Third Semester Structure and Detail Syllabus (2024 Batch)

Department of Civil Engineering

NIST University, Institute Park, Berhampur, Odisha-761008

Vision of the Department

To nurture Civil Engineering graduates who excel as leaders in addressing technological and societal challenges, aligning with national aspirations, while contributing to their profession and successfully pursuing advanced studies.

Mission of the Department

1. To establish the Civil Engineering Department as a renowned academic and research hub, fostering excellence in the field of civil engineering.
2. To cultivate a dynamic research and innovation ecosystem by engaging students, faculty, staff, industry, and the broader society (both rural and urban) to identify and solve real-world, environmentally sustainable engineering challenges.
3. To actively collaborate through partnerships and Memoranda of Understanding (MoUs) with esteemed national and international institutions and laboratories, addressing the growing demand for advanced civil engineering technologies.

Program Educational Objectives [PEO]
(Undergraduate Program)

PEO 1: Graduates will excel in their professional careers by solving complex civil engineering problems and contributing to infrastructure development with a focus on sustainability and societal needs.

PEO 2: Graduates will pursue higher education, engage in research and innovation, and adapt to advancements in technology to remain competitive in the global environment.

PEO 3: Graduates will demonstrate leadership, teamwork, ethical responsibility, and a commitment to lifelong learning to address diverse challenges in the civil engineering field.

Program Outcome [PO]
(Undergraduate Program)

PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2 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.
PO3 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.
PO4 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.

PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 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.

PO7 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.

PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 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.

PO11 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.

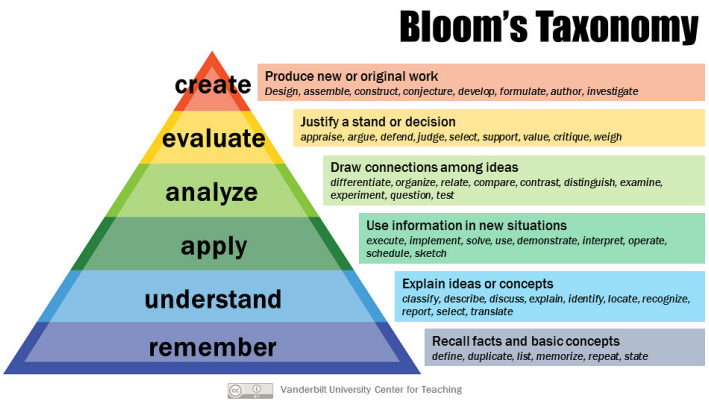
PO12 Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcome [PSO]
(Undergraduate Program)

On completion of the B.Tech.(CE) degree the graduates will be able to:-

1. **Apply fundamental civil engineering principles** to analyze, design, and construct safe, efficient, and sustainable structures.
2. **Utilize engineering codes, standards, and modern tools** to develop innovative and environmentally responsible solutions for societal needs.
3. **Demonstrate strong communication, teamwork, and ethical responsibility** in multidisciplinary civil engineering projects.

Blooms Taxonomy



III and IV Semester Syllabus Structure and Detailed Syllabus

Second - Year Course Structure (III Semester)							
S. No.	**Course Category**	**Course Code**	**Course Title**	**L**	**P**	**T**	**Credits**
1	BS	MTH-200	Probability and Statistics	3	0	1	4
2	PC	CVL-200	Civil Engineering Material and Construction Technology	3	2	0	4
3	PC	CVL-201	Engineering Survey	3	2	0	4
4	PC	CVL-202	Mechanics of Solids	3	2	0	4
5	ES	CVL-203	Introduction to Python Programming	3	2	0	4
6	AEC	ENG-200	Soft Skill-1	1	0	0	1
7	VAC	CVL-204	Environmental Science and Engineering	1	0	0	1
Total Credits							**22**

Second - Year Course Structure (IV Semester)							
S. No.	**Course Category**	**Course Code**	**Course Title**	**L**	**P**	**T**	**Credits**
1	BS	CVL-205	Fluid Mechanics	3	2	0	4
2	PC	CVL-206	Structural Analysis	3	2	0	4
3	PC	CVL-207	Highway Engineering	3	2	0	4
4	PC	CVL-208	Soil Mechanics	3	2	0	4
5	HS	MGT-202	Organizational Behavior/Engineering Economics	3	0	0	3
6	SEC	CVL-209	Building Modeling using Auto CAD	0	2	0	1
7	SEC	MGT-200	Aptitude and Reasoning-I	0	2	0	1
8	VAC	MGT-201	Constitution of India	1	0	0	1
Total Credits							**22**

Course Code	Course Name	L	T	P	C
CVL-200	Civil Engineering Material and Construction Technology	3	0	2	4
Pre-requisite	NIL				
Branch	Civil Engineering (CVL)				
Batch	2024				

CO Code	Course Outcome	Bloom's Taxonomy
CO1	Identify and classify traditional building materials like stones, bricks, and lime.	L1-Remembering, L2-Understanding
CO2	Analyse and evaluate properties of finishing and modern materials (tiles, glass, steel, geosynthetics).	L4-Analysing, L5-Evaluating
CO3	Design concrete mixes as per IS code and interpret test results.	L3-Applying, L6-Creating
CO4	Demonstrate understanding of basic construction systems and select suitable techniques.	L2-Understanding, L3-Applying

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1			2							3	2	
CO2	3	3	2			1							3	2	
CO3	3	3	3	2		1							3	3	
CO4	3	2	3						2	2			3	3	2

Detailed Syllabus

Module I	Building Materials – Traditional and Modern	Contact Hours (09)

Bricks: types of bricks, properties, Brick testing methods – compressive strength, water absorption, efflorescence: Environmental concerns and alternatives (fly ash bricks, hollow blocks, AAC block) **Cement:** cement, Chemical composition and properties of Ordinary Portland Cement, Hydration process and setting of cement, Tests on cement – fineness, consistency, initial and final setting time, soundness, Sustainable cement types: slag cement, geopolymer cement, **Aggregates:** Natural and artificial aggregates, Properties: grading, shape, texture, impact value, crushing value, Recycled aggregates – need and applications

Module II	Advanced Construction Materials and Admixtures	Contact Hours (09)

Concrete Technology: Ingredients of concrete and their roles, Water-cement ratio and workability, Types of concrete: high strength, lightweight, fiber-reinforced, self-compacting, Properties and testing of fresh and hardened concrete, **Admixtures:** Classification: plasticizers, superplasticizers, retarders, accelerators, air-entraining agents: Role of admixtures in improving concrete performance, **Modern and Smart Materials:** Ferrocement, fiber-reinforced polymers, GFRP, carbon composites, Smart materials: self-healing concrete, phase change materials (PCM), **Sustainability and Green Materials,** Low-carbon construction materials, Fly ash, GGBS, silica fume, and rice husk ash in concrete.

Module III	Building Construction Techniques	Contact Hours (09)

Foundations and Basement Construction: Excavation and dewatering methods, Construction of basements and waterproofing methods, **Masonry Work:** Brick and stone masonry: types, bonds, construction methods, Hollow block and rat-trap bond masonry, Reinforced brickwork and cavity wall construction, **Formwork, Scaffolding, and Centering:** Materials for formwork: timber, steel, aluminum, plastic, Modular and tunnel formwork systems, Scaffolding types and safety requirements, **Roofs and Floors:** Types of

floor finishes – tiles, terrazzo, wooden, epoxy, Types of roofs – flat, pitched, trussed, Roof coverings – GI sheets, tiles, bituminous felt		
Module IV	Modern Construction Methods and Equipment	**Contact Hours (09)**
Prefabrication and Pre-casting: Advantages and limitations, Precast elements – walls, slabs, beams, staircases, Jointing methods and on-site installation, **Modular and 3D Printing Construction:** Principles of modular construction, 3D printing technologies for concrete and buildings, Automation and robotics in construction, **Construction Equipment:** Earthmoving equipment: bulldozers, excavators, scrapers, Concrete equipment: mixers, vibrators, pumps, Lifting and hoisting: cranes, hoists, winches, Safety and efficiency in equipment use, **Sustainable Construction Practices:** Energy-efficient building design, Green building rating systems (LEED, GRIHA), Construction and demolition waste management		
	Total Lecture Hours	36
Textbooks		
1.	**S.K. Duggal**, *Building Materials*, 5th Edition, New Age International Publishers, 2020.	
2.	**M.S. Shetty**, *Concrete Technology: Theory and Practice*, 8th Edition, S. Chand Publishing, 2019.	
Reference Books		
1.	**P.C. Varghese**, *Building Construction*, 3rd Edition, PHI Learning Pvt. Ltd., 2014.	
2.	**Neville, A.M.**, *Properties of Concrete*, 5th Edition, Pearson Education, 2011.	
Digital Learning Resources		
Course Name: Course Link: Course Instructor:		
Mode of Evaluation: Internal Assessment (Quiz, Course Project, Mid-Term) and External Assessment (End Term)		
Recommended by Board of Studies	No.:	Date:
Approved by Academic Council	No.:	Date:

CEMCT Lab Experiment List

1. **Compressive Strength Test on Bricks**
   Standard: IS 3495 (Part 1)
   Objective: To determine the load-carrying capacity of a brick.
2. **Water Absorption Test on Bricks**
   Standard: IS 3495 (Part 2)
   Objective: To evaluate the water absorption capacity of brick units.
3. **Field Test on Lime (Acid Test)**
   Objective: To assess the quality and class of lime.
4. **Test for Fineness of Cement by Sieve Analysis**
   Standard: IS 4031 (Part 1)
   Objective: To determine particle size distribution of cement.
5. **Standard Consistency and Initial/Final Setting Time of Cement**
   Standard: IS 4031 (Part 4 & 5)
   Objective: To find the water content required for standard consistency and setting time.
6. **Soundness Test of Cement**
   Standard: IS: 4031 (Part 3) – 1988:
   Objective: To determine the soundness of cement by Le-Chatelier method
7. **Slump Test for Workability of Concrete**
   Standard: IS 1199
   Objective: To measure the workability of freshly mixed concrete.
8. **Compaction Factor Test for Concrete Workability**
   Objective: To evaluate concrete mix suitability for low workability conditions.
9. **Tensile Strength Test of Steel Reinforcement Bar**
   Standard: IS 1608
   Objective: To determine yield and ultimate tensile strength of mild steel and TMT bars.
10. **Absorption and Strength Test on Floor Tiles**
    Standard: IS 1237
    Objective: To check physical quality parameters of floor tiles.
11. **Visual Identification and Testing of Geosynthetics**
    Objective: To classify geotextiles and demonstrate their filtration/reinforcement functions.

Course Code	Course Name	L	T	P	C

CVL-201	Engineering Survey	3	0	2	4
Pre-requisite	NIL				
Branch	Civil Engineering (CVL)				
Batch	2024				

CO Code	Course Outcome	Bloom's Taxonomy
CO1	Understand the principles of surveying, types of errors, and apply measurement techniques using basic instruments.	L2-Understanding
CO2	Apply levelling and traversing methods to compute elevation differences and determine coordinates accurately.	L3-Applying
CO3	Analyse curve setting techniques and use modern instruments like Total Station and EDM in fieldwork.	L4-Analysing
CO4	Utilize geospatial technologies like GIS, GPS, and Remote Sensing in civil engineering problem solving.	L3-Applying,

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2			2								3	2	
CO2	3	3	3		2								3	3	
CO3	3	3	3	2	3				2				3	3	2
CO4	3	2	2	3	3		2						3	3	3

Detailed Syllabus

Module I	Surveying Principles and Measurements	Contact Hours (10)

Definition and classification of surveying, Principles of surveying, Errors in measurement and their adjustment (systematic, random, gross errors), Maps and scale; Types of scales, Coordinate systems: Plane and geodetic, Distance measurement using chain/tape, Ranging & chaining of survey lines, surveying in obstacles in chaining, Field work & Plotting of maps using chain survey. Types of compass, use of compass, bearing of a line, local attractions and correction of bearings.,

Module II	Levelling and Traverse Surveying	Contact Hours (10)

Types of theodolite: seconds theodolites, micro-optic theodolites, electronic theodolites, measurement of horizontal angles and vertical angles using theodolite traversing, Levelling: Definitions, types of levels, levelling staff, Fly levelling, differential levelling, profile levelling, Booking and reduction: HI method, Rise & Fall method, Trigonometric levelling, Traversing: Compass and theodolite methods, Triangulation survey: Principles and applications, Closing error and adjustments.

Module III	Advanced Instruments and Curve Setting	Contact Hours (08)

Total Station: Components, working principle, field data collection, Horizontal and vertical curves: Simple, compound, reverse and transition curves, Curve setting out using theodolite and total station, EDM: Principles and application, Introduction to Tacheometry.

Module IV	Remote Sensing, Photogrammetry, and GIS	Contact Hours (08)

Photogrammetry: Scale, flying height, image interpretation, Remote Sensing: Basic concepts, types of sensors and platforms, Applications in Civil Engineering, Geographic Information System (GIS): Components, data structure, spatial analysis, Introduction to GPS and drone-based surveying.		
	Total Lecture Hours	32
Textbooks		
1.	**B.C. Punmia,** Ashok Kumar Jain, Arun Kumar Jain, *Surveying Vol. 1 & 2*, Laxmi Publications, 2022.	
2.	**S.K. Duggal**, *Surveying (Vol. I & II)*, McGraw Hill Education, 4th Edition, 2019.	
Reference Books		
1.	**R. Subramanian**, *Surveying and Levelling*, Oxford University Press, 2nd Edition, 2018.	
2.	**K.R. Arora**, *Surveying Vol. 1 & 2*, Standard Book House, 11th Edition, 2020.	
Digital Learning Resources		
Course Name: Course Link: Course Instructor:		
Mode of Evaluation: Internal Assessment (Quiz, Course Project, Mid-Term) and External Assessment (End Term)		
Recommended by Board of Studies	No.:	Date:
Approved by Academic Council	No.:	Date:

Engineering Survey Lab Experiments

1. **Linear Measurement by Chain and Tape**

Objective: To measure distances using chain and tape and plot a small area.

2. **Compass Surveying**

   Objective: To determine included angles and plot traverse using prismatic compass and apply corrections for local attraction.

3. **Levelling – Fly and Differential Levelling**

   Objective: To determine the reduced levels using Dumpy/Auto level and staff.

4. **Profile and Cross-Section Levelling**

   Objective: To draw longitudinal and cross-sectional profiles along a given route.

5. **Theodolite Traverse Survey**

   Objective: To measure horizontal angles and compute coordinates of traverse stations.

6. **Trigonometric Levelling**

   Objective: To determine heights and distances using theodolite based on angular measurements.

7. **Total Station – Data Collection and Coordinate Computation**

   Objective: Introduction to total station components, angle and distance measurement, and coordinate determination.

8. **Curve Setting – Simple Curve by Theodolite**

   Objective: To set out a circular curve using tangential angle method.

9. **Tacheometric Surveying**

   Objective: To determine horizontal distance and elevation using stadia method.

10. **Introduction to GIS and GPS Survey**

    Objective: To demonstrate basic spatial data collection using GPS and map features using GIS software.

Course Code	Course Name	L	T	P	C
CVL-202	Mechanics of Solids	3	0	2	4

Pre-requisite	NIL
Branch	Civil Engineering (CVL)
Batch	2024

CO Code	Course Outcome	Bloom's Taxonomy
CO1	Understand stress, strain, and deformation of structural members under axial loading and thermal effects.	L2-Understanding
CO2	Analyse internal forces and bending stresses in beams and draw SFD and BMD for various loading conditions.	L4-Analysing
CO3	Apply torsional theory and principal stress analysis for complex loading on circular shafts and components.	L3-Applying,
CO4	Evaluate beam deflection, critical load for columns, and strain energy using analytical and energy methods.	L5-Evaluating

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2											3	2	
CO2	3	3	2										3		2
CO3	3	3	3	2									2	3	
CO4	3	3	2	3									2	3	2

Detailed Syllabus

Module I	Stress, Strain, and Elastic Constants	Contact Hours (08)

Concept of stress and strain: axial, lateral, shear and volumetric, Hooke's Law, Young's modulus, Poisson's ratio, modulus of rigidity, bulk modulus, Stress-strain diagrams for ductile and brittle materials, Principle of superposition, Thermal stresses, Elastic and plastic behaviour, Factor of safety, working stress and limit state approach.

Module II	Bending and Shear	Contact Hours (08)

Bending moment and shear force diagrams (SFD and BMD) for statically determinate beams, Relationship between load, shear force, and bending moment, Theory of simple bending: assumptions and flexure formula, Section modulus, bending stresses in symmetrical and unsymmetrical sections, Shear stress distribution in rectangular, circular, and I-sections.

Module III	Torsion and Principal Stresses	Contact Hours (08)

Torsion of circular shafts – solid and hollow, Combined bending and torsion, Polar moment of inertia, Principal planes and principal stresses, Mohr's circle for plane stress and strain, Maximum shear stress theory.

Module IV	Deflection, Columns, and Energy Methods	Contact Hours (08)

Deflection of beams: double integration, moment-area method, Macaulay's method, Euler's theory of columns – different end conditions, Slenderness ratio and its significance, Strain energy due to axial load, bending, shear and torsion, Castigliano's theorem, Impact loading

Total Lecture Hours	32

Textbooks

1.	S. S. Bhavikatti, *Strength of Materials*, 6th Edition, Vikas Publishing House, 2021.
2.	R. K. Bansal, *Strength of Materials*, 6th Edition, Laxmi Publications, 2018.
Reference Books	
1.	F. P. Beer, E. R. Johnston Jr., and J. T. DeWolf, *Mechanics of Materials*, 8th Edition, McGraw Hill Education, 2019.
2.	R. C. Hibbeler, *Mechanics of Materials*, 10th Edition, Pearson Education, 2020.
Digital Learning Resources	
Course Name: Course Link: Course Instructor:	
Mode of Evaluation: Internal Assessment (Quiz, Course Project, Mid-Term) and External Assessment (End Term)	

Recommended by Board of Studies	No.:	Date:
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Mechanics of Solid Laboratory Experiments

1. **Tensile Strength of Steel**
   Objective: Determination of the tensile strength and stress-strain behavior of mild steel using a universal testing machine (UTM).
2. **Compression Test on Wood and Concrete**
   Objective: Evaluation of compressive strength for wooden and concrete specimens under axial loading.
3. **Compressive Strength Test of Cement**
   Objective: Determination of compressive strength of cement mortar cubes as per IS: 4031.
4. **Support Reactions of Different Types of Beams**
   Objective: Experimental determination of support reactions in simply supported and overhanging beams.
5. **Experiment on Trusses**
   Objective: To calculate the internal member forces of a simple truss using strain gauge or analytical method.
6. **Deflection Test on Simply Supported Beam**
   Objective: Measurement of deflection for a simply supported beam under central point load and comparison with theoretical values.
7. **Deflection Test on Overhanging Beam**
   Objective: Study of beam deflection and slope in overhanging conditions under different loading configurations.
8. **Bending Test of Steel or Concrete**
   Objective: Bending behavior and modulus of rupture determination for steel and concrete beams.
9. **Aggregate Crushing Value Test**
   Objective: Determination of aggregate crushing value of coarse aggregate as per IS: 2386.
10. **Torsion Test on Mild Steel Rod**
    Objective: To determine torsional strength and modulus of rigidity for a mild steel circular rod.
11. **Plan, Elevation and Section Drawing**
    Objective: Drafting the architectural plan, elevation, and sectional views of a residential and commercial building using standard conventions.

Course Code	Course Name	L	T	P	C
CVL-203	Introduction to Python Programming	3	0	2	4
Pre-requisite	NIL				
Branch	Civil Engineering (CVL)				
Batch	2024				

CO Code	Course Outcome	Bloom's Taxonomy
CO1	Understand Python syntax, data types, and perform basic operations and data conversions.	L2-Understand
CO2	Apply variables, operators, and control structures to implement logic and loops in Python.	L2-Understand
CO3	Develop modular code using user-defined and anonymous functions with different argument types.	L6-Create,
CO4	Implement object-oriented concepts and perform file operations with proper error handling.	L3-Apply,

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2											3	2	
CO2	3	3	2										3		2
CO3	3	3	3	2									2	3	
CO4	3	3	2	3									2	3	2

Detailed Syllabus

Module I	Introduction to Python and Data Types	Contact Hours (08)

Introduction to Python Programming Language: Introduction to Python Language and installation, interpreters and complier, Numeric Data Types: int, float, Boolean, complex and string and its operations, Standard Data Types: List, tuple, set and Dictionaries, Data Type conversions, commenting in python.

Module II	Variables, Operators, and Control Structures	Contact Hours (08)

Variables and Operators: Understanding Python variables, Multiple variable declarations, Python basic statements, Python basic operators: Arithmetic operators, Assignment operators, Comparison operators, Logical operators, Identity operators, Membership operators, Bitwise operators, Precedence of operators, Expressions.

Control Flow and Loops: Conditional (if), alternative (if-else), chained conditional (if- elif - else), Loops: For loop using ranges, string, Use of while loops in python, Loop manipulation using pass, continue and break.

Module III	**Functions and Lambda Expressions**	Contact Hours (08)

Functions: Defining Your Own Functions, Calling Functions, passing parameters and arguments, Python Function arguments: Keyword Arguments, Default Arguments, Variable length arguments, Anonymous Functions, Fruitful Functions, Scope of the Variables in a Function - Global and Local Variables. Powerful Lambda functions in python.

Module IV	Object-Oriented Programming & File Handling	Contact Hours (08)
Object Oriented Programming: Class and Object, Defining variables and functions inside class, Creating objects, Inheritance, Inheritance, Encapsulation, Polymorphism, Abstraction. **I/O and Error Handling in Python:** Introduction, Access Modes, Writing Data to a File, Reading Data from a File, Additional File Methods introduction to Errors and Exceptions, Handling IO Exceptions, Run Time Errors, Handling Multiple Exceptions.		
	Total Lecture Hours	32

Textbooks	
1.	Reema Thareja, *Python Programming: Using Problem Solving Approach*, Oxford University Press, 2018.
2.	R. Nageswara Rao, *Core Python Programming*, 2nd Edition, Dreamtech Press (Wiley), 2019.
Reference Books	
1.	E. Balagurusamy, *Introduction to Computing and Problem Solving Using Python*, 1st Edition, McGraw-Hill Education, 2016.
2.	Ljubomir Perkovic, *Introduction to Computing Using Python: An Application Development Focus*, John Wiley & Sons, 2012.
Digital Learning Resources	
Course Name: Course Link: Course Instructor:	
Mode of Evaluation: Internal Assessment (Quiz, Course Project, Mid-Term) and External Assessment (End Term)	

Recommended by Board of Studies	No.:	Date:
Approved by Academic Council	No.:	Date:

Course Code	Course Name	L	T	P	C
CVL-204	Environmental Science and Engineering	1	0	0	1
Pre-requisite	NIL				
Branch	Civil Engineering (CVL)				
Batch	2024				

CO Code	Course Outcome	Bloom's Taxonomy
CO1	Understand the structure and function of ecosystems and the interdependence of life forms.	L2-Understanding
CO2	Explain the importance of natural resources and biodiversity conservation.	L2-Understanding
CO3	Identify major types of pollution and waste management strategies.	L1- Remember
CO4	Illustrate the concept of sustainable development and assess impacts of climate change.	L3-Apply

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2										3	2	
CO2	3				2								2	3	
CO3	2	1	1						2	2				2	3
CO4	2				2		2	2				1	1	2	2

Detailed Syllabus

Module I	Environment and Ecosystems	Contact Hours (03)

Definition, scope and importance of environmental science, Structure and function of ecosystems, Types of ecosystems: forest, grassland, desert, aquatic (pond, ocean), Energy flow, food chains, ecological pyramids.

Module II	Natural Resources and Biodiversity	Contact Hours (03)

Renewable and non-renewable resources: land, water, energy, food, Biodiversity: Definition, types, value and threats, Conservation of biodiversity: In-situ and ex-situ methods, Environmental legislation: Air Act, Water Act, and Wild Life Protection Act.

Module III	Environmental Pollution	Contact Hours (03)

Air, water and soil pollution: sources, effects and control, Solid waste management: types, treatment and disposal, Environmental impact of construction activities, Role of engineers in pollution control.

Module IV	Sustainable Development and Climate Change	Contact Hours (03)

Concept and principles of sustainable development, Global warming, ozone layer depletion, and climate change, Carbon footprint and mitigation strategies, Role of green buildings and environmental ethics.

Total Lecture Hours	32

Textbooks

1. S. C. Sharma & M. P. Poonia, *Environmental Studies*, Khanna Publishing House,

	New Delhi, 2017.		
2.	Benny Joseph, *Environmental Studies*, Tata McGraw Hill, 3rd Edition, 2017.		
Reference Books			
1.	Erach Bharucha, *Textbook of Environmental Studies for Undergraduate Courses*, UGC, University Press, 2nd Edition, 2013.		
2.	G. Tyler Miller and Scott Spoolman, *Environmental Science*, Cengage Learning, 15th Edition, 2017.		
Digital Learning Resources			
Course Name: Course Link: Course Instructor:			
Mode of Evaluation: Internal Assessment (Quiz, Course Project, Mid-Term) and External Assessment (End Term)			
Recommended by Board of Studies		No.:	Date:
Approved by Academic Council		No.:	Date: