GENERIC ELECTIVE: ENVIRONMENT SUSTAINABILITY AND BIOMEDICAL WASTE MANAGEMENT

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Environment Sustainability And Biomedical Waste Management	**4**	**3**	**-**	**1**	**XII Passed**	**Basic knowledge of biology**

Learning objectives

The Learning objectives of this course are as follows:

- To promote awareness among students about the importance of environment and its sustainable usage and development
- To highlight the components affecting environment and factors responsible for deterioration of environment
- To familiarize with the techniques available for waste management, use of refuse/ reduce/re-use/recover/re-cycle of substances toxic for environment

Learning outcomes

Having successfully completed this course, students shall be able to learn and appreciate:

- Surroundings and environment, renewable/non-renewable natural resources and their exploitation. Sensitizing about environmental crisis can promote them to for search alternatives to reduce our dependence of non-renewable natural resources and their usage.
- Studies on pollution and deforestation will help them to understand their impact on environment and human health. Conservation of forests and recycling policies will promote social awareness about sustainable development.
- Learning about various methods of sustainable development is an important for skill development in students so that they can design better strategies to protect our environment.
- Generation of biomedical waste is alarmingly increasing but the awareness of appropriate waste disposal methods is completely lacking. Development of new methods for waste management and strategies in this area will help them to reduce and segregate waste at point source.
- At the end of this course, students will be able to understand the severity of the problem and influence of biohazards on human health

SYLLABUS

Unit I: Environment and Environmental Crisis (08 hrs)

Function of environment, resources (biotic and abiotic), renewable resources (air, water, land) and non-renewable resources (fossil fuels), worldwide Environmental Crisis: Global Warming, Ozone Layer Depletion, Measures to protect environment: environmental pollution and its control measures, air pollution in metropolitan cities of India, Deforestation and conservation, steps for social awareness, Reduce, Reuse and Recycle policy for waste management, water conservation, implementation of policies and programmes for environment sensitization, Environmental tribulations in India: Environmental degradation, Indian government proposals and plans to protect environmental degradation

Unit II: Role of green technologies in Sustainable development (14 hrs)

- Definition and aspects, requirements, strategies and way for sustainable development , Role of education for sustainable development (ESD); Management of resources for human consumption and its impacts assessment, Influence of biodiversity on ecosystem services, Land use changes for agriculture and food, Indian government initiatives to implement sustainable development, Challenges to acquire SDGs.

- Surfacing green technologies and sustainable growth, Different aspects of sustainable development: bioprospect of plant essential oils for medicinal uses-revival of Indian ancient practice; Nanotechnology: potential for environmental sustainability, Role of photo-catalyst in environmental remediation, Applications and future prospective of biopolymers in industries; Green and self-sustainable buildings: Opportunities and challenges

Unit III: Measures for Sustainable development (09 hrs)

Phytoremediation of chemopollutants, bioconversion of industrial wastes into value-added polyhydroxyalkanoate (eg sugar and oils), Role of fungal and bacterial resources in heavy metal/radioactive waste material contaminated soil remediation and ecological restoration, xenobiotics bioremediation using fungi, Impact of pesticides usage in agricultural practices on microbial communities and soil bioprocesses: a biochemical, physiological, and molecular perception; Possibilities of biofuel production from microalgae as renewable energy source for environmental sustainability, integrated algal industrial waste treatment and bioenergy generation

Unit IV: Biomedical waste management (07 hrs)

Definition and classification of biomedical waste, Infectious, non-infectious and chemical waste;
Waste management: designation of waste, segregation, packaging and transportation.
Treatment: steam sterilization, chemical disinfection, incineration, emerging treatment technologies, treated waste disposal, regulatory and advisory considerations, Training of supportive staff

Unit V: Health and safety of workers in hazardous environment (07 hrs)

Exposure of workers at hazardous waste sites: chemical exposure, explosion and fire, ionizing radiation, biologic hazards, oxygen deficiency, heat stress, blood borne pathogens, safety hazards, electrical hazards, noise hazards, cold exposure, other physical hazards, hazardous waste operations and emergency response

Practical (30 hrs)

(Wherever wet lab experiments are not possible, the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.)

1. Document the Biological Wealth (flora and fauna) of your campus.
2. Calculate the water footprint of your organization.
3. Examine the current status of organization for waste management. Develop guidelines to reduce waste by improved methods of handling and disposing of wastes.
4. Plan guidelines for the safety of workers working at hazardous waste sites.
5. A case study on "Make sustainability more than just the right thing to Do"
6. A case study on handling and disposal of wastes.
7. Develop green design of organization to maintain and enrich the biological wealth.
8. Understandings of energy missions and follow up for classroom energy audit.
9. Prepare a questionnaire to asses knowledge, attitude and practices among students about Sustainable Development
10. Prepare a poster on Bio-augmentation and Bio-stimulation**.**
11. Make a poster on success stories of environment polices and movements that have reduced pollution or reversed diminishing populations of unique species.
12. Determine your carbon foot printing.

Essential readings

- Sangeetha, J; Thangadurai, D; David, M and Abdullah, M.A. (2021) 1st Edition. Environmental Biotechnology: Biodegradation, Bioremediation, and Bioconversion of Xenobiotics for Sustainable Development. Edited by. Apple Academic Press Inc, 9 Spinnaker Way, Waretown, NJ 08758, USA. International Standard Book Number-13: 978-1771883627.
- Fulekar, M.H.; Pathak, B; Kale, R.K. (2014) Edition 2014th Environment and Sustainable Development. Publisher-Springer Nature ISBN: 978-8132211655
- William C. Blackman, Jr (2001) Basic hazardous waste management.. Third Edition, Lewis Publishers, Boca Raton London New York Washington, D.C. ISBN 1-56670-533-9 (alk. paper)

Suggestive readings:

- Tweedy, James T., Healthcare hazard control and safety management-CRC Press_Taylor and Francis (2014).