

**COURSE DESCRIPTION**

This course aims to provide a broad understanding about the modern values and ethical principles that have evolved and are enshrined in the Constitution of India with regard to the democratic, secular and scientific aspects. The course is designed for undergraduate students so that they could study, understand and apply these values in their day to day life.

**COURSE OBJECTIVES:**

- To create awareness about values and ethics enshrined in the Constitution of India
- To sensitize students about the democratic values to be upheld in the modern society.
- To inculcate respect for all people irrespective of their religion or other affiliations.
- To instill the scientific temper in the students' minds and develop their critical thinking.
- To promote sense of responsibility and understanding of the duties of citizen.

**UNIT I DEMOCRATIC VALUES**

6

Understanding Democratic values: Equality, Liberty, Fraternity, Freedom, Justice, Pluralism, Tolerance, Respect for All, Freedom of Expression, Citizen Participation in Governance – World Democracies: French Revolution, American Independence, Indian Freedom Movement.

Reading Text: Excerpts from John Stuart Mills' *On Liberty*

**UNIT II SECULAR VALUES**

6

Understanding Secular values – Interpretation of secularism in Indian context - Disassociation of state from religion – Acceptance of all faiths – Encouraging non-discriminatory practices.

Reading Text: Excerpt from *Secularism in India: Concept and Practice* by Ram Puniyani

**UNIT III SCIENTIFIC VALUES**

6

Scientific thinking and method: Inductive and Deductive thinking, Proposing and testing Hypothesis, Validating facts using evidence based approach – Skepticism and Empiricism – Rationalism and Scientific Temper.

Reading Text: Excerpt from *The Scientific Temper* by Antony Michaelis R

**UNIT IV SOCIAL ETHICS**

6

Application of ethical reasoning to social problems – Gender bias and issues – Gender violence – Social discrimination – Constitutional protection and policies – Inclusive practices.

Reading Text: Excerpt from *21 Lessons for the 21<sup>st</sup> Century* by Yuval Noah Harari

**UNIT V SCIENTIFIC ETHICS**

6

Transparency and Fairness in scientific pursuits – Scientific inventions for the betterment of society - Unfair application of scientific inventions – Role and Responsibility of Scientist in the modern society.

Reading Text: Excerpt from *American Prometheus: The Triumph and Tragedy of J.Robert Oppenheimer* by Kai Bird and Martin J. Sherwin.

**TOTAL: 30 PERIODS****COURSE OUTCOMES**

Students will be able to

- CO1 : Identify the importance of democratic, secular and scientific values in harmonious functioning of social life
- CO2 : Practice democratic and scientific values in both their personal and professional life.
- CO3 : Find rational solutions to social problems.
- CO4 : Behave in an ethical manner in society
- CO5 : Practice critical thinking and the pursuit of truth.

**REFERENCES:**

1. The Nonreligious: Understanding Secular People and Societies, Luke W. Galen Oxford University Press, 2016.
2. Secularism: A Dictionary of Atheism, Bullivant, Stephen; Lee, Lois, Oxford University Press, 2016.
3. The Oxford Handbook of Secularism, John R. Shook, Oxford University Press, 2017.
4. The Civic Culture: Political Attitudes and Democracy in Five Nations by Gabriel A. Almond and Sidney Verba, Princeton University Press,
5. Research Methodology for Natural Sciences by Soumitro Banerjee, IISc Press, January 2022

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## MANDATORY COURSES I

MX3081

**INTRODUCTION TO WOMEN AND GENDER STUDIES**

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### COURSE OUTLINE

#### UNIT I CONCEPTS

Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour.

#### UNIT II FEMINIST THEORY

Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, ecofeminist.

#### UNIT III WOMEN'S MOVEMENTS: GLOBAL, NATIONAL AND LOCAL

Rise of Feminism in Europe and America.  
Women's Movement in India.

#### UNIT IV GENDER AND LANGUAGE

Linguistic Forms and Gender.  
Gender and narratives.

#### UNIT V GENDER AND REPRESENTATION

Advertising and popular visual media.  
  
Gender and Representation in Alternative Media.  
Gender and social media.

TOTAL : 45 PERIODS

CME350

**ENVIRONMENT SUSTAINABILITY AND IMPACT  
ASSESSMENT**

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### COURSE OBJECTIVES

- 1 To make the students to understand the concepts of Environmental Sustainability & Impact Assessment
- 2 To familiarize the students in environmental decision making procedure.
- 3 Make the students to identify, predict and evaluate the economic, environmental, and social impact of development activities
- 4 To provide information on the environmental consequences for decision making
- 5 To promote environmentally sound and sustainable development through the identification of appropriate alternatives and mitigation measures.

#### UNIT – I ENVIRONMENTAL IMPACT ASSESMENT

9

Environmental impact assessment objectives – rationale and historical development of EIA - Conceptual frameworks for EIA Legislative development – European community directive – Hungarian directive.

#### UNIT – II ENVIRONMENTAL DECISION MAKING

9

Strategic environmental assessment and sustainability appraisal – Mitigation, monitoring and management of environmental impacts- Socio economic impact assessment.

#### UNIT – III ENVIRONMENTAL POLICY, PLANNING AND LEGISLATION

9

Regional spatial planning and policy – Cumulative effects assessment – Planning for climate change, uncertainty and risk.

#### UNIT – IV LIFE CYCLE ASSESSMENT

9

Life cycle assessment; Triple bottom line approach; Industrial Ecology. Ecological foot printing, Design for Environment, Future role of LCA, Product stewardship, design, durability and justifiability, measurement techniques and reporting

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**UNIT – V                    SUSTAINABLE URBAN ECONOMIC DEVELOPMENT****9**

Spatial economics – Knowledge economy and urban regions.

**TOTAL: 45 PERIODS****OUTCOMES:** At the end of the course the students would be able to

1. Explain the concepts of Environment Sustainability and trained to make decision related to Environment.
2. Make decision that has an effect on our environment
3. Evaluate the basics of environmental policy, planning and various legislation  
Get valuable information for exploring decisions in each life stage of materials, buildings, services and infrastructure.
4. Explain the Life cycle assessment of Environmental sustainability.
5. Explain sustainable urban economic development.

**TEXT BOOKS:**

1. The Application of Science in Environmental Impact Assessment, by Aaron J. MacKinnon, Peter I Duinker , Tony R. Walker , Routledge; 1st edition (14 May 2019), ISBN-10 : 0367340194
2. Routledge Handbook of Environmental Impact Assessment, by Kevin Hanna, Routledge; 1st editic (11 April 2022), ISBN-10 : 0367244470

**REFERENCES:**

1. Clive George, C. Collin, H. Kirkpolarice – Impact Assessment and sustainable development – Edward Elgar Publishing, 2007
2. Robert B Gibsan, Sustainability Assessment, Earth Scan publishers, 2005
3. Simon Dresner, The principle of sustainability – Earth Scan publishers, 2008
4. Canter, R.L., "Environmental Impact Assessment", McGraw Hill Inc., New Delhi, 1996.
5. Shukla, S.K. And Srivastava, P.R., "Concepts In Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.
6. John G. Rau And David C Hooten "Environmental Impact Analysis Handbook", McGraw Hill Book Company, 1990.

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**ENVIRONMENTAL SCIENCES AND SUSTAINABILITY**

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**OBJECTIVES:**

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

**UNIT I ENVIRONMENT AND BIODIVERSITY**

6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

**UNIT II ENVIRONMENTAL POLLUTION**

6

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHSMS). Environmental protection, Environmental protection acts.

**UNIT III RENEWABLE SOURCES OF ENERGY**

6

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

**UNIT IV SUSTAINABILITY AND MANAGEMENT**

6

Development, GDP, Sustainability- concept, needs and challenges–economic, social and aspects of sustainability–from unsustainability to sustainability–millennium development goals, and protocols–Sustainable Development Goals–targets, indicators and intervention areas Climate change– Global, Regional and local environmental issues and possible solutions–case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry–A case study.

**UNIT V SUSTAINABILITY PRACTICES**

6

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles–carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization– Socio-economical and technological change.

**TOTAL : 30 PERIODS**

**OUTCOMES:**

- To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
- To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
- To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
- To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
- To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

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**SUSTAINABLE AND ENVIRONMENTAL FRIENDLY  
HV INSULATION SYSTEM**

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**COURSE OBJECTIVES:**

- To Know about the products related with sustainable applicaton.
- To learn about Green Gaseous, liquid solid insulators.
- To understand the standards for green insulation systems.

**UNIT I SUSTAINABLE AND ENVIRONMENTAL ENERGY AND PRODUCTS 9**  
Carbon print, global warming potential, environment requirement for any product and system.

**UNIT II ALTERNATE GREEN GASEOUS INSULATORS 9**  
SF6 gas and its hazardous environmental effects, alternate gases, gaseous mixtures and other sources and it's properties.

**UNIT III ALTERNATE GREEN LIQUID INSULATORS 9**  
hazardous effects of existing liquid dielectric materials (such as organic oil), alternate sources of environmental friendly liquid such as ester oil, vegetable oils dielectric and it's properties.

**UNIT IV ALTERNATE GREEN SOLID INSULATORS 9**  
hazardous effects of existing solid dielectric materials, alternate sources of environmental friendly solid dielectric and its properties.

**UNIT V EVOLVING STANDARDS FOR GREEN INSULATION SYSTEMS 9**  
Requirements, evolving standards of management, testing, usage and disposal of alternate insulation systems, Major applications and standards

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. <https://www.iso.org/standard/79064.html>
2. <https://www.ictfootprint.eu/en/iec-tr-627252013-factsheet>
3. [https://www.iec.ch/dyn/www/f?p=103:7:0:::FSP\\_ORG\\_ID,FSP\\_LANG\\_ID:1275,25](https://www.iec.ch/dyn/www/f?p=103:7:0:::FSP_ORG_ID,FSP_LANG_ID:1275,25)
4. [https://www.iec.ch/ords/f?p=103:41:628762356646470:::FSP\\_ORG\\_ID,FSP\\_LANG\\_ID:323,7,25](https://www.iec.ch/ords/f?p=103:41:628762356646470:::FSP_ORG_ID,FSP_LANG_ID:323,7,25)
5. [https://www.iec.ch/dyn/www/f?p=103:7:0:::FSP\\_ORG\\_ID,FSP\\_LANG\\_ID:1299,25](https://www.iec.ch/dyn/www/f?p=103:7:0:::FSP_ORG_ID,FSP_LANG_ID:1299,25)
6. <https://www.iec.ch/sdqs/sdq13>
7. [http://highperformanceinsulation.eu/wp-content/uploads/2016/08/sustainability\\_a\\_guide.pdf](http://highperformanceinsulation.eu/wp-content/uploads/2016/08/sustainability_a_guide.pdf)

**COURSE OUTCOMES:**

Upon completion of the course, students will be able to:

- CO1: Know about sustainable and environmental energy and products.
- CO2: Describe the alternate green gaseous insulators.
- CO3: Describe the alternate green liquid insulators
- CO4: Describe the alternate green solid insulators
- CO5: Elaborate the standards for Green insulation systems.

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**COURSE OBJECTIVES:**

- To understand and study the complexity of the environment in relation to pollutants generated due to industrial activity.
- To analyze the quality of the environmental parameters and monitor the same for the purpose of environmental risk assessment.

**UNIT I: ENVIRONMENTAL MONITORING AND STANDARDS**

9

Introduction- Environmental Standards- Classification of Environmental Standards- Global Environmental Standards- Environmental Standards in India- Ambient air quality standards- water quality standard- Environmental Monitoring-Need for environmental monitoring- Concepts of environmental monitoring- Techniques of Environmental Monitoring.

**UNIT II: MONITORING OF ENVIRONMENTAL PARAMETERS**

9

Current Environmental Issues- Global Environmental monitoring programme-International conventions- Application of Environmental Monitoring- Atmospheric Monitoring - screening parameters – Significance of environmental sampling- sampling methods – water sampling - sampling of ambient air-sampling of flue gas.

**UNIT III: ANALYTICAL METHODS FOR ENVIRONMENTAL MONITORING**

9

Classification of Instrumental Method- Analysis of Organic Pollutants by Spectrophotometric methods -Determination of nitrogen, phosphorus and, chemical oxygen demand (COD) in sewage; Biochemical oxygen demand (BOD)- Sampling techniques for air pollution measurements; analysis of particulates and air pollutants like oxides of nitrogen, oxides of sulfur, carbon monoxide, hydrocarbon; Introduction to advanced instruments for environmental analysis

**UNIT IV : ENVIRONMENTAL MONITORING PROGRAMME (EMP) & RISKASSESSMENT**

9

Water quality monitoring programme- national water quality monitoring- Parameters for National Water Quality Monitoring- monitoring protocol; Process of risk assessment- hazard identification- exposure assessment- dose-response assessment; risk characterization.

**UNIT V: AUTOMATED DATA ACQUISITION AND PROCESSING**

9

Data Acquisition for Process Monitoring and Control - The Data Acquisition System - Online Data Acquisition, Monitoring, and Control - Implementation of a Data Management System - Review of Observational Networks -Sensors and transducers- classification of transducers- data acquisition system- types of data acquisition systems- data management and quality control; regulatory overview.

**TOTAL: 45 PERIODS****COURSE OUTCOMES**

After completion of this course, the students will know

**CO1** Basic concepts of environmental standards and monitoring.

**CO2** the ambient air quality and water quality standards;

**CO3** the various instrumental methods and their principles for environmental monitoring

**CO4** The significance of environmental standards in monitoring quality and sustainability of the environment.

**CO5** the various ways of raising environmental awareness among the people.

**CO6** Know the standard research methods that are used worldwide for monitoring the environment.

**TEXTBOOKS**

1. Environmental monitoring Handbook, Frank R. Burden, © 2002 by The McGraw-Hill Companies, Inc.
2. Handbook of environmental analysis: chemical pollutants in the air, water, soil, and solid wastes / Pradyot Patnaik, © 1997 by CRC Press, Inc

**REFERENCES**

1. Environmental monitoring / edited by G. Bruce Wiersma, © 2004 by CRC Press LLC.
2. H. H. Willard, L. L. Merit, J. A. Dean and F. A. Settle, Instrumental Methods of Analysis, CBP Publishers and Distributors, New Delhi, 1988.
3. Heaslip, G. (1975) Environmental Data Handling. John Wiley & Sons. New York.

**COURSE OBJECTIVES:**

- To understand the types of energy sources, energy efficiency and environmental implications of energy utilisation
- To create awareness on energy audit and its impacts
- To acquaint the techniques adopted for performance evaluation of thermal utilities
- To familiarise on the procedures adopted for performance evaluation of electrical utilities
- To learn the concept of sustainable development and the implication of energy usage

**UNIT I ENERGY AND ENVIRONMENT**

9

Primary energy sources - Coal, Oil, Gas – India Vs World with respect to energy production and consumption, Climate Change, Global Warming, Ozone Depletion, UNFCCC, COP

**UNIT II ENERGY AUDITING**

9

Need and types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments

**UNIT III ENERGY EFFICIENCY IN THERMAL UTILITIES**

9

Energy conservation avenues in steam generation and utilisation, furnaces, Thermic Fluid Heaters. Insulation and Refractories - Commercial waste heat recovery devices: recuperator, regenerator, heat pipe, heat exchangers (Plate, Shell & Tube), heat pumps, and thermocompression

**UNIT IV ENERGY CONSERVATION IN ELECTRICAL UTILITIES**

9

Demand side management - Power factor improvement – Energy efficient transformers - Energy conservation avenues in Motors, HVAC, fans, blowers, pumps, air compressors, illumination systems and cooling towers

**UNIT V SUSTAINABLE DEVELOPMENT**

9

Sustainable Development: Concepts and Stakeholders, Sustainable Development Goal (SDG). Globalization and Economic growth. Economic development: Economic inequalities, Income and growth. Social development: Poverty, conceptual issues and measures, impact of poverty,

**TOTAL : 45 PERIODS****COURSE OUTCOMES:**

Upon completion of this course, the students will be able to

- CO1 Understand the prevailing energy scenario
- CO2 Familiarise on energy audits and its relevance
- CO3 Apply the concept of energy audit on thermal utilities
- CO4 Employ relevant techniques for energy improvement in electrical utilities
- CO5 Understand Sustainable development and its impact on human resource development

**REFERENCES:**

1. Energy Manager Training Manual (4Volumes) available at <http://www.em-ee.org/gbook1.asp>, a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India.2004
2. Eastop.T.D& Croft D.R, "Energy Efficiency for Engineers and Technologists", Logman Scientific & Technical, ISBN-0-582-03184, 1990
3. W.R. Murphy and G. McKay "Energy Management" Butterworths, London 1987
4. Pratap Bhattacharyya, "Climate Change and Greenhouse Gas Emission", New India Publishing Agency- Nipa,2020
5. Matthew John Franchetti , Defne Apul "Carbon Footprint Analysis: Concepts, Methods, Implementation, and Case Studies" CRC Press,2012
6. Robert A. Ristinen, Jack J. Kraushaar, Jeffrey T. Brack, "Energy and the Environment", 4th Edition,Wiley,2022
7. M.H. Fulekar,Bhawana Pathak, R K Kale,"Environment and Sustainable Development" Springer,2016
8. Sustainable development in India: Stocktaking in the run up to Rio+20: Report prepared by

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**COURSE OBJECTIVES:**

- To educate the students about the issues of sustainability in agroecosystems, introduce the concepts and principles of agroecology as applied to the design and management of sustainable agricultural systems for a changing world.

**UNIT I AGROECOLOGY, AGROECOSYSTEM AND SUSTAINABLE AGRICULTURE CONCEPTS** 9

Ecosystem definition - Biotic Vs. abiotic factors in an ecosystem - Ecosystem processes - Ecological services and agriculture - Problems associated with industrial agriculture/food systems - Defining sustainability - Characteristics of sustainable agriculture - Difference between regenerative and sustainable agriculture systems

**UNIT II SOIL HEALTH, NUTRIENT AND PEST MANAGEMENT** 9

Soil health definition - Factors to consider (physical, chemical and biological) - Composition of healthy soils - Soil erosion and possible control measures - Techniques to build healthy soil - Management practices for improving soil nutrient - Ecologically sustainable strategies for pest and disease control

**UNIT III WATER MANAGEMENT** 9

Soil water storage and availability - Plant yield response to water - Reducing evaporation in agriculture - Earthworks and tanks for rainwater harvesting - Options for improving the productivity of water - Localized irrigation - Irrigation scheduling - Fertigation - Advanced irrigation systems and agricultural practices for sustainable water use

**UNIT IV ENERGY AND WASTE MANAGEMENT** 9

Types and sources of agricultural wastes - Composition of agricultural wastes - Sustainable technologies for the management of agricultural wastes - Useful and high value materials produced using different processes from agricultural wastes - Renewable energy for sustainable agriculture

**UNIT V EVALUATING SUSTAINABILITY IN AGROECOSYSTEMS** 9

Indicators of sustainability in agriculture - On-farm evaluation of agroecosystem sustainability - Alternative agriculture approaches/ farming techniques for sustainable food production - Goals and components of a community food system - Case studies

**TOTAL: 45 PERIODS**

**COURSE OUTCOME**

- On completion of the course, the student is expected to be able to
- CO1** Have an in-depth knowledge about the concepts, principles and advantages of sustainable agriculture
- CO2** Discuss the sustainable ways in managing soil health, nutrients, pests and diseases
- CO3** Suggest the ways to optimize the use of water in agriculture to promote an ecological use of resources
- CO4** Develop energy and waste management plans for promoting sustainable agriculture in non-sustainable farming areas
- CO5** Assess an ecosystem for its level of sustainability and prescribe ways of converting to a sustainable system through the redesign of a conventional agroecosystem

**REFERENCES:**

- Approaches to Sustainable Agriculture – Exploring the Pathways Towards the Future of Farming, Oberc, B.P. & Arroyo Schnell, A., IUCN, Belgium, 2020
- Natural bioactive products in sustainable agriculture, Singh, J. & Yadav, A.N., Springer, 2020
- Organic Farming for Sustainable Agriculture, Nandwani, D., Springer, 2016
- Principles of Agronomy for Sustainable Agriculture, Villalobos, F.J. & Fereres, E., Springer, 2016
- Sustainable Agriculture for Food Security: A Global Perspective, Balkrishna, A., CRC Press, 2021
- Sustainable Energy Solutions in Agriculture, Bundschuh, J. & Chen, G., CRC Press, 2014



**COURSE OBJECTIVES:**

1. Demonstrate an understanding of how occupational hygiene standards are set and used in work health and safety.
2. Compare and contrast the roles of environmental and biological monitoring in work health and safety
3. Outline strategies for identifying, assessing and controlling risks associated with airborne gases, vapours and particulates
4. Discuss how personal protective equipment can be used to reduce risks associated with workplace exposures
5. Provide high-level advice on managing and controlling noise and noise-related hazards

**UNIT I INTRODUCTION AND SCOPE**

9

Occupational Health and Environmental Safety Management - Principles practices. Comm on Occupational diseases: Occupational Health Management Services at the work place. Pre-employment, periodic medical examination of workers, medical surveillance for control of occupational diseases and health records.

**UNIT II MONITORING FOR SAFETY, HEALTH & ENVIRONMENT**

9

Occupational Health and Environment Safety Management System, ILO and EPA Standards Industrial Hygiene: Definition of Industrial Hygiene, Industrial Hygiene: Control Methods, Substitution, Changing the process, Local Exhaust Ventilation, Isolation, Wet method, Personal hygiene, housekeeping and maintenance, waste disposal, special control measures.

**UNIT III OCCUPATIONAL HEALTH AND ENVIRONMENTAL SAFETY EDUCATION**

9

Element of training cycle, Assessment of needs. Techniques of training, design and development of training programs. Training methods and strategies types of training. Evaluation and review of training programs. Occupational Health Hazards, Promoting Safety, Safety and Health training, Stress and Safety, Exposure Limit .

**UNIT IV OCCUPATIONAL SAFETY, HEALTH AND ENVIRONMENT MANAGEMENT**

9

Bureau of Indian standards on safety and health 14489 - 1998 and 15001 – 2000, OSHA, Process Safety Management (PSM) as per OSHA, PSM principles, OHSAS – 18001, EPA Standards, Performance measurements to determine effectiveness of PSM. Importance of Industrial safety, role of safety department,

**UNIT V INDUSTRIAL HAZARDS**

9

Radiation: Types and effects of radiation on human body, Measurement and detection of radiation intensity. Effects of radiation on human body, Measurement – disposal of radioactive waste, Control of radiation ii. Noise and Vibration: Sources, and its control, Effects of noise on the auditory system and health, Measurement of noise , Different air pollutants in industries, Effect of different gases and particulate matter ,acid fumes ,smoke, fog on human health, Vibration: effects.

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

Students able to

CO1: Explain and apply human factors engineering concepts in both evaluation of existing systems and design of new systems

CO2: Specify designs that avoid occupation related injuries

CO3: Define and apply the principles of work design, motion economy, and work environment design.

CO4: Identify the basic human sensory, cognitive, and physical capabilities and limitations with respect to human-machine system performance.

CO5: Acknowledge the impact of workplace design and environment on productivity

**TEXT BOOKS:**

1. R. K. Jain and Sunil S. Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers, New Delhi (2006)
2. Slote. L, Handbook of Occupational Safety and Health, John Willey and Sons, New York .

**REFERENCES:**

1. Jeanne MagerStellman, Encyclopedia of Occupational Health and Safety (ILO) Ms. Irma Jourdan publication
2. Frank P Lees - Loss of prevention in Process Industries, Vol. 1 and 2,
3. ButterworthHeinemann Ltd., London (1991). 2. Industrial Safety - National Safety Council of India

4. Frank P Lees – Loss of prevention in Process Industries , Vol. 1 and 2, Butterworth- Heinemann Ltd., London
5. R. K. Jain and Sunil S. Rao, Industrial Safety , Health and Environment Management Systems, Khanna publishers, New Delhi (2006).

**TEXT BOOKS:**

1. R. K. Jain and Sunil S. Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers, New Delhi (2006)
2. Slote. L, Handbook of Occupational Safety and Health, John Willey and Sons, New York .

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1. Jeanne MagerStellman, Encyclopedia of Occupational Health and Safety (ILO) Ms. Irma Jourdan publication
2. Frank P Lees - Loss of prevention in Process Industries, Vol. 1 and 2,
3. ButterworthHeinemann Ltd., London (1991). 2. Industrial Safety - National Safety Council of India
4. Frank P Lees – Loss of prevention in Process Industries , Vol. 1 and 2, Butterworth- Heinemann Ltd., London
5. R. K. Jain and Sunil S. Rao, Industrial Safety , Health and Environment Management Systems, Khanna publishers, New Delhi (2006).

**CO's- PO's & PSO's MAPPING**

CO's	PO's												PSO's		
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**SUSTAINABLE CONSTRUCTION AND LEAN CONSTRUCTION**

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**COURSE OBJECTIVE:**

- To impart knowledge about sustainable construction and to understand the concepts of sustainable materials, energy calculations, green buildings and environmental effects.

**UNIT I INTRODUCTION & MATERIALS USED IN SUSTAINABLE CONSTRUCTION 9**

Introduction and definition of Sustainability - Carbon cycle - role of construction material: concrete and steel, etc. - CO<sub>2</sub> contribution from cement and other construction materials - Recycled and manufactured aggregate - Role of QC and durability - Life cycle and sustainability.

**UNIT II ENERGY CALCULATIONS 9**

Components of embodied energy - calculation of embodied energy for construction materials - Energy concept and primary energy - Embodied energy via-a-vis operational energy in conditioned building - Life Cycle energy use.

**UNIT III GREEN BUILDINGS 9**

Control of energy use in building – National Building Code (NBC), ECBC code, codes in neighboring tropical countries - OTTV concepts and calculations – Features of LEED and TERI – Griha ratings - Role of insulation and thermal properties of construction materials - influence of moisture content and modeling -Performance ratings of green buildings - Zero energy building'

**UNIT IV CORE CONCEPTS IN LEAN 9**

Introduction to the Course; Lean Overview; Need for Productivity Measurement and improvement; Productivity Measurement System (PMS).

**UNIT V LEAN CONSTRUCTION TOOLS AND TECHNIQUES 9**

Sampling/ Work Sampling; Survey/ Foreman delay survey; Value Stream/ Process Mapping– 5S , Collaborative Planning System (CPS)/ Last Planner™ System (LPS) – Big Room Approach, IT/BIM and Lean, How to Start Practicing Lean Tools in Project Site.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

- On completion of the course, the student is expected to be able to
- CO1** Describe the various sustainable materials used in construction.  
**CO2** Explain the method of estimating the amount of energy required for building.  
**CO3** Describe the features of LEED, TERI and GRIHA ratings of buildings.  
**CO4** Explain the core concepts of lean construction tools and techniques and their importance in achieving better productivity.  
**CO5** Apply lean tools & techniques to achieve sustainability in construction projects.

**REFERENCES:**

- Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4<sup>th</sup> Edition, Wiley Publishers 2016.
- Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.
- Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.
- Ballard, G., Tommelein, I., Koskela, L. and Howell, G., Lean construction tools and techniques, 2002.
- Salem, O., Solomon, J., Genaidy, A. and Luegring, M., Site implementation and Assessment of Lean Construction Techniques, Lean Construction Journal, 2005.

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**COs- PO's & PSO's MAPPING**

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
<b>PROGRAM OUTCOMES(PO)</b>							
PO1	Knowledge of Engineering Sciences	2	3	2	3	3	3
PO2	Problem analysis	-	1	2	1	1	1
PO3	Design / development of solutions	1	3	3	3	2	3
PO4	Investigation	1	2	1	2	2	2
PO5	Modern Tool Usage	-	1	1	2	2	2
PO6	Engineer and Society	2	2	1	1	2	2
PO7	Environment and Sustainability	3	2	1	3	3	3
PO8	Ethics	1	-	-	1	1	1
PO9	Individual and Team work	1	1	-	1	-	1
PO10	Communication	-	1	-	1	1	1
PO11	Project Management and Finance	2	1	3	3	3	3
PO12	Life Long Learning	1	2	1	2	2	2
<b>PROGRAM SPECIFIC OUTCOMES (PSO)</b>							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

**COURSE OBJECTIVES:**

- To expose the students to the need, methodology, documentation and usefulness of environmental impact assessment and to develop the skill to prepare environmental management plan.
- To participate in the performance of an environmental assessment process (EIA or SEA), given the disciplinary knowledge and skills in natural sciences and engineering the student have achieved in other courses.

**UNIT I INTRODUCTION****9**

Historical development of Environmental Impact Assessment (EIA). Environmental Clearance- EIA in project cycle. legal and regulatory aspects in India – types and limitations of EIA –EIA process screening – scoping - terms of reference in EIA- setting – analysis – mitigation. Cross sectoral issues –public hearing in EIA- EIA consultant accreditation.

**UNIT II IMPACT IDENTIFICATION AND PREDICTION****10**

Matrices – networks – checklists – cost benefit analysis – analysis of alternatives – expert systems in EIA. prediction tools for EIA – mathematical modelling for impact prediction – assessment of impacts – air – water – soil – noise – biological – cumulative impact assessment

**UNIT III SOCIO-ECONOMIC IMPACT ASSESSMENT****8**

Socio-economic impact assessment - relationship between social impacts and change in community and institutional arrangements. factors and methodologies- individual and family level impacts. communities in transition-rehabilitation

**UNIT IV EIA DOCUMENTATION AND ENVIRONMENTAL MANAGEMENT PLAN****9**

Environmental management plan - preparation, implementation and review – mitigation and rehabilitation plans – policy and guidelines for planning and monitoring programmes – post project audit – documentation of EIA findings – ethical and quality aspects of environmental impact assessment

**UNIT V CASE STUDIES****9**

Mining, power plants, cement plants, highways, petroleum refining industry, storage & handling of hazardous chemicals, common hazardous waste facilities, CETPs, CMSWMF, building and construction projects

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

**On completion of the course, the student is expected to be able to**

- CO1** carry out scoping and screening of developmental projects for environmental and social assessments
- CO2** explain different methodologies for environmental impact prediction and assessment
- CO3** asses socio-economic investigation of the environment in a project
- CO4** plan environmental impact assessments and environmental management plans
- CO5** knowledge to prepare environmental impact assessment reports for various projects

**REFERENCES:**

1. Canter, L.W., "Environmental Impact Assessment", McGraw Hill, New York. 1996
2. Lawrence, D.P., "Environmental Impact Assessment – Practical solutions to recurrent problems", Wiley-Interscience, New Jersey. 2003
3. World Bank –Source book on EIA
4. Cutter, S.L., "Environmental Risk and Hazards", Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
5. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York, 1996.
6. K. V. Raghavan and A A. Khan, "Methodologies in Hazard Identification and Risk Assessment", Manual by CLRI, 1990.

7. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012.

**COs- PO's & PSO's MAPPING**

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1						2	3	3					2		
2	3	2	3	2	2			3	2			1		2	2
3		2	3	2	2			3	2			1		2	
4			3		3	2	2	2	2	1	1			2	2
5	3			2				2							
<b>Avg.</b>	3	2	3	2	2	2	2	3	2	1	1	1	2	2	2

1.low, 2-medium, 3-high, '-'- no correlation

**COURSE OBJECTIVE:**

- The student acquires the knowledge on the Geotechnical engineering problems associated with soil contamination, safe disposal of waste and remediate the contaminated soils by different techniques hereby protecting environment.

**UNIT I SOIL – WASTE INTERACTION 9**

Role of Geo-environmental Engineering – sources, generation and classification of wastes – causes and consequences of soil pollution – case studies in soil failure -factors influencing soilpollutant interaction – modification of index, chemical and engineering properties – physical and physio-chemical mechanisms.

**UNIT II CONTAMINANT TRANSPORT AND SITE CHARACTERISATION 9**

Transport of contaminant in subsurface – advection, diffusion, dispersion – chemical process – biological process, sorption, desorption, precipitation, dissolution, oxidation, complexation, ion exchange, Volatization, biodegradation – characterization of contaminated sites – soil and rock data – hydrological and chemical data – analysis and evaluation.

**UNIT III WASTE CONTAINMENT AND REMEDIATION OF CONTAMINATED SITES 9**

In-situ containment – vertical and horizontal barrier – surface cover – ground water pumping system on subsurface drain – soil remediation – Soil Vapour extraction, soil waste stabilization, solidification of soils, electrokinetic remediation, soil heating, vitrification, bio remediation, Phyto-remediation – ground water remediation – pump and treat , In-situ flushing, permeable reacting barrier, In-situ air sparging.

**UNIT IV LANDFILLS AND SURFACE IMPOUNDMENTS 9**

system – Source and characteristics of waste - site selection for landfills – components of landfills – liner soil, geomembrane, geosynthetic clay, geo-composite liner system – leachate collection – final cover design – monitoring landfill - Environmental laws and regulations.

**UNIT V STABILISATION OF WASTE 9**

Evaluation of waste materials – flyash, municipal sludge, plastics, scrap tire, blast furnace slag, construction waste, wood waste and their physical, chemical and biological characteristics – potential reuse – utilization of waste and soil stabilization.

**TOTAL:45 PERIODS****COURSE OUTCOMES:**

On completion of the course, the student is expected to be able to;

- CO1** Understand the various causes and consequences of waste interaction with soil and their modification.
- CO2** Understand the various mechanism of transport of contaminants into the subsurface and characterization of contaminated sites and their risk analysis.
- CO3** Understand on how to decontaminate the site so as to reuse the site for human settlement
- CO4** Understand how to safely dispose the waste through different containment process.
- CO5** Expose on how to convert the waste into a resource material through soil waste stabilization techniques with or without chemical stabilization.

**REFERENCES:**

- Daniel B.E, Geotechnical Practice for waste disposal, Chapman & Hall, London, 1993.
- Hari D. Sharma and Krishna R.Reddy, Geo-Environmental Engineering – John Wiley and Sons, INC, USA, 2004.
- Westlake, K., Landfill Waste pollution and Control, Albion Publishing Ltd., England, 1995.
- Wentz, C.A., Hazardous Waste Management, McGraw Hill, Singapore, 1989.
- Proceedings of the International symposium of Environmental Geotechnolgy (Vol.I and II), Environmental Publishing Company, 1986 and 1989.
- Ott, W.R., Environmental Indices, Theory and Practice, Ann Arbor, 1978.
- Fried, J.J., Ground Water Pollution, Elsevier, 1975.
- ASTM Special Tech. Publication 874, Hydraulic Barrier in Soil and Rock, 1985.
- Lagrega, M.d., Buckingham, P.L., and Evans, J.C., Hazardous Waste Management, McGraw Hill, Inc. Singapore, 1994.

**COURSE OBJECTIVE:**

- The objective of this course is to create an awareness / overview of the impact of Transportation Projects on the environment and society.

**UNIT I INTRODUCTION 8**  
Environmental Inventory, Environmental Assessment, Environmental Impact Assessment (EIA), Environmental Impact of Transportation Projects, Need for EIA, EIA Guidelines for Transportation Project, Historical Development.

**UNIT II METHODOLOGIES 8**  
Elements of EIA – Screening and Scoping – Methods of Impact Analysis – Applications – Appropriate methodology.

**UNIT III ENVIRONMENTAL IMPACT, PREDICTION AND ASSESSMENT 10**  
Prediction and Assessment of Impact of Transportation Project at various stages on water, air, noise, land acquisition and resettlement, Socio economic impact, indigenous people, aesthetics, health and safety, energy studies, traffic impact studies, IRC guidelines.

**UNIT IV ENVIRONMENTAL MITIGATION AND MANAGEMENT PLAN 10**  
Mitigation of the impact on Natural and Man-made Environment, Health, Water, Land, Noise, Air, Public participation, Environmental Management Plan, Energy Conservation, Methods to reduce Global Warming.

**UNIT V EIA CASE STUDIES 9**  
EIA Case Studies on Highway, Railway - EIA Case Studies on Transit Oriented Development (TOD), Compact Cities, Non-Motorised Transport (NMT)

**TOTAL: 45 PERIODS****COURSE OUTCOMES**

- CO1** Understand the basic concepts of Environmental Impact of Assessment  
**CO2** Apply various methods of analyzing environmental Impact Analysis.  
**CO3** Gain knowledge on Stage Wise Assessment and Prediction of impact of transportation projects  
**CO4** Adopt environmental management plan and their impact on earth.  
**CO5** Reviewing various case studies on environmental impact assessment of transport projects.

**TEXTBOOKS:**

- Canter, L.R., Environmental Impact Assessment, McGraw Hill, New Delhi, 1996.
- Indian Road Congress (IRC), Environmental Impact of Highway Projects, IRC, Delhi, 1998.
- EIA Guidance Manual- Highway- MOEF & Govt of India, 2010
- P. Meenakshi, Elements of Environmental Science and Engineering, Prentice Hall of India, New Delhi, 2006
- Thirumurthy A.M., Introduction to Environmental Science and Management, Shroff Publishers, Bombay, 2005.

**REFERENCES:**

- John G.Rau and David, C.Hooten, Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1995
- James H.Banks, Introduction to Transportation Engineering, McGraw Hill Book Company, 2000
- World Bank, A Handbook on Roads and Environment, Vol.I and II, Washington DC, 1997
- Priya Ranjan Trivedi, International Encyclopedia of Ecology and Environment – EIA, Indian Institute of Ecology and Environment, New Delhi, 1998
- Manual on Norms & Standards for Environmental Clearance of large construction projects, MOEF & Govt of India

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**COURSE OBJECTIVES**

- 1 To introduce the concept of environmental design and industrial ecology.
- 2 To impart knowledge about air pollution and its effects on the environment.
- 3 To enlighten the students with knowledge about noise and its effects on the environment.
- 4 To enlighten the students with knowledge about water pollution and its effects on the environment.
- 5 To introduce the concept of green co-rating and its need

**UNIT – I DESIGN FOR ENVIRONMENT AND LIFE CYCLE ASSESSMENT 9**

Environmental effects of design -selection of natural friendly material - Eco design - Environmental damage Material flow and cycles – Material recycling – Emission less manufacturing- Industrial Ecology – Pollution prevention – Reduction of toxic emission – design for recycle.

**UNIT – II AIR POLLUTION SAMPLING AND MEASUREMENT 9**

Primary and Secondary Pollutants, Automobile Pollutants, Industrial Pollution, Ambient air quality Standards, Metrological aspects of air Pollution, Temperature lapse Rates and Stability-wind velocity and turbulence-Pump behavior dispersion of air Pollutants-solution to the atmosphere dispersion equation-the Gaussian Plume Model, Air pollution sampling-collection of gaseous air pollutants-collection of particulate pollutants-stock sampling, analysis of air pollutants-sulfur dioxide-nitrogen dioxide, carbon monoxide, oxidants and ozone.

**UNIT – III NOISE POLLUTION AND CONTROL 9**

Frequency and Sound Levels, Units of Noise based power radio, contours of Loudness. Effect of human, Environment and properties, Natural and Anthrogenic Noise Sources, Measuring Instruments for frequency and Noise levels, Masking of sound, Types, Kinetics, Selection of different reactors used for waste treatment, Treatment of noise at source, Path and Reception, Sources of noise, Effects of noise-Occupational Health hazards, thermal Comforts, Heat Island Effects, Radiation Effects.

**UNIT – IV WATER DEMAND AND WATER QUALITY 9**

Factors affecting consumption, Variation, Contaminants in water, Nitrates, Fluorides, Detergents, taste and odour, Radio activity in water, Criteria, for different impurities in water for portable and non-portable use, Point and non-point Source of pollution, Major pollutants of Water, Water Quality Requirement for different uses, Global water crisis issues.

**UNIT – V GREEN CO-RATING 9**

Ecological Footprint - Need For Green Co-Rating – Green Co-Rating System – Intent – System Approach – Weightage- Assessment Process – Types Of Rating – Green Co-Benefits – Case Studies Of Green Co-Rating

**TOTAL:45 PERIODS****OUTCOMES:** At the end of the course the students would be able to

1. Explain the environmental design and selection of eco-friendly materials.
2. Analyse manufacturing processes towards minimization or prevention of air pollution.
3. Analyse manufacturing processes towards minimization or prevention of noise pollution.
4. Analyse manufacturing processes towards minimization or prevention of water pollution.
5. Evaluate green co-rating and its benefits.

**TEXT BOOKS:**

1. Gradel.T.E. and B.R. Allenby – Industrial Ecology – Prentice Hall – 2010
2. Rao M.N. and Dutta A.K. "Wastewater treatment", Oxford & IBH publishing Co. Pvt. Ltd., New Delhi, Second Edition, 2006

**REFERENCES:**

1. Gradel.T.E. and B.R. Allenby – Industrial Ecology – Prentice Hall – 2010
2. Frances Cairncross– Costing the Earth: The Challenge for Governments, the Opportunities for Business – Harvard Business School Press – 1993.
3. World Commission on Environment and Development (WCED), Our Common Future, Oxford University Press 2005.
4. Rao M.N. and Dutta A.K. "Wastewater treatment", Oxford & IBH publishing Co. Pvt. Ltd., New Delhi, Second Edition, 2006
5. Rao CS Environmental Pollution Control Engineering-, Wiley Eastern Ltd., New Delhi, 2006.
6. Lewis H Bell and Douglas H Bell, Industrial noise control, Fundamentals and applications, Marcel Decker, 1994.

**OBJECTIVE:**

- To enable the students to create an awareness on Engineering Ethics and Human Values to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

**UNIT I HUMAN VALUES 10**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

**UNIT II ENGINEERING ETHICS 9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

**UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

**UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

**UNIT V GLOBAL ISSUES 8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.

**TOTAL: 45 PERIODS****OUTCOME:**

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

**TEXT BOOKS:**

- Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
- Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

**REFERENCES:**

- Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
- Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.
- Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
- John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
- Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013.
- World Community Service Centre, ' Value Education', Vethathiri publications, Erode, 2011.

**OBJECTIVES:**

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

**UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY****14**

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

**UNIT II ENVIRONMENTAL POLLUTION****8**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

**UNIT III NATURAL RESOURCES****10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

**UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT****7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

**UNIT V HUMAN POPULATION AND THE ENVIRONMENT****6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

**TOTAL: 45 PERIODS****OUTCOMES:**

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

**TEXTBOOKS:**

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2<sup>nd</sup> edition, Pearson Education, 2004.

**REFERENCES :**

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.
4. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.

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**OBJECTIVES:**

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

**UNIT I INTRODUCTION TO DISASTERS 9**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

**UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9**

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

**UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

**UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9**

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

**UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9**

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

**TOTAL: 45 PERIODS****OUTCOMES:**

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

**TEXT BOOKS:**

1. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
2. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.
3. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
4. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]

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1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

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**OBJECTIVE:**

- The objective of this course is to create an awareness / overview of the impact of Transportation Projects on the environment and society..

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>8</b>
Environmental Inventory, Environmental Assessment, Environmental Impact Assessment (EIA), Environmental Impact of Transportation Projects, Need for EIA, EIA Guidelines for Transportation Project, Historical Development.		
<b>UNIT II</b>	<b>METHODOLOGIES</b>	<b>8</b>
Elements of EIA – Screening and Scoping – Methods of Impact Analysis – Applications – Appropriate methodology.		
<b>UNIT III</b>	<b>ENVIRONMENTAL IMPACT, PREDICTION AND ASSESSMENT</b>	<b>10</b>
Prediction and Assessment of Impact of Transportation Project at various stages on water, air, noise, land acquisition and resettlement, Socio economic impact, indigenous people, aesthetics, health and safety, energy studies, IRC guidelines.		
<b>UNIT IV</b>	<b>ENVIRONMENTAL MITIGATION AND MANAGEMENT PLAN</b>	<b>10</b>
Mitigation of the impact on Natural and Man-made Environment, Health, Water, Land, Noise, Air, Public participation, Environmental Management Plan, Energy Conservation, Methods to reduce Global Warming.		
<b>UNIT V</b>	<b>EIA CASE STUDIES</b>	<b>9</b>
EIA Case Studies on Highway, Railway, Airways and Waterways Projects		
		<b>TOTAL: 45 PERIODS</b>

**OUTCOMES:**

Students will be able to

- Understood the impact of Transportation projects on the environment.
- Get knowledge on methods of impact analysis and their applications.
- Understand environmental Laws on Transportation Projects and the mitigative measures adopted in the planning stage.
- Predict and assess the impact of transportation projects.

**TEXTBOOKS:**

- Canter, L.R., Environmental Impact Assessment, McGraw Hill, New Delhi, 1996.
- Indian Road Congress (IRC), Environmental Impact of Highway Projects, IRC, Delhi, 1998.
- P. Meenakshi, Elements of Environmental Science and Engineering, Prentice Hall of India, New Delhi, 2006
- Thirumurthy A.M., Introduction to Environmental Science and Management, Shroff Publishers, Bombay, 2005

**REFERENCES:**

- John G.Rau and David, C.Hooten, Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1995
- James H.Banks, Introduction to Transportation Engineering, McGraw Hill Book Company, 2000
- World Bank, A Handbook on Roads and Environment, Vol.I and II, Washington DC, 1997
- Priya Ranjan Trivedi, International Encyclopedia of Ecology and Environment – EIA, Indian Institute of Ecology and Environment, New Delhi, 1998

**OBJECTIVE:**

- To impart the knowledge and skills to identify, assess and mitigate the environmental and social impacts of developmental projects

**UNIT I INTRODUCTION**

9

Impacts of Development on Environment – Rio Principles of Sustainable Development-Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types – EIA in project cycle –EIA Notification and Legal Framework–Stakeholders and their Role in EIA– Selection & Registration Criteria for EIA Consultants

**UNIT II ENVIRONMENTAL ASSESSMENT**

9

Screening and Scoping in EIA – Drafting of Terms of Reference,Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction – Analysis of alternatives

**UNIT III ENVIRONMENTAL MANAGEMENT PLAN**

9

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Review of EIA Reports – Public Hearing-Environmental Clearance Post Project Monitoring

**UNIT IV SOCIO ECONOMIC ASSESSMENT**

9

Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis-

**UNIT V CASE STUDIES**

9

EIA case studies pertaining to Infrastructure Projects – Real Estate Development - Roads and Bridges – Mass Rapid Transport Systems - Ports and Harbor – Airports - Dams and Irrigation projects - Power plants – CETPs- Waste Processing and Disposal facilities – Mining Projects.

**TOTAL: 45 PERIODS****OUTCOMES:**

The students completing the course will have ability to

- carry out scoping and screening of developmental projects for environmental and social assessments
- explain different methodologies for environmental impact prediction and assessment
- plan environmental impact assessments and environmental management plans
- evaluate environmental impact assessment reports

**TEXTBOOKS:**

- Canter, R.L, "Environmental impact Assessment ", 2nd Edition, McGraw Hill Inc, New Delhi,1995.
- Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu, "Environmental Impact Assessment for Developing Countries in Asia", Volume 1 – Overview, Asian Development Bank,1997.
- Peter Morris, Riki Therivel "Methods of Environmental Impact Assessment", Routledge Publishers,2009.

**REFERENCES:**

- Becker H. A., Frank Vanclay,"The International handbook of social impact assessment" conceptual and methodological advances, Edward Elgar Publishing, 2003.
- Barry Sadler and Mary McCabe, "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme, 2002.
- Judith Petts, "Handbook of Environmental Impact Assessment Vol. I and II", Blackwell Science New York, 1998.
- Ministry of Environment and Forests EIA Notification and Sectoral Guides, Government of India, New Delhi, 2010.



**OBJECTIVE:**

- The student acquires the knowledge on the Geotechnical engineering problems associated with soil contamination, safe disposal of waste and remediate the contaminated soils by different techniques thereby protecting environment.

**UNIT I GENERATION OF WASTES AND CONSEQUENCES OF SOIL POLLUTION 8**

Introduction to Geo **environmental** engineering – Environmental cycle – Sources, production and classification of waste – Causes of soil pollution – Factors governing soil pollution interaction clay minerals - Failures of foundation due to waste movement.

**UNIT II SITE SELECTION AND SAFE DISPOSAL OF WASTE 10**

Safe disposal of waste – Site selection for landfills – Characterization of land fill sites and waste – Risk assessment – Stability of landfills – Current practice of waste disposal – Monitoring facilities – Passive containment system – Application of geosynthetics in solid waste management – Rigid or flexible liners.

**UNIT III TRANSPORT OF CONTAMINANTS 8**

Contaminant transport in sub surface – Advection, Diffusion, Dispersion – Governing equations – Contaminant transformation – Sorption – Biodegradation – Ion exchange – Precipitation – Hydrological consideration in land fill design – Ground water pollution.

**UNIT IV WASTE STABILIZATION 10**

Stabilization - Solidification of wastes – Micro and macro encapsulation – Absorption, Adsorption, Precipitation – Detoxification – Mechanism of stabilization – Organic and inorganic stabilization – Utilization of solid waste for soil improvement – case studies.

**UNIT V REMEDIATION OF CONTAMINATED SOILS 9**

Exsitu and Insitu remediation-Solidification, bio-remediation, incineration, soil washing, phyto remediation, soil heating, vetrification, bio-venting.

**TOTAL: 45 PERIODS****OUTCOMES:**

The students will be able to

- Assess the contamination in the soil
- Understand the current practice of waste disposal
- To prepare the suitable disposal system for particular waste.
- Stabilize the waste and utilization of solid waste for soil improvement.
- Select suitable remediation methods based on contamination.

**TEXTBOOKS:**

1. Hari D. Sharma and Krishna R. Reddy, "Geo-Environmental Engineering" –John Wiley and Sons, INC, USA, 2004.
2. Daniel B.E., "Geotechnical Practice for waste disposal", Chapman & Hall, London 1993.
3. Manoj Datta, "Waste Disposal in Engineered landfills", Narosa Publishing House, 1997.
4. Manoj Datta, B.P. Parida, B.K. Guha, "Industrial Solid Waste Management and Landfilling Practice", Narosa Publishing House, 1999.

**REFERENCES:**

1. Westlake, K, "Landfill Waste pollution and Control", Albion Publishing Ltd., England, 1995.
2. Wentz, C.A., "Hazardous Waste Management", McGraw Hill, Singapore, 1989

3. Proceedings of the International symposium on "Environmental Geotechnology" (Vol.I and II). Environmental Publishing Company, 1986 and 1989.
4. Ott, W.R., "Environmental indices, Theory and Practice", Ann Arbor, 1978.
5. Fried, J.J., "Ground Water Pollution", Elsevier, 1975.
6. ASTM Special Tech. Publication 874, Hydraulic Barrier in Soil and Rock, 1985.
7. Lagrega, M.D., Buckingham, P.L. and Evans, J.C., "Hazardous Waste Management" McGraw Hill Inc. Singapore, 1994.

**OBJECTIVES :**

- To sensitize the Engineering students to various aspects of Human Rights.

**UNIT I**

9

**Human Rights** – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

**UNIT II**

9

Evolution of the concept of Human Rights Magna carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

**UNIT III**

9

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

**UNIT IV**

9

Human Rights in India – Constitutional Provisions / Guarantees.

**UNIT V**

9

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabilityd persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

**TOTAL : 45 PERIODS****OUTCOME :**

- Engineering students will acquire the basic knowledge of human rights.

**REFERENCES:**

- Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
- Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
- Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

**OBJECTIVE:**

- To facilitate the understanding of Quality Management principles and process.

**UNIT I INTRODUCTION**

9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

**UNIT II TQM PRINCIPLES**

9

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

**UNIT III TQM TOOLS AND TECHNIQUES I**

9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

**UNIT IV TQM TOOLS AND TECHNIQUES II**

9

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

**UNIT V QUALITY MANAGEMENT SYSTEM**

9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration--**ENVIRONMENTAL MANAGEMENT SYSTEM:** Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.

**TOTAL: 45 PERIODS****OUTCOME:**

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

**TEXT BOOK:**

- Dale H.Besterfield, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, "Total Quality Management", Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

**REFERENCES:**

- James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8<sup>th</sup> Edition, First Indian Edition, Cengage Learning, 2012.
- Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
- Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
- ISO9001-2015 standards

**OBJECTIVE:**

- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization

**UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9**

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

**UNIT II PLANNING 9**

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

**UNIT III ORGANISING 9**

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

**UNIT IV DIRECTING 9**

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

**UNIT V CONTROLLING 9**

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

**TOTAL: 45 PERIODS****OUTCOME:**

- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

**TEXT BOOKS:**

- JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6th Edition, Pearson Education, 2004.
- Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India) Pvt. Ltd., 10<sup>th</sup> Edition, 2009.

**REFERENCES:**

- Harold Koontz & Heinz Wehrich, "Essentials of Management", Tata McGraw Hill, 1998.
- Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.
- Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management", 7<sup>th</sup> Edition, Pearson Education, 2011.
- Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999

**OBJECTIVE:**

- The objective of this course is to create an awareness / overview of the impact of Transportation Projects on the environment and society..

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>8</b>
Environmental Inventory, Environmental Assessment, Environmental Impact Assessment (EIA), Environmental Impact of Transportation Projects, Need for EIA, EIA Guidelines for Transportation Project, Historical Development.		
<b>UNIT II</b>	<b>METHODOLOGIES</b>	<b>8</b>
Elements of EIA – Screening and Scoping – Methods of Impact Analysis – Applications – Appropriate methodology.		
<b>UNIT III</b>	<b>ENVIRONMENTAL IMPACT, PREDICTION AND ASSESSMENT</b>	<b>10</b>
Prediction and Assessment of Impact of Transportation Project at various stages on water, air, noise, land acquisition and resettlement, Socio economic impact, indigenous people, aesthetics, health and safety, energy studies, IRC guidelines.		
<b>UNIT IV</b>	<b>ENVIRONMENTAL MITIGATION AND MANAGEMENT PLAN</b>	<b>10</b>
Mitigation of the impact on Natural and Man-made Environment, Health, Water, Land, Noise, Air, Public participation, Environmental Management Plan, Energy Conservation, Methods to reduce Global Warming.		
<b>UNIT V</b>	<b>EIA CASE STUDIES</b>	<b>9</b>
EIA Case Studies on Highway, Railway, Airways and Waterways Projects		

**TOTAL: 45 PERIODS****OUTCOMES:**

Students will be able to

- Understood the impact of Transportation projects on the environment.
- Get knowledge on methods of impact analysis and their applications.
- Understand environmental Laws on Transportation Projects and the mitigative measures adopted in the planning stage.
- Predict and assess the impact of transportation projects.

**TEXTBOOKS:**

- Canter, L.R., Environmental Impact Assessment, McGraw Hill, New Delhi, 1996.
- Indian Road Congress (IRC), Environmental Impact of Highway Projects, IRC, Delhi, 1998.
- P. Meenakshi, Elements of Environmental Science and Engineering, Prentice Hall of India, New Delhi, 2006
- Thirumurthy A.M., Introduction to Environmental Science and Management, Shroff Publishers, Bombay, 2005

**REFERENCES:**

- John G.Rau and David, C.Hooten, Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1995
- James H.Banks, Introduction to Transportation Engineering, McGraw Hill Book Company, 2000
- World Bank, A Handbook on Roads and Environment, Vol.I and II, Washington DC, 1997
- Priya Ranjan Trivedi, International Encyclopedia of Ecology and Environment – EIA, Indian Institute of Ecology and Environment, New Delhi, 1998

**OBJECTIVE:**

- To gain an insight on local and global perceptions and approaches on participatory water resource management

**UNIT I FUNDAMENTALS: SOCIOLOGY AND PARTICIPATORY APPROACH 6**  
Sociology – Basic concepts – Perspectives- Social Stratification – Irrigation as a Socio technical Process - Participatory concepts– Objectives of participatory approach

**UNIT II UNDERSTANDING FARMERS PARTICIPATION 10**  
Farmers participation –need and benefits – Comparisons of cost and benefit -Sustained system performance - Kinds of participation – Context of participation, factors in the environment – WUA - Constraints in organizing FA – Role of Community Organiser – Case Studies.

**UNIT III ISSUES IN WATER MANAGEMENT 9**  
Multiple use of water – Issues in Inter-sectoral Water Allocation - domestic, irrigation, industrial sectors - modernization techniques – Rehabilitation – Command Area Development - Water delivery systems

**UNIT IV PARTICIPATORY WATER CONSERVATION 10**  
Global Challenges -Social – Economic – Environmental - Solutions –Political - Water Marketing – Water Rights -Consumer education – Success Stories Case Studies

**UNIT V PARTICIPATORY WATERSHED DEVELOPMENT 10**  
Concept and significance of watershed - Basic factors influencing watershed development – Principles of watershed management - Definition of watershed management – Identification of problems - Watershed approach in Government programmes – People's participation – Entry point activities - Evaluation of watershed management measures.

**TOTAL: 45 PERIODS****OUTCOMES:**

The students will be able to

- Gain knowledge on various processes involved in participatory water resource management.
- Understand farmers participation in water resources management.
- Aware of the issues related to water conservation and watershed Development
- Get knowledge in participatory water conservation
- Understand concept, principle, approach of watershed management.

**TEXTBOOKS:**

- Sivasubramaniyan, K. Water Management, SIMRES Publication, Chennai, 2011
- Uphoff.N., Improving International Irrigation management with Farmer Participation – Getting the process Right – Studies in water Policy and management, No.11, Westview press, Boulder,CO, 1986.
- Tideman, E.M., "Watershed Management", Omega Scientific Publishers, New Delhi, 1996.

**REFERENCE:**

- Chambers Robert, Managing canal irrigation, Cambridge University Press, 1989

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