COURSE FOR HIMACHAL PRADESH PCB AND HARYANA PCB
POST - ASSISTANT ENVIRONMENTAL ENGINEER

FEATURES OF THE COURSE

- **FORMAT - RECORDED**
- **STUDY MATERIAL - TO BE PROVIDED.**
- **APPROX HOURS - 120**
- **QUESTIONS - 600 MCQs WITH SOLUTION TO BE PROVIDED**
- **A COMPLETELY ORGANIZED STRUCTURE OF THE SYLLABUS**
- **EXAM ORIENTED APPROACH**

SUBJECT 1 - ECOLOGY AND NATURAL RESOURCES

Ecosystem

Types of ecosystem;
Ecosystem processes - energy transfer, food chain, food-web;
Eltonian pyramids;
Structural and functional characteristics of an ecosystem;
Ecological succession;
Population ecology;
Metapopulation dynamics;
Growth rates: density independent growth; density dependent growth;
Plant-animal interactions;
Mutualism, commensalism, competition and predation;
Trophic interactions;
Functional ecology; ecophysiology; behavioural ecology; Community assembly, organization and evolution;
biodiversity: species richness, evenness and diversity indices; endemism; species-area relationships.
Mathematics and statistics in ecology;

Natural Resources:

Concept of resource,
classification of natural resources.
Factors influencing resource availability, distribution and uses.
Interrelationships among different types of natural resources.
Concern on Productivity issues.
Ecological, social and economic dimension of resource management.
Forest resources: forest vegetation, status and distribution, major forest types and their characteristics. Use and over- exploitation, deforestation.

Timber extraction, mining, dams and their effects on forest and tribal people, forest management.
Developing and developed world strategies for forestry.

Land resources: Land as a resource. Dry land, land use classification, land degradation, man induced landslides, soil erosion and desertification.
Landscape impact analysis, wetland ecology & management.
Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
Water ecology and management.
Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of altemate energy sources.
Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer- pesticide problems, water logging, salinity.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
Resource Management Paradigms: Resource management -the evolution and history of resource management paradigms.

APPROX TEACHING HOURS - 18

SUBJECT 2 - ENERGY, ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE DEVELOPMENT
Environment Management System: Introduction to Environmental Management System basic definitions and terms, Framework for Environmental Management Systems, Approach for developing an Environmental Management System; The introduction and implementation of ISO 14001: environmental policy, planning, implementation and operation, checking, management review, etc; Applications EMS irt terms ofProcess flow chart, effluent Generation, composition and treatment of effluents; Introduction to Environmental Auditing, Category "A'' & Procedures and Guidelines to conduct Environmental Audit.

Non-conventional energy systems:
SOLAR ENERGY
solar energy its radiation, collection, storage and application. It also introduces the wind energy, Biomass energy, Geothermal energy and ocean energy as alternative energy sources; Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data; Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors;

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion;

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics; BIO-MASS: Principles of Bio-Conversion, Anaerobic/ aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.c. Engine operation and economic aspects;

GEOTHERMAL ENERGY: Resources, types of wells, methods of hamessing the energy, potential in India;

OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics;

DIRECT ENERGY CONVERSION: Need for DEC, carnot cycie, limitations, principles of DEC. Thermoelectric generators, seebeck, peltier and joule Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's laws, thermodynamic aspects, selection of fuels and operating conditions.

APPROX TEACHING HOURS - 25

SUBJECT 3 - GLOBAL AND INDIAN ENVIRONMENTAL ISSUES

Environmental movements and related issues in India: Bishnoism, Silent valley movement, Narmada Dam, Teheri Dam, Almatti Dam, River Linking, Joint Forest Management, Chipko movement, Apikko movement, River cleaning initiatives; Ecological restorations: case studies from Ramsar wetlands and mines; Waste land and their reclamation; Desertification and its control. Concept of Sustainability: Sustainability indices; Strategies and debates on sustainable development; concept of Sustainable Agriculture; India's environment action programme: issues, approaches and initiatives towards Sustainability; Sustainable development in practice; Urbanization; Urban sprawling and urban growth; Concept and characteristics of smart city; Urban resources and environmental problems; Carrying capacity analysis; Concept of ecological footprints

APPROX TEACHING HOURS - 18

SUBJECT 4 - ENVIRONMENT LEGISLATIONS

Environment Protection Act 1986; Air (Prevention and Control of pollution) Act; Water (Prevention and Control of pollution) Act; Mines and Mineral Act; Factories Act; Pesticides Act; Indian Forest Act; Wildlife Act; Ancient Monuments and Archaeological Sites and Remains Act; Hazardous Waste Management and Handling Rules/Biomedical Rules / Solid Waste Management Rules; Environment Tribunal Act; Climate change Protocols and Conventions; MOEF Guidelines and Notifications; Appellate Authority Act; Other related Notifications.

APPROX TEACHING HOURS - 15

SUBJECT 5 - SOLID AND HAZARDOUS WASTE MANAGEMENT

Municipal solid waste (management and handling) rules; hazardous waste (management and handling) rules; biomedical waste handling rules; fly ash rules; recycled plastics usage rules; batteries (management and handling) rules; Municipal solid waste Management - Fundamentals Sources; composition; generation
rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options; Hazardous waste Management - Fundamentals characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects; Radioactive waste Management - Fundamentals sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear
power plants; disposal options; Environmental Risk Assessment Defining risk and environmental risk; methods of risk assessment; case studies; physicochemical
Treatment of solid and Hazardous waste chemical treatment processes for MSW (combustion, stabilization and solidification of hazardous wastes); physicochemical processes for hazardous wastes (soil vapour extraction, air stripping, chemical oxidation); ground water contamination and remediation; Biological treatment of Solid and Hazardous waste composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bioreactor; in-situ remediation; Landfill design
Landfill design for solid and hazardous wastes; leachate collection and removal; landfill covers and incineration.

APPROX TEACHING HOURS - 35

SUBJECT 6 - BIODIVERSITY

Biodiversity: Definition, components, scope, and constraints of biodiversity (genetic diversity, species diversity, ecosystem diversity - agro-biodiversity, urban- peri-urban biodiversity), forest biodiversity; biodiversity indices, threats to biodiversity; Landscape approach to biodiversity conservation,

Corridor approach, individual species approach, habitat conservation approaches, National Biodiversity Strategy and Action Plan.

APPROX TEACHING HOURS - 10

NOTE - THE SYLLABUS ALREADY PART OF CIVIL ENGINEERING IS NOT TAUGHT IN THIS COURSE.