SDG 11: SUSTAINABLE CITIES AND COMMUNITIES

SDG 11 emphasizes sustainable cities and communities. Integrating this SDG promotes urban planning, resilience, and sustainability awareness. Students understand smart city concepts and community development. This supports sustainable urban growth.



List of Courses mapped to SDG 11:

S.No	Course Title	Name of the Program	Justification for SDG Mapping
1	SUSTAINABLE DESIGN & SOCIAL INNOVATION IN SMART MANUFACTURING	B.Tech. - Mechanical Engineering	Integrates sustainable design and social innovation to develop products and systems that benefit communities.
2	SUSTAINABLE ARCHITECTURE - I & II	Bachelor of Architecture	Teaches energy-efficient, low-impact building design for sustainable, liveable settlements.
3	DESIGN FOR SUSTAINABILITY	M.Tech - Machine Design	Applies sustainability principles to the design of products and systems with lower resource impact.
4	SUSTAINABLE CONSTRUCTION TECHNOLOGY	B.Tech - Civil Engineering	Covers green materials and efficient construction practices for resilient infrastructure.
5	URBAN DESIGN	Bachelor of Architecture	Addresses the planning of inclusive, safe and well-designed public spaces and cities.
6	INSIGHTS TO SUSTAINABLE DEVELOPMENT GOALS	All B.Tech Programs	Module 4 covers Sustainable Cities and Communities along with circular-economy approaches for community-level solutions.

Course Outcomes and Syllabus

Sustainable Design & Social Innovation in Smart Manufacturing

SDG 11

Course code: 22ME4067 | L-T-P-S: 1-0-4-0 | Credits: 3 | Programme: B.Tech. - Mechanical Engineering

CO	Course Outcome	PO / PSO	BTL
CO1	apply all fundamental concepts related to the streams in smart manufacturing Specialization	PO1	3
CO2	identify the real-world problem and inculcate problem solving and critical thinking skills	PO1	3
CO3	Develop a conceptual prototype	PO1	3
CO4	Design and execute a fully functional prototype	PO4, PSO1	5

Syllabus

Fundamental concepts in Smart Manufacturing Specialization. Hands-on experience on all relevant software tool Capstone Project: Step-1: Define the problem and identify the objectives Step-2: Research must be focused and incorporate new ideas and a thorough exploration of old similar ideas. Step-3: The build process must take into consideration materials, processes, construction limitations, and cost. Step-4: The entire project must be tested to see if it does the job for which it was designed.

Sustainable Architecture - I

SDG 11

Course code: 22AR3117B | L-T-P-S: 2-0-0-0 | Credits: 2 | Programme: Bachelor of Architecture

CO	Course Outcome	PO / PSO	BTL
CO1	To understand the concept of green building need for it in today's context	PO7	1
CO2	To understand the traditional buildings under different climatic zones and the elements in vernacular buildings	PO8	2
CO3	Understanding the climatic influences on built environment	PO8	3
CO4	To understand the importance of site planning and energy efficient landscaping as an important tool in sustainable architecture	PO8, PSO2	3

Syllabus

Concept of green building- Introduction to green building concept, need for green buildings today, statistics denoting the impact of built environment on our planet and its resources, Traditional methods and materials, techniques that were incorporated in preindustrial era, analysis of traditional knowledge and their relevance in today's context. Indian vernacular architecture concepts and analysis of spatial elements like courtyard houses, terraces, pavilions. Use of local materials and climate responsive techniques like jharokas, jaalis, chajjas etc., Climatic influence on buildings design consideration for built environment under different climatic conditions- thermal and visual comfort, thermal conductivity and heat transfer, strategic design to suit the local climatic conditions, physical and technological aspects of the building. Site Planning and Landscape Design- relation between site features and design requirements, site planning techniques and checklist and evaluating surface drainage, criteria for plant selection in different conditions.

Sustainable Architecture- II

SDG 11

Course code: 22AR3221B | L-T-P-S: 2-0-0-0 | Credits: 2 | Programme: Bachelor of Architecture

CO	Course Outcome	PO / PSO	BTL
CO1	To understand the importance of energy efficiency in buildings and strategies involved.	PO1, PO4	2
CO2	To understand the importance of relevance of water in built environment	PO6	2
CO3	Introduction to green rating systems and building codes	PO3	2
CO4	Introduction to simulation and analysis software	PO9	2

Syllabus

Energy Efficiency in buildings: General understanding of energy efficiency in thermal appliances, electrical appliances, HVAC systems, Energy performance assessment in terms of building operations, and embodied energy; BEE ratings for electrical appliances. Water in built environment: water crisis and increased misuse, water pollution and social implications. Groundwater and surface water management, site planning for efficient water management. Traditional water harvesting techniques in different climatic zones. Green rating systems: Introduction to green rating systems like LEED, IGBC, GRIHA Criteria for rating and general understanding and comparison between various rating systems NBC and other national codes for green buildings. Simulation Software: General introduction and application of Building Simulation software for various applications like thermal comfort, day lighting, artificial lighting, and HVAC systems.

Design for Sustainability

SDG 11

Course code: 25MD52B2 | L-T-P-S: 2-0-2-0 | Credits: 3 | Programme: M.Tech - Machine Design

CO	Course Outcome	PO / PSO	BTL
CO1	Understanding the Principles and Importance of Sustainability	PO5, PO6	2
CO2	Applying Life Cycle Assessment and Environmental Impact Assessment in Design	PO1, PO2	3
CO3	Applying Life Cycle Assessment and Environmental Impact Assessment in Design	PO1, PO2	3
CO4	Apply Sustainable Manufacturing, Supply Chain, and Assessment Tools	PO5, PO6	3
CO5	Apply principles of sustainability in engineering design and develop sustainable solutions	PO5, PO6	3

Syllabus

Introduction to Sustainability: Definition and Principles of Sustainability, Importance of Sustainable Design, Environmental, Social, and Economic Dimensions Life Cycle Assessment: Introduction to Life Cycle Assessment (LCA), Life Cycle Thinking and Stages of LCA, Environmental Impact Assessment in Design, Interpretation and Limitations of LCA Results.

Sustainable Design Strategies: Design for Disassembly and End-of-Life Management, Material Selection and Substitution, Energy Efficiency and Renewable Energy Integration, Water Conservation and Waste Reduction, Design for Recyclability and Upcycling Sustainable Product Design: Design Principles for Sustainable Products, Eco-design and Design Guidelines, Cradle-to-Cradle Design Concepts, Sustainable Packaging Design.

Sustainable Manufacturing and Supply Chain Lean Manufacturing and Waste Reduction, Green Supply Chain Management, Closed-Loop Systems and Circular Economy, Social and Ethical Considerations in Manufacturing

Sustainable Design Assessment Tools Sustainable Design Standards and Certifications (e.g., LEED, BREEAM), Environmental Product Declarations (EPDs), Carbon Footprint Analysis, Social Life Cycle Assessment

Sustainable Construction Technology

SDG 11

Course code: 22CE4156 | L-T-P-S: 3-0-0-0 | Credits: 3 | Programme: B.Tech - Civil Engineering

CO	Course Outcome	PO / PSO	BTL
CO1	Understand the construction basics of a Common building construction methods conventional	7,11	1
CO2	Understand the modern construction methods basics of construction Modular Construction Precast concrete.	7,11	1
CO3	Understand the sustainable construction materials technologies and project management strategies	7,11	1
CO4	Understand the LEED for New Construction rating system	7,11	1

Syllabus

Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods conventional walls and slabs; conventional framed structure with blockwork as infill walls; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges; Identification of cutting edge sustainable construction materials, technologies, and project management strategies for use in the construction industry and evaluation of their potential to reduce the negative environmental impacts of construction activity. Examination of the current LEED for New Construction rating system, and case study analysis of highly successful recent "green construction projects" through student team assignments and presentations. Preparation for the LEED Green Associate professional licensing exam.

Urban Design

SDG 11

Course code: 22AR4229A | L-T-P-S: 2-0-0-0 | Credits: 2 | Programme: Bachelor of Architecture

CO	Course Outcome	PO / PSO	BTL
CO1	To memorize Urban Design terminologies	PO2	2
CO2	To understand Users and Activities in a city	PO4	2
CO3	To understand public spaces, streets & Transport	PO4	2
CO4	To understand Application of Urban Design	PO9	2

Syllabus

Introduction to Urban Design; Terminologies; Urban Design as a Multi-Disciplinary field; Stakeholders and their role in the process of Urban Design. Users and Activities in a city and their Analysis; User needs and behavioral studies; Socio-cultural and Socio-economic aspects of people; Memory and mental mapping. Urban Design – Scope, Scale, Strategies, levels & legislation; “FIVE ELEMENTS” in a city; People-Centric Design and Public Participation. Urban morphology & Urban Character; Elements and aspects of Urban Design; Built & unbuilt spaces; Buildings; Public spaces, streets & Transport; Pedestrianization& streetscape; Movement pattern; Services; Defensible Spaces; Environment and Urban Design. Survey techniques; Evolution Analysis; Townscape analysis; Perpetual structure; Permeability study (Privacy & Accessibility) & Visual Analysis; Constraints and possibilities; designing in a context and site planning; articulation of spaces; Flexibility, adaptability; Formulation of issues for intervention. Application of Urban Design, Examples of Good Urban Design; New Urbanism, case studies and contemporary urban interventions.

Insights to Sustainable Development Goals

SDG 11

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.