SDG 6: CLEAN WATER AND SANITATION

SDG 6 emphasizes clean water and sanitation for all. Curriculum integration promotes sustainable water management and hygiene practices. Students gain awareness of water conservation and public health linkages. This supports environmental sustainability.



List of Courses mapped to SDG 6:

S.No	Course Title	Name of the Program	Justification for SDG Mapping
1	SOIL AND WATER CONSERVATION ENGINEERING	B.Sc. (Hons.) Agriculture	Teaches water harvesting, irrigation efficiency and watershed management for sustainable use of water resources.
2	WATER RESOURCES ENGINEERING	B.Tech. - Civil Engineering	Covers hydrology, water supply and storage systems that ensure reliable access to water.
3	PHYSICO-CHEMICAL PROCESSES FOR WASTE WATER TREATMENT	M.Sc. (Chemistry)	Covers treatment processes that remove pollutants from wastewater, improving water quality and reuse.
4	ENVIRONMENTAL ENGINEERING	B.Tech. - Civil Engineering	Addresses water and wastewater treatment and sanitation systems that protect public health.
5	INSIGHTS TO SUSTAINABLE DEVELOPMENT GOALS	All B.Tech Programs	Module 4 covers Clean Water and Sanitation, with labs and a case study on a water initiative such as river rejuvenation.

Course Outcomes and Syllabus

Soil and Water Conservation Engineering

SDG 6

Course code: 22AENG151 | L-T-P-S: 1-0-3-0 | Credits: 2 | Programme: B.Sc. (Hons.) Agriculture

CO	Course Outcome	PO / PSO	BTL
CO 1	Understand the concepts of soil, water, and wind erosion along with their various conservation practices.	PO1,4	3
CO 2	Comprehend about terraces, contours, and grasses waterways in order to prevent erosion at different grades of slopy land	PO2,7	3
CO 3	Characterize the concepts of irrigation water measurement and various irrigation methods - micro-irrigation, underground pipeline system.	PO1,4	3
CO 4	Understand the water conservation structure, and the systems associated with wells to drive water out of them to irrigate the agricultural land	PO1,5	3
CO 5	Apply the solutions to the real-life problems through laboratories' work.	PO1,4,8	4

Syllabus

Introduction to soil and water conservation - Causes of soil erosion - Definition and agents of soil erosion - Water erosion - Forms of water erosion - Gully classification and control measures - Soil loss estimation by Universal Soil Loss Equation - Soil loss measurement techniques - Principles of erosion control - Introduction to contouring Strip cropping - Contour bund - Graded bund and bench terracing - Grassed water ways and their design - Water harvesting and its techniques - Wind erosion - Mechanics of wind erosion - Types of soil movement - Principles of wind erosion control and its control measures. Introduction to irrigation - Irrigation project classification - Methods of microirrigation - Importance of irrigation water measurements – Volumetric area velocity Discharge methods - Weirs – Orifice – Flumes - Types of wells - Water lifting devices Classification of pumps – capacity – Power - Discharge calculations - Open channel hydraulics - Discharge calculations - Underground pipeline systems - Functional components of micro irrigation systems and its design like drip - Sprinkler etc. - Water harvesting - Lining of ponds – Tanks - Canals.

Water Resources Engineering

SDG 6

Course code: 22CE3102 | L-T-P-S: 3-1-0-0 | Credits: 4 | Programme: B.Tech. - Civil Engineering

CO	Course Outcome	PO / PSO	BTL
CO1	Evaluate the different components of hydrological cycle	1,4	5
CO2	Estimate the ground water yield and requirement of water for the crops	1,2	4
CO3	Design the canal irrigation system based on discharge	1,4	6
CO4	Analyze stability and forces acting on Gravity dams and life of reservoir	1,4	6

Syllabus

Introduction - Hydrologic cycle, Precipitation - forms of precipitation, characteristics of precipitation in India, measurement of precipitation, raingauge network, mean precipitation over an area, Abstractions from precipitation - evaporation process, interception, depression storage, infiltration, infiltration indices. Runoff - runoff volume, hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, derivation of unit hydrograph, S- Curve and method of superposition methods. Ground water and well hydraulics - forms of subsurface water, saturated formation, aquifer types and properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifer, Pumping tests. Water requirement of crops-, duty and delta, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation. Canal irrigation and classification of canals, alignment of canals, canal losses, Design of channels- alluvial channels, Kennedy's and Lacey's theory of regime channels. Water logging: causes, effects and remedial measures. Lining of canals, types of lining. Dams - embankment dams: Classification, design considerations, control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis and spillways, Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

Physico-chemical Processes for Waste Water Treatment

SDG 6

Course code: 23CC4043 | L-T-P-S: 0-0-0-8 | Credits: 0 | Programme: M.Sc. (Chemistry)

CO	Course Outcome	PO / PSO	BTL
CO1	Use the basic principles of water pollution and the various physicochemical processes involved in wastewater treatment.	PO1, PO4	3
CO2	Apply knowledge of physicochemical treatments in practical settings, such as real-world water and wastewater treatment scenarios, which include industrial applications.	PO1, PO4	3
CO3	Design and evaluate different wastewater treatment processes based on their effectiveness, cost, applicability, and environmental impact.	PO1, PO5, PO6	3
CO4	Analyze and interpret data from water and wastewater treatments, ensuring compliance with environmental laws and standards which is crucial for the protection of public health and the environment.	PO1, PO5, PO6	3

Syllabus

Introduction to Water Pollution and Control, Pre-treatment & Physical treatment: Flow equalization & Aeration, Pre-treatment & Physical treatment: Coagulation and Flocculation, Setting and Sedimentation & Settling Chamber Design-Filtration & Filtration System Design, Wastewater treatment by Adsorption & Ion Exchange, Wastewater treatment by Membrane Based Technologies, Advanced Oxidation Processes: Introduction-Advanced Oxidation Processes: Fenton and catalytic treatment, Advanced Oxidation Processes: Photo-induced processes, Advanced Oxidation Processes: Sono- and Electro-chemical Treatment, Case studies on wastewater treatment in various process, chemical, and allied industry

Environmental Engineering

SDG 6

Course code: 22CE2204 | L-T-P-S: 3-0-2-0 | Credits: 4 | Programme: B.Tech. - Civil Engineering

CO	Course Outcome	PO / PSO	BTL
CO1	To apply the concept of forecast population and design of water treatment units	1,6,7	3
CO2	To apply the concept of Water distribution system by using Equivalent pipe method	6,7	3
CO3	To apply concept of sewage quantity and design of sewerage system and septic tank design.	1,6,7	3
CO4	To Understand the concept of Solid Waste Management methods and Noise pollution effects	6,7	2
CO5	To apply the testing of water & wastewater, design of water, wastewater treatment plant.	1,6,7	4

Syllabus

Water Supply: Necessity of protected water supply. Role of Civil Engineer. Water demand, per capita consumption and factors affecting. Effect of variations of water demand. Design period – population forecasting, Sources of water - quality parameters and their significance. Drinking water quality standards in India. Intake structures design. Water Treatment: Types and origin of impurities, Need for water treatment. Purpose, principles of operation and design considerations of plain sedimentation, sedimentation with coagulation, flocculation clarifier design. Design of filters. Disinfection methods. Distribution systems -Design procedures- Hardy Cross and equivalent pipe methods– Layout of distribution system. Joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines. Introduction to Sewerage system: Sewerage systems, Quantity estimation, Velocity in sewers, Storm water sewers-Strom water estimation by rational method. Sewerage system design, Objectives and extent of wastewater treatment, characteristics of sewage – examination of sewage – B.O.D. – C.O.D. equations. Sewage Treatment: Purpose, principle and design considerations of Preliminary treatment -. Screens, grit chambers; Primary Treatment-Sedimentation – rectangular and circular tanks; Secondary treatment- Activated sludge process, Trickling filter and UASB. Septic tanks - design parameters and working principles. Noise Pollution & Solid waste Management: Noise pollution, types, Impacts on environment and control measures. Solid Wastes - Types, sources and composition of solid wastes, Methods of collection and disposal Air Pollution: Air Pollution-Types, Impacts on environment, and Principles of control techniques

Insights to Sustainable Development Goals

SDG 6

Course code: 25UC0032E | L-T-P-S: 2-0-0-0 | Credits: 0 | Programme: All B.Tech Programs

CO	Course Outcome	PO / PSO	BTL
CO1	Understand sustainable development — concept, pillars, and the road to the SDGs.	PO6, PO7, PSO1	2
CO2	Understand the 17 SDGs, their targets, and their interlinkages.	PO6, PO7, PSO1	2
CO3	Analyze the people-and-prosperity SDGs in the Indian and global context.	PO6, PO7, PSO2	4
CO4	Analyze the planet SDGs — climate, energy, water, and ecosystems.	PO6, PO7, PSO2	4
CO5	Apply SDG measurement, governance, and localisation.	PO7, PO11, PSO2	3
CO6	Analyze how technology, AI, and innovation can accelerate the SDGs.	PO5, PO7, PSO2	4

Syllabus

Module 1: Foundations of Sustainable Development. Topics: What sustainable development means; The Brundtland definition; The three pillars - economic, social, environmental; Planetary boundaries; From MDGs to SDGs; The 2030 Agenda and 'leave no one behind'; Sustainability vs growth debates; India's sustainability context. Labs: Map a real project against the three pillars of sustainability; Footprint lab: estimate and reduce a sustainability footprint. Case Study: a development-vs-environment trade-off (e.g., a dam/infrastructure project): analyse how the three pillars of sustainability were balanced or violated.

Module 2: The 17 SDGs Overview. Topics: Overview of all 17 goals; Targets and indicators; The SDG 'wedding cake' model; Interlinkages and trade-offs among goals; Synergies across goals; 'Leave no one behind'; The global indicator framework; Tracking progress. Labs: Build an SDG interlinkage map for a chosen development problem; Indicator lab: interpret SDG progress data for a country/state. Case Study: SDG interlinkages in practice (e.g., clean energy enabling health and education): analyse how progress on one goal advances others.

Module 3: People & Prosperity SDGs. Topics: No poverty and zero hunger; Good health and well-being; Quality education; Gender equality; Decent work and economic growth; Reduced inequalities; Industry, innovation, and infrastructure; India's progress on people/prosperity goals. Labs: Analyse a region's people/prosperity indicators and gaps; Design an intervention targeting a people/prosperity SDG. Case Study: an Indian social initiative (e.g., a health/education/livelihood program): analyse its SDG contribution and outcomes.

Module 4: Planet SDGs. Topics: Clean water and sanitation; Affordable and clean energy; Climate action; Life below water; Life on land; Sustainable cities and communities; Responsible consumption and production; Circular economy. Labs: Audit a setting for responsible consumption and propose circular fixes; Design a planet-SDG (energy/water/waste) solution for a community. Case Study: a clean-energy or water initiative in India (e.g., solar mission / river rejuvenation): analyse its planet-SDG impact and scalability.

Module 5: Partnership, Governance & Measurement. Topics: Peace, justice, and strong institutions (SDG16); Partnerships for the goals (SDG17); Financing the SDGs; Indicators and the SDG India Index; Localising the SDGs; Voluntary National Reviews; Role of governments, business, and civil society; Accountability and reporting. Labs: Build an SDG scorecard for an organisation/community; Design a multi-stakeholder partnership for an SDG target. Case Study: the SDG India Index / a state's SDG localisation: analyse how SDGs are measured and localised, and what drives improvement.

Module 6: Technology, AI & Innovation for the SDGs. Topics: Technology as an SDG accelerator; AI for good - use cases across goals; Social entrepreneurship and impact ventures; Frugal and inclusive innovation; Digital public infrastructure for development; Measuring impact (theory of change); The engineer's and youth's role; Designing an SDG-aligned solution. Labs: Design a technology/AI-enabled solution mapped to an SDG with a theory of change; Pitch a social-impact venture targeting one or more SDGs. Case Study: AI/technology for an SDG (e.g., AI in healthcare access or precision agriculture): analyse how technology accelerates a specific goal, with its risks.