition. Routledge, New York. pp.421

4. Burroughs WJ (2007) Climate Change: A multidisciplinary approach. 2nd Edition. Cambridge University Press. Pp.390. ISBN: 978-0-521-69033-1

5. Dessler A (2016) Introduction to Modern Climate Change. 2nd Edition. Cambridge University Press. ISBN: 978-521-17315-5

MOOCs Links and additional reading material:

1. https://www.ipcc.ch/assessment-report/ar5/
2. https://www.coursera.org/specializations/climatechangeandsustainableinvesting
3. https://moef.gov.in/moef/about-the-ministry/index.html

Course Outcomes:

At the end of the course the students will be able to:

1. Classify the Atmospheric Structure and Define the global energy budget, External and internal forcing
2. Explain the basic concepts of Human footprints on global warming, Predicting future climate, Temperature regimes and Extreme climate events
3. Explain the effect of Climate change on environment and its mitigation
4. Explain the importance of climate change at National and International Level

FF No.: 654

FROM CAMPUS TO CORPORATE

Course Code: HS2002

Credits: 2	**Teaching Scheme: Theory: 2 Hours /Week**

FF No.: 654

REASONING AND APTITUDE DEVELOPMENT 3

Course Code: HS2001

Credits: 1	**Teaching Scheme: Tutorial: 1 Hour /Week**

English Language

Familiarity with English Language, Ability to understand written text, spoken word and effective communication through written documents; Coverage of vocabulary to cope up with general and specific terminology, syntax and sentence structure, prevention of incorrect use leading to distortion in communication; synonyms, antonyms and contextual vocabulary, Grammar – Error identification, sentence improvement and construction, Reading Comprehension

Logical Ability

Objective interpretation of things, ability to perceive and interpret trends to make generalizations; ability to analyze assumptions behind an argument or statement; Deductive reasoning: Assessment of ability to synthesize information and derive conclusions - Coding deduction logic, Data Sufficiency, Directional Sense, Logical word sequence, Objective reasoning, Selection and decision tables, puzzles; Inductive reasoning: Assessment of ability to learn by example, imitation or by trial – Analogy pattern recognition, Classification pattern recognition, Coding pattern recognition, Number series pattern recognition; Abductive reasoning: Critical thinking ability of seeing through logical weak links or loopholes in an argument or a group of statements; Critical reasoning: assessment of ability to think through and analyze logical arguments, assessment of ability to use logical constructs to offer reasoning in unfamiliar situations; Information Gathering and synthesis: Ability of locating information, information ordering, rule based selection and data interpretation, order and classify data, interpret graphs, charts, tables and make rule based deductions. Application of these approaches for using visual, numerical and textual data from single or multiple sources.

Quantitative Ability

Basic numbers – decimals and fractions, factorization, divisibility: HCF, LCM, Odd, even, prime and rational numbers. Application of algebra to real world, direct and inverse proportion, common applications – Speed-time -distance, Profit-loss, percentage, age relations, mixtures, other miscellaneous quantitative combination, exponentials and logarithms, permutations and combinations, probability. Spatial reasoning: Inductive – Missing portions, Sequence and series; Deductive analysis.

Reference Books –

1. "English Grammar in Use" by Raymond Murphy, Cambridge University Press.
2. "Word Power Made Easy" by Norman Lewis, Goyal Publishers & Distributors.
3. "Objective General English" by S.P. Bakshi, Arihant Publications.
4. "English for Competitive Examinations" by K. Sinha, S. Chand Publishing.
5. "Essential English Grammar" by Philip Gucker, Wiley.
6. "English Idioms and Phrasal Verbs" by M.A. Yadav, Vikas Publishing House.
7. "The Oxford English Grammar" by Sidney Greenbaum, Oxford University Press.
8. "A Modern Approach to Verbal & Non-Verbal Reasoning" by R.S. Aggarwal, S. Chand Publishing, ISBN: 978-8121903409.
9. "Logical Reasoning and Data Interpretation for the CAT" by Nishit K. Sinha, Pearson India, ISBN: 978-8131709117.
10. "Logical Reasoning and Data Interpretation for the CAT" by Arun Sharma, McGraw Hill Education, ISBN: 978-0070709642.
11. "A New Approach to Reasoning Verbal and Non-Verbal" by B.S. Sijwali & Indu Sijwali, Arihant Publications, ISBN: 978-9311124692.
12. "Quantitative Aptitude for Competitive Examinations" by R.S. Aggarwal, S. Chand Publishing, ISBN: 978-8121900637.
13. "How to Prepare for Quantitative Aptitude for the CAT" by Arun Sharma, McGraw Hill Education, ISBN: 978-0070709642.
14. "The Pearson Guide to Quantitative Aptitude for Competitive Examination" by Pearson, Pearson India, ISBN: 978-8131709117.
15. "Quantitative Aptitude for Competitive Examinations" by Abhijit Guha, Tata McGraw Hill Education, ISBN: 978-0070666653.
16. "Data Interpretation & Data Sufficiency" by R.S. Aggarwal, S. Chand Publishing ISBN: 978-8121903515.
17. "Quantitative Aptitude for Competitive Examinations" by S. Chand, S. Chand Publishing, ISBN: 978-8121903423.

Automata Module:

Automata i s a path breaking tool to evaluate programming skills in a simulated environment. With capability to evaluate programming code beyond correctness and ability to rate code quality, efficiency of execution and

provide objective norm-based scores.
Scientifically designed question bank consisting of a wide range of easy to hard programming problems with smartly designed corner and generic tests cases, Knowledge of algorithms, data structures, concepts like recursion, dynamic memory allocation and modular programming. The compiler supports multiple programming languages such as C, C++, Java, etc. The question bank includes distinct problem sets for IT Product and IT Services companies. B asic, advanced and edge test cases designed for a problem, the code is checked thoroughly for correctness and completeness. It can evaluate the time complexity or simply the efficiency of the code. The code is scored on quality of the code based on industry defined best practice

Automata Pro
It can be effectively used for fresher hiring as well as hiring lateral programmers. The assessment allows evaluation of actual programming skills of a candidate, giving the candidate an opportunity to write the program in an editor, compile and run test cases, all in the assessment environment itself.

Automata Fix
Automata fix assesses the candidate's skill to diagnose and identify any bugs in code and fix them.

Reference Books for Automata Module :
1. "Data structures using C and C++", Y. Langsam, M.J. Augenstein, A.M.Tenenbaum, Pearson Education, Second Edition.
2.Programming Pearls" by Jon Bentley, ISBN 13: 978 1449357162,O'Reilly Media.
3. "Introduction to the Theory of Computation" by Michael Sipser, ISBN 13: 978 1133187790, Cengage Learning.
4. "Algorithms" by Robert Sedge wick and Kevin Wayne, ISBN 13: 978 0321573513, Publisher: Addison Wesley.
5."Data Structures and Algorithm Made Easy", Narasimha Karumanchi, Fifth Edition, CareerMonk publication.
6. "The Art of Computer Programming" by Donald E. Knuth, Addison Wesley.
7. "Operating System Concepts" by Abraham Silberschatz, Henry Korth, and S. Sudarshan, ISBN10:1119946005, Wiley.

MOOCs Links for Automata:
1. www.nptelvideos.in

FF No.: 654

DESIGN THINKING 3

Course Code: CV2001

Credits: 1	**Teaching Scheme: Tutorial: 1 Hour /Week**
Course Prerequisites: Problem Based Learning, Project Centric Learning	
Course Objective: To provide ecosystem for students and faculty for paper publication and patent filing	
Section 1: Topics/Contents	
1)What is research? 2) Importance of Paper Publication and Patents 3) Structure of Paper 4) Journal Publication 5) Publication in conference 6) Literature Review 7) Research Paper Writing 8) Journal Ratings and Evaluation 9) How to rate a Journal? 10) Intellectual property (IP) 11) Research Ethics 12) Entrepreneurship	
Section 2: Topics/Contents	
1)Structure of the paper 2) Journal List (Top 50 Journals) 3) Selection of the journal 4) Use of various online journal selection tools 5) Plagiarism checking 6) Improving contents of the paper 7) Patent drafting Patent search 8) Filing of patent 9) Writing answers to reviewer questions 10) Modification in manuscript 11) Checking of publication draft	
Course Outcome: [Publication of paper or patent] The student will be able to 1. Understand the importance of doing Research 2. Interpret and distinguish different fundamental terms related to Research 3. Apply the methodology of doing research and mode of its publication 4. Write a Research Paper based on project work 5. Understand Intellectual property rights 6. Use the concepts of Ethics in Research 7. Understand the Entrepreneurship and Business Planning	

FF No.: 654

ENGINEERING DESIGN AND INNOVATION 3

Course Code: CV2002

Credits: 2	**Teaching Scheme: Laboratory: 4 Hours / Week**

FF No.: 654

STRUCTURAL ANALYSIS

Course Code: CV2009

Credits: 3 **Teaching Scheme: Theory: 2 Hours / Week**

Laboratory: 2 Hour / Week

Unit 1: Influence Line Diagram and Three Hinged Arches. (6 lectures)

Influence Line Diagram: Basic concepts, influence line diagram for reactions, shear and bending moment for simply supported and overhanging beams and Trusses Three Hinged Arches: Concept, analysis of parabolic and semicircular arch with supports at same and different levels. Horizontal thrust, radial shear and normal thrust for parabolic and semicircular arch

Unit 2: Three Moment Theorem and Castigliano's Second Theorem. (6 lectures)

Static and Kinematic redundancy of beams, trusses and frames. Clapeyron's Theorem of Three Moments, Application of the theorem to indeterminate beams with settlement of supports having static indeterminacy not more than 2. Castigliano's Second Theorem, Application of the theorem to indeterminate beams having static indeterminacy not more than 2.

Unit 3: Slope Deflection Method and Moment Distribution Method (6 lectures)

Introduction to Slope Deflection Method, sign conventions, fixed end moments, development of slope deflection equations, Application to indeterminate beams and non-sway frames having degree of Indeterminacy not more than 2. Introduction to Moment Distribution Method, carry over moment, distribution factors, modification of stiffness for simple ends, Application to indeterminate beams and non-sway frames having degree of indeterminacy not more than 2.

Unit 4: Flexibility and Stiffness Method (6 lectures)

Flexibility Method: Fundamental concepts, formulation of flexibility matrix, application to beams and sway and non-sway frames. (degree of Indeterminacy not more than 2) Stiffness Method: Fundamental concepts, formulation of stiffness matrix, application to indeterminate beams and non-sway frames using member approach. (degree of Indeterminacy not more than 2)

Laboratory

List of Assignments

1. Calculation of support reactions, shear Force and bending moment at any section of simple beam using the concepts of Influence Line Diagram
2. Calculation of support reactions, normal thrust and radial shear at any section for a three hinged parabolic and semi-circular arch
3. Computation of support moments for a two-span and three span continuous beams with different types of supports using Three Moment Theorem
4. Computation of support moments for two-span continuous beams with different types of supports using Castigliano's II Theorem
5. Computation of support moments for a two-span and three span continuous beams/ non sway frames with different types of supports using Slope Deflection Method
6. Computation of support moments for a two-span and three span continuous beams/ non sway frames with different types of supports using Moment Distribution Method
7. Computation of support moments for a two-span and three span continuous beams/ non sway frames with different types of supports using Flexibility Method
8. Computation of support moments for a two-span and three span continuous beams/ non sway frames with different types of supports using Stiffness Method

Text Books:

1. S.B. Junnerkar and H.J. Shah;,Mechanics of Structures-Vol II; Charotar Publishing House,2015
2. B.C.Punmia, Ashok kumar Jain and Arun Kumar Jain; Theory of Structures; Laxmi Publications (P) Ltd.;2017
3. S.Ramamrutham and R. Narayan; Theory of Structures; Dhanpat Rai Publishing Company, 2017
4. S.S.Bhavikatti; Structural Analysis-II; Vikas Publishing House Pvt. Ltd.; 2018

Reference Books:

1. Devdas Menon; "Advanced Structural Analysis" Narosa Publishing House, Mumbai;2009
2. R.C.Hibbler;Structural Analysis; Pearson Publications; 2017
3. Dr. A.S.Meghre and S.K.Deshmukh; Matrix Methods of Structural Analysis; Charotar Publishing House;2016

Course Outcomes:

1. Analyze the determinate beams using the concept of Influence Line Diagram and analyze the three hinged arches
2. Analyze the indeterminate beams using Three Moment Theorem, Castigliano's II Theorem,
3. Analyze the indeterminate beams and frames using Slope-Deflection Method, Moment Distribution Method
4. Analyze the indeterminate beams and frames using matrix methods: Flexibility Method and Stiffness Method

FF No.: 654

GEOMATICS ENGINEERING

Course Code: CV2010

Credits: 3 **Teaching Scheme: Theory: 2 Hours / Week**

Laboratory: 2 Hours / Week

Unit I: Traversing and Triangulation (6 Hours)

Theodolite: Study of theodolite (vernier and micrometer), uses of theodolite. Fundamental axes of theodolite: permanent adjustments of a transit theodolite. (1 Lecture)

Traversing: computation of consecutive and independent co-ordinates, adjustment of closed traverse by transit rule and Bowditch's rule, Gale's traverse table. Checks, omitted measurements, area calculation by independent coordinates. (3 Lectures)

Geodetic Survey: Objective, Introduction to Triangulation, classification of Triangulation Systems, Triangulation figures, Concept of well-conditioned Triangle, selection of stations, intervisibility and height of stations. (2 Lectures)

Unit II: Tacheometry, Setting-Out and Curves (6 Hours)

Tachometry: application and limitations, principle of stadia tachometry, fixed hair method with vertical staff to determine horizontal distances and elevations of points. (3 Lectures)

Setting-Out Works - buildings, maintaining verticality of tall buildings, bridges, and tunnels. (1 Lectures)

Curves: horizontal and vertical curves, different types and their applications, simple circular curves, elements and setting out by linear and angular methods (Numerical on simple circular curves only), Transition curves: necessity and types. (2 Lectures)

Unit III: Theory of Errors and Triangulation Adjustment (6 Hours)

Kinds of errors, Laws of weights, Determination of most probable values (MPV) of conditioned and independent quantities, Method of least squares, Indirect observations, Probable error and its determination, Distribution of error to the field measurements, Normal equation, Method of correlates. Station and figure adjustment of geodetic quadrilateral without central station. Spherical triangle, Calculations of spherical excess and sides of spherical triangle. (6 Lectures)

Unit IV: Modern Techniques in Surveying (6 Hours)

Aerial Photogrammetry: Objects, Classification- qualitative and quantitative photogrammetry Applications, comparison of map and aerial photograph, Vertical, Tilted and Oblique photographs, Scale of and Relief displacement in vertical photograph, Stereoscopic parallax and its measurement by parallax bar. Mirror stereoscope, Differential height from differential parallax. Ground control points (GCPs), Flight planning. (3 Lectures)

Satellite based positioning systems (SBPS): SBPS systems - GPS, Glonoss, Galileo, Navic, Compass, etc. and their features, Segments of SBPS (Space, Control and User), their importance and role in SBPS, Positioning with SBPS - Absolute and Differential Methods, Use of SBPS in Surveying, SBPS Co-ordinates and heights, Different types of errors in SBPS Positioning. (1 Lecture)

Remote Sensing & GIS: Basic concepts in Remote Sensing, Basic Laws of electromagnetic radiation, Atmospheric effects on radiation, Interaction of EM energy with matter. Applications of remote sensing. Geographical Information System: Components (people, procedure, hardware, software & data) & functions of GIS. Coordinate systems and projections, Georeferencing, GIS data – spatial (Raster & vector) & aspatial data. Applications of GIS in civil engineering. Limitations of GIS. (2 Lectures)

Laboratory:

List of Experiments (Perform any 8):

1. Measurement of horizontal and vertical angles using 20" vernier Theodolite by repetition method.
2. Measurement of horizontal and vertical angles with 1" theodolite.
3. Finding horizontal and vertical distance using Tachometer.
4. Radial contouring: Plotting of contours from one station
5. Setting out a building from a given foundation plan (minimum six co-ordinates).
6. Setting out a circular curve by Rankine's method of deflection angles.
7. Practical based on measurement with total station (angles, distance, remote elevation measurements, and remote distance measurements)
8. Determination of air base distance using mirror stereoscope.
9. Determination of difference in elevation by parallax bar.

10. Use of RS images and visual interpretation
11. Use of interface and tools in GIS software such as GRAM++ or QGIS or equivalent software.

List of Projects:

Perform any two:

1. Traversing: Plotting traverse and finding out its area using vernier/micrometer Theodolite
2. Adjustment of geodetic quadrilateral without central station by method of correlates.
3. Field survey (500 sq.m.) using GPS (Control as well as mapping).
4. Radial contouring: Plotting of contours from two stations minimum 60m to 100m apart.

Textbooks:

1. Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain, (2005) "Surveying Vol. I and Vol. II", Laxmi Publications Pvt Limited
2. N.N. Basak, (2014), "Surveying and Levelling", McGraw Hill Education
3. R. Subramanian, (2012) "Surveying and Levelling", Oxford University Press
4. T. P. Kanetkar and S. V. Kulkarni, (2010) "Surveying and Levelling Vol I and Vol. II", Vidyarthi Griha Prakashan.
5. Basudeb Bhatta (2011) "Remote Sensing and GIS", Oxford University Press

Reference Books:

1. J. Uren, W.F. Price, (2010), "Surveying for Engineers", Palgrave Macmillan
2. S.K. Duggal, (2013), "Surveying Vol. I and Vol. II", McGraw Hill Education
3. James McMurry Anderson, James M Anderson, Edward M Mikhail, (1998), "Surveying: Theory and Practice", McGraw-Hill Education
4. Russell C. Brinker, (2013), "The Surveying Handbook", Springer US
5. Peter A. Burrough, Christopher D. Lloyd, Rachel A. Mcdonnell (2015) "Principles of Geographical Information System"' Oxford University Press
6. Satheesh Gopi, R. Sathikumar, N. Madhu (2014) "Advanced Surveying -Total Station, GIS and Remote Sensing", Pearson Publication

MOOCs Links and additional reading material:

https://nptel.ac.in/courses/105104101
https://nptel.ac.in/courses/105107121

Course Outcomes:

Upon completion of the course, students will be able to

1. **Perform** traversing using a Theodolite.
2. **Explain** triangulation method for geodetic survey and **determine** intervisibility of triangulation stations
3. **Determine** reduced level of points using Tacheometry and **draw** a contour map
4. **Design** and set out horizontal curve on ground.
5. **Compute** most probable values of angles in triangulation, considering plane and spherical angles
6. **Describe** classification, applications, flight planning in aerial photogrammetry and **determine** scale and relief displacement in vertical photograph
7. **Explain** fundamentals of segments, positioning methods, and errors in Space Based Positioning System
8. **Describe** concepts, physical fundamentals, and components of Remote Sensing
9. **Describe** objectives, components, limitations, and applications of Geographical Information System

FF No.: 654

WASTEWATER ENGINEERING

Course Code: CV2011

Credits: 3	**Teaching Scheme: Theory: 2 Hour / Week** **Lab: 2 Hours / Week**

Unit I - Waste Water and Treatment Concept (6 Hours)

Fundamentals of waste water, types of waste water, Characteristics of sewage: physical, chemical and biological, effluent standards as per CPCB/MPCB norms, unit operation and process, treatment system such as preliminary, primary, secondary and tertiary, functions of treatment plant. Flow rate concept of mass flow rate, types of reaction and reactors. Concept for HRT, SLR, WLR.

Unit II – Stream Sanitation, Preliminary and Primary Treatment Units (6 Hours)

Stream sanitation: Self-purification of natural streams, Oxygen Sag Curve, Streeter -Phelps equation and terminology (without derivation and numerical).
Analysis of flow measurement, equalization basin, screen chamber, grit chamber, oil and grease trap. Design of circular sanitary sewers pipe system. Design of primary and secondary sedimentation tank.

Unit III– Biological treatment of waste water (6 Hours)

Secondary Biological treatment unit: Suspended growth process, consideration of HRT, MCRT,F/M ratio, OLR, Qty. of oxygen required, Power required, sludge production, sludge flow rate, recycling ratio. Secondary Biological treatment unit: Attach growth process. Tricking (NRC equation), introduction to bio- towers

Unit IV -Anaerobic Biological Treatment, sludge treatment and Low Cost Treatments (6 Hours)

Anaerobic treatment process, anaerobic reactor types. Principle of anaerobic digestion, stages of digestion, factors governing anaerobic digestion, Dewatering of sludge by gravity thickener, sludge drying bed, decanters. Methods of sludge treatment and disposal. Up-flow Anaerobic Sludge Blanket (UASB) Reactor–Principle.
Oxidation pond: Bacteria –algae symbiosis, oxidation pond as per the manual of CPHEEO, advantages and disadvantages of oxidation ponds.
Aerated lagoons: Principle, aeration method, advantages and disadvantages of aerated Lagoons, Removal of nutrient process such as phosphate, nitrate from waste water.

Laboratory:

List of practical – (Any Six of the following)

1. Determination of dissolved oxygen
2. Determination of biological oxygen demand
3. Determination of chemical oxygen demand
4. Determination of sludge volume index.
5. Determination of phosphate or nitrate
6. Determination of solids such as suspended, total, fixed
7. Determination of total dissolved solids by conductivity method
8. Visit to sewage treatment plant (STP)
9. Design of 1 MLD STP by using any software or excel sheet.

Text Books:

1. Environmental studies by Rajgopalan -Oxford University Press.
2. Waste Water Treatment and Disposal –Metcalf and Eddy -TMH publication.
3. Environmental Engg. -Peavy, Rowe-McGraw Hill Publication.
4. Waste Water Treatment -Rao and Dutta.

Reference Books:

1. Waste Water Engg. –B.C. Punmia and Ashok Jain -Arihant Publications.
2. Water Supply and Waste Water Engg.-B.S.N. Raju –TMH publication.
3. Sewage Disposal and Air Pollution Engg. –S. K. Garg–Khanna Publication.
4. Environmental Engg. –Davis -McGraw Hill Publication
5. Manual on sewerage and sewage treatment –Public Health Dept., Govt. of India.
6. Standard Methods by APHA.

Course Outcomes :

At the end of the course the students will be able to:

1. Explain the process used in waste water treatment
2. Design preliminary and primary treatment units for sewage treatment and understand stream sanitation.
3. Design of Secondary Biological treatment unit
4. Develop Low cost treatment and advance treatment methods of waste water

FF No.: 654

GEOTECHNICAL ENGINEERING

Course Code: CV2012

Credits: 3	**Teaching Scheme: Theory: 2 Hours /Week** **Practical: 2 Hours/Week**

Unit-I Index Properties of Soil (6 Hours)

Need for soil mechanics studies, Soil as an engineering material - Scope of Geotechnical engineering. Major soil deposits of India, Index properties of soil and rock, three phase soil system, Soil minerals, Soil structures, Weight volume relationship, Index properties of soil and rock.

Soil water, permeability definition and necessity of its study, Darcy's law, factors affecting permeability. Laboratory measurement of permeability – Constant head method and Falling head method as per IS 2720. Field test for determination of permeability test as per IS. Permeability of stratified soil deposits.

Seepage and Seepage Pressure, quicksand phenomenon, critical hydraulic gradient, General flow equation for 2-D flow (Laplace equation), Flow Net, properties and application, Flow Net construction for flow under sheet pile and earthen dam.

Unit-II Compaction and Stress Distribution (6 Hours)

Introduction, Standard Proctor test, Modified Proctor test, Zero air void line. Factors affecting compaction. Effect of compaction on soil properties. Field compaction methods and compaction equipment is for different types of soil, Field compaction control

Geostatic stress, Boussinesq's theory with assumptions for point load (with numerical), equations for circular load, line load and strip load, Pressure Distribution diagram on a horizontal and vertical plane, Pressure bulb and its significance. Westergaard's theory, equivalent point load method, Approximate stress distribution method.

Unit-III Shear Strength of Soil (6 Hours)

Mohr's stress circle, Mohr-Coulomb failure theory. The effective stress principle- Total stress, effective stress and neutral stress / pore water pressure. Peak and Residual shear strength, factors affecting shear strength. Stress-strain behavior of sands and clays. Direct Shear test, Tri-axial compression test, Unconfined Compression test, Vane Shear test. (Different drainage conditions for shear tests). Sensitivity and thixotropy of cohesive soils.

Unit-IV Earth Pressure theory and Stability of Slope (6 Hours)

Earth Pressure – Introduction, Rankine's state of Plastic Equilibrium in soils- Active and Passive states due to wall movement, Earth Pressure at rest. Rankine's Theory: Earth pressure on Retaining wall due to submerged backfill. Backfill with uniform surcharge, backfill with sloping surface, layered backfill. Coulomb's Wedge theory. Rebhann's and Culmann's graphical method of determination of earth pressure.

Classification and failure of slopes, Finite slope stability by Swedish circle method with slip circle and method of slices, Soil stabilization, its necessity and methods. Landslides- Causes and remedial measures.

Rock quality designation, Rock mass classification, Laboratory methods to determine strength of rocks, Determination of Bearing capacity

Laboratory:

List of Practical's and Project work:

1. Determination of water content and specific gravity of soil
2. Sieve analysis, particle size determination and IS classification as per I. S. Codes.
3. Determination of Consistency limits and their use in soil classification. as per I. S. Codes.
4. Field density test by a) Core cutter b) Sand Replacement
5. Determination of coefficient of permeability by a) constant head and b) variable head method.
6. Direct shear test.
7. Unconfined compression test.
8. Vane Shear test.
9. Standard Proctor test / Modified Proctor test.
10. Differential free swell test.

11. Demonstration of Tri-axial test
12. Swelling Pressure test
13. Any one of the following assignments-
a) Review of any field geotechnical investigation report.
b) Construction of pressure bulb by using any geotechnical engineering software.
14. Assignments on the following topics
a) Rebhann's and Cullman's graphical method for determination of earth pressure.
b) Solution of problems on shear strength parameters using graph.

Text books:

1. Punmia B. C, (2017), "Soil Mechanics and Foundation Engineering". Laxmi Publications.
2. Shashi K. Gulati and Manoj Datta (2018), "Geotechnical Engineering", Tata McGraw Hill.
3. Murthy, V. N. S., (2000), "Principles of Soil Mechanics and Foundation Engineering", UBS Publishers
4. Mukherjee, P. K. (2013), "A Text Book of Geology", World press Publishers.

Reference Books:

1. Terzaghi and Peck (1996), "Soil mechanics and engineering Practice" John Wiley & Sons
2. Joseph. E. Bowles (2001),"Physical and Geotechnical Properties of Soils", International Students Edition
3. Das B. M. (2010), "Principles of Geotechnical Engineering", Cengage Learning

Course Outcomes: At the end of the course the students will be able to:

1. Classify the different types of soil with their index properties and Explain permeability and seepage through soil
2. Determine compaction properties and stress, and methods to determine stress distribution in the soils.
3. Calculate shear strength parameters of soil and explain methods to determine shear strength of soils.
4. Compute the lateral thrust due to backfill on the retaining walls and Describe soil slopes.

FF No.: 654

CLIMATOLOGY

Course Code: CVM001

Credits: 3	**Teaching Scheme: Theory: 2 Hours /Week** **Tutorial: 1 Hour/Week**

Unit I - Atmospheric Structure and Climate (6 Hours)

Atmospheric structure and composition, Solar radiation and global energy budget, External and internal forcing, Climate feedbacks, Account of past climate, Environmental indicators and instrumental records

Unit II – Global Warming and Impact of Climate Change (6 Hours)

Human footprints on global warming, Predicting future climate, Temperature regimes, Extreme climate events Impact of climate change on agriculture, Impact of climate change on Livestock, Impact of climate change on biodiversity, Impact of climate change on water resources, Impact of climate change on livelihood, Impact of climate change on human health

Unit III– Climate Change and its mitigation (6 Hours)

Climate change vulnerability assessment, IPCC, Life Cycle Assessment, Geoinformatics in Climate Change Studies, Concept of mitigation and adaptation

Unit IV - International and national level initiatives on Climate Change (6 Hours)

Climate smart agriculture, Soil carbon sequestration, Biofuels, Climate Refugees, Climate Justice, Climate Change and Gender, International Initiatives, National Level Action Plan, State Level

Tutorials:

Two Assignments on each unit

Text Books:

4. Global Warming and Climate Change by Agarwal S. K., First Edition, A P H Publishing Corporation, 2004
5. Foundations of Climatology by E.T. Stringer, Surjeet Publications, Delhi,1989
6. Impact of climate change on water resources Climate by Raju, K. Srinivasa, and D. Nagesh Kumar, 2018

Reference Books:

1. The rough guide to climate change by Robert Henson, London, New York, 2008. 2nd edition

2. Primer on Climate Change and Sustainable Development by Mohan Munasinghe and Rob Swart, Cambridge University Press, 2005

3. Barry RG and Chorley RJ. (2010). Atmosphere, weather and climate. 8th Edition. Routledge, New York. pp.421

4. Burroughs WJ (2007) Climate Change: A multidisciplinary approach. 2nd Edition. Cambridge University Press. Pp.390. ISBN: 978-0-521-69033-1

5. Dessler A (2016) Introduction to Modern Climate Change. 2nd Edition. Cambridge University Press. ISBN: 978-521-17315-5

MOOCs Links and additional reading material:

1. https://www.ipcc.ch/assessment-report/ar5/
2. https://www.coursera.org/specializations/climatechangeandsustainableinvesting
3. https://moef.gov.in/moef/about-the-ministry/index.html

Course Outcomes:

At the end of the course the students will be able to:

5. Classify the Atmospheric Structure and Define the global energy budget, External and internal forcing
6. Explain the basic concepts of Human footprints on global warming, Predicting future climate, Temperature regimes and Extreme climate events
7. Explain the effect of Climate change on environment and its mitigation
8. Explain the importance of climate change at National and International Level

FF No.: 654

FROM CAMPUS TO CORPORATE 2

Course Code: HS2004

Credits:2	**Teaching Scheme: Theory: 2 Hours / Week**

FF No.: 654

REASONING AND APTITUDE DEVELOPMENT 4

Course Code: HS2003

Credits: 1	**Teaching Scheme: Tutorial: 1 Hour /Week**

English Language

Familiarity with English Language, Ability to understand written text, spoken word and effective communication through written documents; Coverage of vocabulary to cope up with general and specific terminology, syntax and sentence structure, prevention of incorrect use leading to distortion in communication; synonyms, antonyms and contextual vocabulary, Grammar – Error identification, sentence improvement and construction, Reading Comprehension

Logical Ability

Objective interpretation of things, ability to perceive and interpret trends to make generalizations; ability to analyze assumptions behind an argument or statement; Deductive reasoning: Assessment of ability to synthesize information and derive conclusions - Coding deduction logic, Data Sufficiency, Directional Sense, Logical word sequence, Objective reasoning, Selection and decision tables, puzzles; Inductive reasoning: Assessment of ability to learn by example, imitation or by trial – Analogy pattern recognition, Classification pattern recognition, Coding pattern recognition, Number series pattern recognition; Abductive reasoning: Critical thinking ability of seeing through logical weak links or loopholes in an argument or a group of statements; Critical reasoning: assessment of ability to think through and analyze logical arguments, assessment of ability to use logical constructs to offer reasoning in unfamiliar situations; Information Gathering and synthesis: Ability of locating information, information ordering, rule based selection and data interpretation, order and classify data, interpret graphs, charts, tables and make rule based deductions. Application of these approaches for using visual, numerical and textual data from single or multiple sources.

Quantitative Ability

Basic numbers – decimals and fractions, factorization, divisibility: HCF, LCM, Odd, even, prime and rational numbers. Application of algebra to real world, direct and inverse proportion, common applications – Speed-time -distance, Profit-loss, percentage, age relations, mixtures, other miscellaneous quantitative combination, exponentials and logarithms, permutations and combinations, probability. Spatial reasoning: Inductive – Missing portions, Sequence and series; Deductive analysis.

Reference Books –

1. "English Grammar in Use" by Raymond Murphy, Cambridge University Press.
2. "Word Power Made Easy" by Norman Lewis, Goyal Publishers & Distributors.
3. "Objective General English" by S.P. Bakshi, Arihant Publications.
4. "English for Competitive Examinations" by K. Sinha, S. Chand Publishing.
5. "Essential English Grammar" by Philip Gucker, Wiley.
6. "English Idioms and Phrasal Verbs" by M.A. Yadav, Vikas Publishing House.
7. "The Oxford English Grammar" by Sidney Greenbaum, Oxford University Press.
8. "A Modern Approach to Verbal & Non-Verbal Reasoning" by R.S. Aggarwal, S. Chand Publishing, ISBN: 978-8121903409.
9. "Logical Reasoning and Data Interpretation for the CAT" by Nishit K. Sinha, Pearson India, ISBN: 978-8131709117.
10. "Logical Reasoning and Data Interpretation for the CAT" by Arun Sharma, McGraw Hill Education, ISBN: 978-0070709642.
11. "A New Approach to Reasoning Verbal and Non-Verbal" by B.S. Sijwali & Indu Sijwali, Arihant Publications, ISBN: 978-9311124692.
12. "Quantitative Aptitude for Competitive Examinations" by R.S. Aggarwal, S. Chand Publishing, ISBN: 978-8121900637.
13. "How to Prepare for Quantitative Aptitude for the CAT" by Arun Sharma, McGraw Hill Education, ISBN: 978-0070709642.
14. "The Pearson Guide to Quantitative Aptitude for Competitive Examination" by Pearson, Pearson India, ISBN: 978-8131709117.
15. "Quantitative Aptitude for Competitive Examinations" by Abhijit Guha, Tata McGraw Hill Education, ISBN: 978-0070666653.
16. "Data Interpretation & Data Sufficiency" by R.S. Aggarwal, S. Chand Publishing ISBN: 978-8121903515.
17. "Quantitative Aptitude for Competitive Examinations" by S. Chand, S. Chand Publishing, ISBN: 978-8121903423.

Automata Module:

Automata i s a path breaking tool to evaluate programming skills in a simulated environment. With capability to evaluate programming code beyond correctness and ability to rate code quality, efficiency of execution and

provide objective norm-based scores.
Scientifically designed question bank consisting of a wide range of easy to hard programming problems with smartly designed corner and generic tests cases, Knowledge of algorithms, data structures, concepts like recursion, dynamic memory allocation and modular programming. The compiler supports multiple programming languages such as C, C++, Java, etc. The question bank includes distinct problem sets for IT Product and IT Services companies. B asic, advanced and edge test cases designed for a problem, the code is checked thoroughly for correctness and completeness. It can evaluate the time complexity or simply the efficiency of the code. The code is scored on quality of the code based on industry defined best practice

Automata Pro
It can be effectively used for fresher hiring as well as hiring lateral programmers. The assessment allows evaluation of actual programming skills of a candidate, giving the candidate an opportunity to write the program in an editor, compile and run test cases, all in the assessment environment itself.

Automata Fix
Automata fix assesses the candidate's skill to diagnose and identify any bugs in code and fix them.

Reference Books for Automata Module :
1. "Data structures using C and C++", Y. Langsam, M.J. Augenstein, A.M.Tenenbaum, Pearson Education, Second Edition.
2.Programming Pearls" by Jon Bentley, ISBN 13: 978 1449357162,O'Reilly Media.
3. "Introduction to the Theory of Computation" by Michael Sipser, ISBN 13: 978 1133187790, Cengage Learning.
4. "Algorithms" by Robert Sedge wick and Kevin Wayne, ISBN 13: 978 0321573513, Publisher: Addison Wesley.
5."Data Structures and Algorithm Made Easy", Narasimha Karumanchi, Fifth Edition, CareerMonk publication.
6. "The Art of Computer Programming" by Donald E. Knuth, Addison Wesley.
7. "Operating System Concepts" by Abraham Silberschatz, Henry Korth, and S. Sudarshan, ISBN10:1119946005, Wiley.

MOOCs Links for Automata:
1. www.nptelvideos.in

FF No.: 654

DESIGN THINKING 4

Course Code: CV2007

Credits: 1	**Teaching Scheme: Tutorial: 1 Hour /Week**
Course Prerequisites: Problem Based Learning, Project Centric Learning	
Course Objective: To provide ecosystem for students and faculty for paper publication and patent filing	
Section 1: Topics/Contents	
1)What is research? 2) Importance of Paper Publication and Patents 3) Structure of Paper 4) Journal Publication 5) Publication in conference 6) Literature Review 7) Research Paper Writing 8) Journal Ratings and Evaluation 9) How to rate a Journal? 10) Intellectual property (IP) 11) Research Ethics 12) Entrepreneurship	
Section 2: Topics/Contents	
1)Structure of the paper 2) Journal List (Top 50 Journals) 3) Selection of the journal 4) Use of various online journal selection tools 5) Plagiarism checking 6) Improving contents of the paper 7) Patent drafting Patent search 8) Filing of patent 9) Writing answers to reviewer questions 10) Modification in manuscript 11) Checking of publication draft	
Course Outcome: [Publication of paper or patent] The student will be able to 1. Understand the importance of doing Research 2. Interpret and distinguish different fundamental terms related to Research 3. Apply the methodology of doing research and mode of its publication 4. Write a Research Paper based on project work 5. Understand Intellectual property rights 6. Use the concepts of Ethics in Research 7. Understand the Entrepreneurship and Business Planning	

FF No.: 654

ENGINEERING DESIGN AND INNOVATION 4

Course Code: CV2008

Credits: 2	**Teaching Scheme: Lab: 4 Hours / Week**