Sustainability Courses - IFHE			
Sl. No.	**Course Name**	**SDG No.**	**SDG Name**
1.	Air Pollution and Control	SDG 3, SDG 11, SDG 13	Good health and well-being, Sustainable cities and communities, Climate action
2.	Autonomous Vehicles	SDG 3, SDG 9, SDG 11, SDG13	Good health and well-being, Industry, Innovation, Technology and Infrastructure, Sustainable cities and communities, Climate action
3.	Environmental Sciences	SDG 11, SDG 7, SDG 13, SDG 6, SDG 15	Sustainable Cities and Communities, Affordable and Clean Energy, Climate Action, Clean Water and Sanitation, Life on Land
4.	Environmental Studies	SDG 13, SDG 15, SDG 12, SDG 6, SDG 11, SDG 3	Climate Action, Life on Land, Responsible Consumption and Production, Clean Water and Sanitation, Sustainable Cities and Communities, Good Health and Well-being
5.	Human Society in the Natural Environment: Sustainability Issues	SDG 13, SDG 15, SDG 12, SDG 6, SDG 11, SDG 3	Climate Action, Life on Land, Responsible Consumption and Production, Clean Water and Sanitation, Sustainable Cities and Communities, Good Health and Well-being
6.	Intelligent Transportation Systems	SDG 9, SDG 11, SDG 13, SDG 7, SDG 3, SDG 12, SDG 15, SDG 6	Industry, Innovation, and Infrastructure, Sustainable Cities and Communities, Climate Action, Affordable and Clean Energy, Good Health and Well-being, Responsible Consumption and Production
7.	Personal and Family Health and Wellness	SDG 3, SDG 4, SDG 6, SDG 11, SDG 12	Good Health and Well-being, Quality Education, Clean Water and Sanitation, Sustainable Cities and Communities, Responsible Consumption and Production

Resolution of the Academic Council

The ICFAI Foundation for Higher Education, Hyderabad, in its 38th Academic Council meeting held on February 17, 2023 at Hyderabad, approved the following course effective from the Academic Year 2023-24.

Air Pollution and Control

Course Objectives:

- Develop an understanding of the classification, sources and effects of pollutants
- Describe general air pollution problems, air transport equations
- To understand the fundamentals of meteorology
- Study the principles and equipment description of control technologies
- Introduction of major problems in indoor air pollution and control, regulations

Unit - I

Introduction: sources, effects on – ecosystems, classification of atmospheric pollutants, air pollution episodes of environmental importance. Meteorology - composition and structure of the atmosphere, wind circulation, solar radiation, lapse rates, atmospheric stability conditions, wind velocity profile, Maximum Mixing Depth (MMD), Temperature Inversions, Windrose diagram. General characteristics of stack emissions, plume behaviour, heat island effect.

Unit - II

Air Quality models - Gaussian convection-diffusion model for point, line and areal sources. Air Pollution Control of particulate matter & gaseous pollutants from point & non-point sources – gravity settling chambers, centrifugal collectors, wet collectors, fabric filters, electrostatic precipitator (ESP). – adsorption, absorption, scrubbers, condensation and combustion. Dust suppression measures.

Unit - III

Indoor Air Pollution – sources, effects and control. Noise - sources, measurements, effects and occupational hazards. Standards, Noise mapping, Noise attenuation equations and methods, prediction equations, control measures, Legal aspects of noise.

Unit - IV

Monitoring of particulate matter and gaseous pollutants – respirable, non-respirable and nano-particulate matter. CO, CO2, Hydrocarbons (HC), SOX and NOX, photochemical oxidants.

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Resolution of the Academic Council

The ICFAI Foundation for Higher Education, Hyderabad, in its 36th Academic Council meeting held on March 11, 2022 at Hyderabad, approved the following course effective from the Academic Year 2023-24.

Autonomous Vehicles

Objectives:

- Understand the rational for and evolution of automotive electronics;
- Understand which automotive systems have been replaced by electronic control systems and the advantage of doing so;
- Understand the fundamental theory of operation of electronic control systems;
- Understand the basics of how automotive ECUs function in conjunction with the vehicle data bus networks and sensors;
- Become familiar with the various types of advanced driver assistance systems.
- Students are able to synthesize performance specifications for autonomous driving.

Unit - I

Introduction to Automated, Connected, and Intelligent Vehicles, Introduction to the Concept of Automotive Electronics, Automotive Electronics Overview, History & Evolution, Infotainment, Body, Chassis, and Powertrain Electronics, Advanced Driver Assistance Electronic Systems, Connected and Autonomous Vehicle Technology, Basic Control System Theory applied to Automobiles.

Unit - II

Overview of the Operation of ECUs, Basic Cyber-Physical System Theory and Autonomous Vehicles, Role of Surroundings Sensing Systems and Autonomy, Role of Wireless Data, Networks and Autonomy, Sensor Technology for Advanced Driver Assistance Systems, Basics of Radar Technology and Systems. Ultrasonic Sonar Systems, Lidar Sensor, Technology and Systems, Camera Technology, Night Vision Technology. Other Sensors, Use of Sensor Data Fusion, Integration of Sensor Data to On-Board Control Systems.

Unit - III

Overview of Wireless Technology, Wireless System Block Diagram and Overview of Components, Transmission Systems – Modulation/Encoding, Receiver System Concepts – Demodulation/Decoding, Signal Propagation Physics, Basic Transmission Line and Antenna Theory, Wireless System Standards and Standards Organizations, Role of Standards, Standards Organizations, Present Standards for Autonomous Applications.

Unit - IV

Wireless Networking and Applications to Vehicle Autonomy, Basics of Computer Networking the Internet of Things, Wireless Networking Fundamentals, Integration of Wireless Networking and On-Board Vehicle Networks, Review of On-Board Networks – Use & Function, Connected Car Technology Connectivity Fundamentals Navigation and Other Applications, Vehicle-to-Vehicle Technology and Applications, Vehicle-to-Roadside and Vehicle-to-Infrastructure Applications, Wireless Security Overview, Advanced Driver Assistance, System Technology, Basics of Theory of Operation, Applications – Legacy, Applications – New, Applications – Future, Integration of ADAS Technology into Vehicle Electronics, System Examples, Role of Sensor Data Fusion, Connected Car Display Technology, Center Console Technology, Gauge Cluster Technology, Heads-Up Display Technology, Warning Technology – Driver Notification

Unit - V

Warning Technology – Driver Notification, Impaired Driver Technology, Driver Impairment Sensor Technology, Sensor Technology for Driver Impairment Detection, Transfer of Control Technology, Vehicle Prognostics Technology, Monitoring of Vehicle Components, Basic Maintenance, End-of-Life Predictions, Advanced Driver Assistance System Sensor Alignment and Calibration, Autonomous Vehicles, Driverless Car Technology, Moral, Legal, Roadblock

Issues, Technical Issues, Security Issues, recent Advanced Driver Assistance System Technology Examples, Advanced Driver Assistance System Technology Examples, Toyota, Nissan, Honda, Hyundai, Volkswagen, BMW, Daimler, Fiat Chrysler Automobiles, Ford, General Motors, Troubleshooting and Maintenance of Advanced Driver Assistance, Systems

Failure Modes – Self Calibration, Sensor Testing and Calibration, Redundant Systems Standard Manufacturing Principles. Non-Passenger Car Advanced Driver Assistance Systems and Autonomous Operation.

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Resolution of the Academic Council

The ICFAI Foundation for Higher Education, Hyderabad, in its 40th Academic Council meeting held on May 14, 2024 at Hyderabad, approved the following course effective from the Academic Year 2023-24.

Environmental Sciences

Course Objective

- To familiarize students with the ecological system and emphasize its significance in architecture
- To explore the challenges faced by urban ecosystems and principles of sustainable design
- To provide insights into sustainable energy and water management practices in buildings.
- To facilitate an understanding of key environmental legislations, acts, and institutions governing sustainable development in India.

Unit - 1: Ecological system

Ecology as a system, Environmental resources, Bio-geographical classification of India, Introduction to Ecosystem Services, challenges for safeguarding ecosystems, Ecology and architecture, Challenges of urban ecosystems- pollution, loss of habitat, urban heat, groundwater, public health etc., Introduction to Ecological footprint

Unit - 2: Ecology and Architecture

Ecology and its significance in architecture, Climate change, Greenhouse effect, Evolution of sustainable development- Stockholm Conference 1972; United Nations Conference on Environment and Development 1992; Rio de Janeiro (Rio Declaration, Agenda 21); Convention on Biological Diversity, Montreal Protocol 1987; Kyoto Protocol 1997; Copenhagen and Paris summits, COP etc. Sustainable Development Goals, Impact of architecture on the environment, Principles of sustainable design

Unit - 3: Energy, Water and Nature-Based Solutions

Environmental Cost, Energy sources and consumption in buildings, Passive design strategies for energy efficiency, Renewable energy technologies in architecture, Water consumption in buildings, Sustainable water use in buildings, Rainwater harvesting and greywater reuse, Introduction to Nature-Based Solutions.

Unit - 4: Environmental Legislations, Acts, Institutions Annexure III

Environmental provisions in the Constitution of India, fundamental rights and, fundamental duties, Legal definitions of environmental pollution, natural resource, biodiversity, forest, sustainable development, Relevant environmental acts of India

Role of Ministry of Environment, Forest & Climate Change, National Green Tribunal, Indian Green Building Council, GRIHA, TERI, and BEE

Course outcome

- Demonstrate an understanding of ecological systems and ecosystem services and their relevance to architecture
- Identify and analyze challenges associated with urban ecosystems
- Apply energy-efficient design strategies to enhance the sustainability of buildings
- Implement sustainable water management practices
- Interpret and adhere to key environmental legislations, acts, and institutional frameworks governing sustainable development in India, including their implications for architectural practice.

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Resolution of the Board of Studies

The ICFAI Foundation for Higher Education, Hyderabad, in its 13th Board of Studies held on April 24, 2018 at Hyderabad, approved the following course effective from the Academic Year 2018-19.

Environmental Studies

Course Description

This course focuses on economic causes of environmental problems. In particular, economic principles are applied to environmental questions and their management through various economic institutions, economic incentives and other instruments and policies. Economic implications of environmental policy are also addressed as well as valuation of environmental quality, quantification of environmental damages, tools for evaluation of environmental projects such as cost-benefit analysis and environmental impact assessments. Selected topics on international environmental problems are also discussed.

Course Outcomes:

- Students will have an idea about the components, importance & problems associated with natural environment.
- To make the students understand about different types of natural resources.
- Students will be able to know about biodiversity & conservation.
- Students will be able to know the causes, effects & remedies of different types of pollutions.
- Students will be able to know about the ecosystem

Unit - I: Introduction to environmental studies: Definition, components, scope and multidisciplinary nature of environment studies-The importance and need for awareness of environmental problems/issues-Ecosystem-Definition, structure, function, and energy flow in ecosystem: food chains, food Webs & ecological succession-Different types of ecosystems and their interdependence on each other.

Unit - II: Natural Resources: Different types of renewal and nonrenewal resources- Contribution of these resources in human life and their misuse and exploitation

Unit - III: Biodiversity & conservation: Introduction and levels of biological diversity; biodiversity patterns and global biodiversity hotspots with a focus to India as a mega biodiversity nation-Endangered and endemic species; threats to biodiversity and ways to conserve the same - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit - IV: Environmental Pollution: Environmental pollution: types (air, water, noise, soil, marine, thermal, radiation), and their causes, effects, and controls - Nuclear hazards and human health risks- Solid waste management: Control measures of urban and industrial waste- Other environmental concerns (climate change, Global warming, ozone Layer depletion, acid rain) and its impact on human life.

Unit - V: Environmental Policies and Practices: Environment Laws & Regulations: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention & Control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols And Convention on Biological Diversity (CBD)-Nature reserves of India.

Unit - VI: Human Communities and the Environment: Human population growth: impacts on environment, human health and welfare- Disaster management: Floods, earthquake, cyclones, and landslides. Resettlement and rehabilitation of affected persons-Environmental movements such as Chipko, Silent Valley; and Bishnois of Rajasthan - Environmental Ethics: Role of Indian and other Religions and cultures in environmental Conservation.

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Resolution of the Board of Studies

The ICFAI Foundation for Higher Education, Hyderabad, in its 25th Board of Studies meeting held on February 10, 2023 at Hyderabad, approved the following course effective from the Academic Year 2023-24.

Human Society in the Natural Environment: Sustainability Issues

Objectives:

- To make students understand how the natural and built environments shape and are shaped by multiple socio-cultural and political factors.
- To make students understand the causes of the prevailing environmental problems and ways of addressing them.
- To help students contemplate various environmental issues across and beyond existing disciplinary boundaries and aid them in becoming aware of the diverse forms of knowledge and experience that arise from human interactions with the environment around them.
- To make students reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Learning Outcomes:

The course will assist the students in nurturing knowledge, respect, and compassion for their natural surrounding environment.

Students will be able to live responsibly and appreciate the environmental and cultural histories associated with the respective places.

Students will be able to understand the importance of proper utilization of natural resources in order to develop sustainably as an individual as well as a society as a whole.

Students will be aware of their role as citizens, consumers and environmental actors in a complex, interconnected world.

Syllabus:

Module - I: Introduction to environmental studies

Definition, components, scope and multi-disciplinary nature of environment studies

To acknowledge the importance and need for awareness of environmental problems/issues

Module - II: Natural Resources

Different types of renewal and non-renewal resources.

Contribution of these resources in human life and their misuse and exploitation.

Module - III: Ecosystem

Definition, structure, function, and energy flow in ecosystem: food chains, food webs & ecological succession

Different types of ecosystems and their interdependence on each other

Module - IV: Biodiversity & conservation

Introduction and levels of biological diversity; biodiversity patterns and global biodiversity hotspots with a focus to India as a mega biodiversity nation.

Endangered and endemic species; threats to biodiversity and ways to conserve the same.

Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Module - V: Environmental pollution

Environmental pollution: types (air, water, noise, soil, marine, thermal, radiation), and their causes, effects, and controls.

Nuclear hazards and human health risks.

Solid waste management: Control measures of urban and industrial waste.

Other environmental concerns (climate change, Global warming, ozone Layer depletion, acid rain) and its impact on human life.

Cases on environmental pollution.

Module - VI: Environmental policies and practices

Environment Laws & Regulations: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention & Control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act.

International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).

Nature reserves of India.

Module - VII: Human communities and the environment

Human population growth: impacts on environment, human health and welfare.

Disaster management: Floods, earthquake, cyclones, and landslides. Resettlement and rehabilitation of affected persons.

Environmental movements such as Chipko, Silent Valley; and Bishnois of Rajasthan.

Environmental Ethics: Role of Indian and other Religions and cultures in environmental Conservation.

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Resolution of the Academic Council

The ICFAI Foundation for Higher Education, Hyderabad, in its 36th Academic Council meeting held on May 11, 2022 at Hyderabad, approved the following course effective from the Academic Year 2023-24.

Intelligent Transportation Systems

Objective:

- To develop an understanding of system engineering processes
- To describe the concepts of system architecture and their evolution
- Understand the capability of key technologies
- Understand impact of technology on different modes and movement
- Understand how to evaluate technologies, applications and services

Unit – I: Fundamentals of ITS: Definition of ITS, the historical context of ITS from both public policy and market economic perspectives, Types of ITS; Historical Background, Benefits of ITS.

Unit –II: Sensor technologies and Data requirements of ITS: Importance of telecommunications in the ITS. Information Management, Traffic Management Centers (TMC).Application of sensors to Traffic management; Traffic flow sensor technologies; Transponders and Communication systems; Data fusion at traffic management centers; Sensor plan and specification requirements; Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, video data collection.

Unit – III: ITS User Needs and Services and Functional areas: Introduction, Advanced Traffic Management systems (ATMS), Advanced Traveler Information systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control systems (AVCS), Advanced Public Transportation systems (APTS), Advanced Rural Transportation systems (ARTS).

Unit – IV: ITS Architecture: Regional and Project ITS architecture; Concept of operations; ITS Models d Evaluation Methods; Planning and human factor issues for ITS, Case studies on deployment planning and system design and operation; ITS and safety, ITS and security, ITS as a technology deployment program, research, development and business models, ITS planning.

Unit – V: ITS applications: Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing.; Transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications; ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation institutions Automated Highway Systems- Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.

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Resolution of the Board of Studies

The ICFAI Foundation for Higher Education, Hyderabad, in its 25th Board of Studies meeting held on February 10, 2023 at Hyderabad, approved the following course effective from the Academic Year 2023-24.

Personal and Family Health and Wellness

Course Description:

The course has been designed to impart education and knowledge about the significance of correct body postures, breathing, movement, and exercises for fostering healthy natural life. This course uses the lens of an individual's lifecycle or life course commencing from conception till old age. Accordingly, students will be familiarized with skills, in self-realization and setting goals in life. It will also help the students to be focused towards their goal and make them physically, mentally and spiritually strong to face different challenges in life. Pursuing this course will develop leadership qualities in the students along with their personality development. Yoga is the science of achieving absolute union with the divine.

Course Objectives:

- To impart knowledge about the benefits of yoga in one's life
- To impart the skills required to practice yoga on a regular basis
- To introduce students to yoga, and help them achieve a reasonable level of proficiency in performing yoga

Syllabus:

Module - I: Human Life Cycle Stages: Introduction; Prenatal development; Infancy; Babyhood; Early Childhood; Late Childhood; Adolescence; Adulthood; Middle Age; Old Age; Theories of Life Span Development; Maintaining a healthy life balance across the life span.

Module - II: The Home and the External Environment: The family at home and members' interdependencies; synchronization and coordination of work for harmony; Hygiene, Cleanliness, and Sanitation; Waste Management; The zero-waste family; socio-economic and environmental factors influencing health; the zero-waste community; water management; community wellness.

Module - III: Health and Wellness: Introduction to Health and Wellness; Heredity and Environment;

Genetic Dispositions and Evolution of the concept of wellness; Circadian rhythms and their implications for wellness; Benefits of health and wellness; Physical Conditions and Dimensions of wellness; Wellness economy.

Module - IV: Managing Health and Wellness: Health – Physical and Mental; Modal concerns across human life course stages; Anticipatory and preventive practices - Diet and Nutrition for wellness, physical activities and rest + sleep, injury prevention practices, immunization, periodic health check-ups; Health risk behaviours – smoking, addiction (alcohol, drugs and technology), time-abuse, Accepting and demonstrating personal responsibility for health and safety.

Module - V: Course Review: Review via Open interactions; Fine Tuning of Practices.

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