REREQUISITES  Category  BS  Credit  3    NIL  Hours/Week  L  T  P  TH    Hours/Week  L  T  P  TH    3  0  0  3    2  Preservation of ecosystem and biodiversity.	22CY201		ENVIRONMENTAL SCIENCE AND ENG	S	Π									
NL  Itours/Week  L  T  P  TH    3  0  0  3    Course Learning Objectives    1  Principles of environmental resources.    2  Preservation of ecosystem and biodiversity.    3  Principles of solid waste management.    4  Principles of solid waste management.    5  Environmental issues and ethics.    Unit 1  Environmental effects of extracting and posticides A Mineral resources - hydrologicalcycle - Food resources - effects of oadrem agriculture, fertilizers, and posticides A Mineral resources - types – mining – environmental effects of extracting and sing mineral resources - Land resources - land degradation – soil erosion.    Unit 1  ECOSYSTEM AND BIODIVERSITY  9  0  0  9    Invironment – biotic and abiotic components – ecosystem components food chain and food web, tropic levels – energy flow in cosystem, ecological pyramids – ecological succession, types – Biodiversity - types, values of iodiversity - IN-situ and Ex-situ anservation.    Unit 11  ENVIRONMENTAL POLLUTION  9  0  9    idversity, threat to biodiversity, endangered and endemic species, conservation of biodiversity - IN-situ and Ex-situ anservation.  9  0  9    Urit 11  ENVIRONMENTAL POLLUTION  9  0  9  <	PRER	EQUIS	ITES	BS	Cre	edit	3							
Indust Week  3  0  0  3    Course Learning Objectives  3  0  0  3    1  Principles of environmental resources.  2  Preservation of ecosystem and biodiversity.    3  Principles of solid waste management.  5  Environmental issues and ethics.    1  Unit 1  ENVIRONMENTAL RESOURCES  9  0  0  9    forest resources – importance, deforestation – water resources – sources - hydrologicalcycle - Food resources – effects of codern agriculture, fertilizers, and pesticides – Mineral resources – uning – environmental effects of extracting and sing mineral resources – Land resources – land degradation – soil erosion.  9  0  0  9    Ivini 1  ECOSYSTEM AND BIODIVERSITY  9  0  0  9    ioidiversity, threat to biodiversity, endangered and endemic species, conservation of biodiversity – lik-situ and Ex-situ onservation.  9  0  0  9    uir bultion – classification of air pollutants gascous, particulates – sources, effects and control of gascous pollutants, SO2 (OD, HS, CO and particulates – control methods – cyclone separator, electrostatic precipitator, eathytic convertor – Wate ollution - heavy metal ions pollutants organic pollutants, oxygen demanding waste, aerobic and anaerobic decompositio docibel sale – sources, effects and control measures.  0  0  9	NIL		Houng/Wools	L	Т	Р	ТН							
Course Learning Objectives    1  Principles of environmental resources.    2  Preservation of ecosystem and biodiversity.    3  Principles of solid waste management.    5  Environmental issues and ethics.    Unit 1    ENVIRONMENTAL RESOURCES    9  0  0  9    ordern agriculture, fertilizers, and pesticides – Mineral resources – sources - hydrologicalcycle - Food resources – effects of nodern agriculture, fertilizers, and pesticides – Mineral resources – types – mining – environmental effects of extracting and sign mineral resources – Land resources – and degradation – soil crosion.    Unit II  ECOSYSTEM AND BIODIVERSITY  9  0  0  9    invironment – biotic and abiotic components – ecosystem components food chain and food web, tropic levels – energy flow ir cosystem, ecological pyramids – ecological succession, types – Biodiversity. types, values of biodiversity, hot spots of iodiversity, threat to biodiversity, endangered and endemic species, conservation of biodiversity. TN-situ and Ex-situ onservation.    Unit III  ENVIRONMENTAL POLLUTION  9  0  0  9    uir pollutants  organic pollutants, sorgen demanding waste, aerobic and anaerobic decompositior 60D and COD – experimental determination of BOD only – treatment of domestic and industrial wastewater – Noise pollutor decibel scale – sources, effects and control measures.  9			3	0	0	3								
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3  Principles of environmental threats and pollution.    4  Principles of solid waste management.    5  Environmental issues and ethics.    Unit I    Environmental issues and ethics.    Unit I    Environmental issues and ethics.    Unit I    Environmental effects of extracting and sign mineral resources – land degradation – soil erosin.    Unit II    ECOSYSTEM AND BIODIVERSITY  9  0  0  9    invironment – biotic and abiotic components – ecosystem components food chain and food web, tropic levels – energy flow ir cosystem, ecological pyramids – ecological succession, types – Biodiversity- types, values of biodiversity, hot spots of iodiversity, threat to biodiversity, endangered and endemic species, conservation of biodiversity – IN-situ and Ex-situ onservation.    Unit II  ENVIRONMENTAL POLLUTION  9  0  9    Vironment – biotic and particulates – control methods – cyclone separator, electrostatic precipitator, catalytic convertor – Wate of BOD only – treatment of domestic and industrial wastewater – Noise pollutant, SO2    402, H5S, CO and particulates – control methods – cyclone separator, electrostatic precipitator, catalytic convertor – Wate of BOD and COD – experimental determination of BOD only – treatment of domestic and industrial wastewater – Noise pollutor docich sca	2	Preserv	eservation of ecosystem and biodiversity.											
4  Principles of solid waste management.    5  Environmental issues and ethics.    Unit I  ENVIRONMENTAL RESOURCES  9  0  0  9    orest resources – importance, deforestation – water resources – sources - hydrologicaleycle - Food resources – effects or andem agriculture, fertilizers, and pesticides – Mineral resources – types – mining – environmental effects of extracting and sing mineral resources – Land resources – land degradation – soil erosion.  9  0  0  9    Unit II  ECOSYSTEM AND BIODIVERSITY  9  0  0  9  0  0  9    invironment – biotic and abiotic components – ecosystem components food chain and food web, tropic levels – energy flow ir cosystem, ceological pyramids – ecological succession, types – Biodiversity, types, values of biodiversity, but stopts of iodiversity, threat to biodiversity, endangered and endemic species, conservation of biodiversity – IN-situ and Ex-situ onservation.  9  0  0  9    Unit III  ENVIRONMENTAL POLLUTION  9  0  0  9  0  0  9    Unit III  ENVIRONMENTAL POLLUTION  9  0  0  9  0  9  0  9  0  0  9  0  0  9  0  0  9  0  0 <td< td=""><td>3</td><td>Princip</td><td colspan="11">Principles of environmental threats and pollution.</td></td<>	3	Princip	Principles of environmental threats and pollution.											
5  Environmental issues and ethics.    Unit I  ENVIRONMENTAL RESOURCES  9  0  0  9    Forest resources – importance, deforestation – water resources – sources - hydrologicalcycle - Food resources – effects of nodern agriculture, fertilizers, and pesticides – Mineral resources – types – mining – environmental effects of extracting and sing mineral resources – Land degradation – soil erosion.    Unit II  ECOSYSTEM AND BIODIVERSITY  9  0  0  9    invironment – biotic and abiotic components – ecosystem components food chain and food web, tropic levels – energy flow in cosystem, ecological pyramids – ecological succession, types – Biodiversity - types, values of biodiversity, hot spots of iodiversity, threat to biodiversity, endangered and endemic species, conservation of biodiversity - IN-situ and Ex-situ onservation.    Unit III  ENVIRONMENTAL POLLUTION  9  0  0  9    Vir pollution – classification of air pollutants gaseous, particulates – sources, effects and control of gaseous pollutants, SO <sub>2</sub> Al <sub>2</sub> S, CO and particulates – control methods – eyclone separator, electrostatic precipitator, catalytic convertor – Water ollution – heavy metal ions pollutants – organic pollutants, oxygen demanding waste, aerobic and anaerobic decomposition OD and COD – experimental determination of BOD only – treatment of domestic and industrial wastewater – Noise pollutior - isaster management – origin, effects and control measures.  9  0  0  9    Unit IV  ENVIRONENTAL THREATS AND SOLID WASTE	4	Principles of solid waste management.												
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Unit II  ECOSYSTEM AND BIODIVERSITY  9  0  0  9    invironment – biotic and abiotic components – ecosystem components food chain and food web, tropic levels – energy flow in cosystem, ecological pyramids – ecological succession, types – Biodiversity- types, values of biodiversity, hot spots of biodiversity, threat to biodiversity, endangered and endemic species, conservation of biodiversity – IN-situ and Ex-situ onservation.    Unit III  ENVIRONMENTAL POLLUTION  9  0  0  9    Unit III  ENVIRONMENTAL POLLUTION  9  0  0  9    tir pollution – classification of air pollutants gaseous, particulates – sources, effects and control of gaseous pollutants, SO2  Q2, H2S, CO and particulates – control methods – cyclone separator, electrostatic precipitator, catalytic convertor – Water ollution – heavy metal ions pollutants – organic pollutants, oxygen demanding waste, aerobic and anaerobic decomposition 30D and COD – experimental determination of BOD only – treatment of domestic and industrial wastewater – Noise pollutor - decibel scale – sources, effects and control measures.  9  0  0  9    Unit IV  ENVIRONENTAL THREATS AND SOLID WASTE // MANAGEMENT  9  0  0  9    vcid rain, greenhouse effect and global warming, ozone depletion, photo chemical smog, eutrophication, bio-amplification – isaster management – origin, effects – treatment methods – 3R approach - composting, sanitary land filling – destructive methods – acienaration, pyrolysis.  9	Forest resources – importance, deforestation – water resources – sources - hydrologicalcycle - Food resources – effects of modern agriculture, fertilizers, and pesticides – Mineral resources – types – mining – environmental effects of extracting and using mineral resources – Land resources – land degradation – soil erosion.													
Environment – biotic and abiotic components – ecosystem components food chain and food web, tropic levels – energy flow ir cosystem, ecological pyramids – ecological succession, types – Biodiversity- types, values of biodiversity, hot spots or biodiversity, threat to biodiversity, endangered and endemic species, conservation of biodiversity – IN-situ and Ex-situ conservation.    Unit III  ENVIRONMENTAL POLLUTION  9  0  0  9    vir pollution – classification of air pollutants gaseous, particulates – sources, effects and control of gaseous pollutants, SO <sub>2</sub> SO <sub>2</sub> , H <sub>2</sub> S, CO and particulates – control methods – cyclone separator, electrostatic precipitator, catalytic convertor – Water ollution – heavy metal ions pollutants – organic pollutants, oxygen demanding waste, aerobic and anaerobic decomposition 30D and COD – experimental determination of BOD only – treatment of domestic and industrial wastewater – Noise pollutor decibel scale – sources, effects and control measures.    Unit IV  ENVIRONENTAL THREATS AND SOLID WASTE (9)  0  0  9    vcid rain, greenhouse effect and global warming, ozone depletion, photo chemical smog, eutrophication, bio-amplification – isaster management – origin, effects – treatment methods – 3R approach - composting, sanitary land filling – destructive methods – acineration, pyrolysis.    Unit V  SOCIAL ISSUES AND ENVIRONMENTAL ETHICS  9  0  9    'rom unsustainable to sustainable development - aim and ways of achieving – urban problems related to energy – water onservation and management - rain water harvesting – waste land reclamation – consumerism – human population – opulation growth – characte	Uni	it II	ECOSYSTEM AND BIODIVERSITY	Y	9	0	0	9						
Unit III  ENVIRONMENTAL POLLUTION  9  0  0  9    Mir pollution – classification of air pollutants gaseous, particulates – sources, effects and control of gaseous pollutants, SO2    MO2, H2S, CO and particulates – control methods – cyclone separator, electrostatic precipitator, catalytic convertor – Water    volution – heavy metal ions pollutants – organic pollutants, oxygen demanding waste, aerobic and anaerobic decompositior    30D and COD – experimental determination of BOD only – treatment of domestic and industrial wastewater – Noise pollution    • decibel scale – sources, effects and control measures.    Unit IV  ENVIRONENTAL THREATS AND SOLID WASTE  9  0  0  9    Actid rain, greenhouse effect and global warming, ozone depletion, photo chemical smog, eutrophication, bio-amplification – isaster management – origin, effects and management of earthquake and floods. Solid waste management – solid wastes lassification, origin, effects – treatment methods – 3R approach - composting, sanitary land filling – destructive methods – neineration, pyrolysis.    Unit V  SOCIAL ISSUES AND ENVIRONMENTAL ETHICS  9  0  9  9    Or unsustainable to sustainable development - aim and ways of achieving – urban problems related to energy – water onservation and management - rain water harvesting – waste land reclamation – consumerism – human population – opulation growth – characteristics of population growth – variation of population among nations and based on age structure – opulation growth – characteristics of popul	Enviror ecosyst biodive conserv	nment – t tem, ecol ersity, thr vation.	pootic and abiotic components – ecosystem components food o logical pyramids – ecological succession, types – Biodiver reat to biodiversity, endangered and endemic species, con	chain and food web rsity- types, values iservation of biodi	o, tropic of bic versity	levels – odiversit – IN-si	y, hot s tu and	flow in pots of Ex-situ						
Air pollution – classification of air pollutants gaseous, particulates – sources, effects and control of gaseous pollutants, SO2    NO2, H2S, CO and particulates – control methods – cyclone separator, electrostatic precipitator, catalytic convertor – Water pollution – heavy metal ions pollutants – organic pollutants, oxygen demanding waste, aerobic and anaerobic decomposition 30D and COD – experimental determination of BOD only – treatment of domestic and industrial wastewater – Noise pollution - decibel scale – sources, effects and control measures.    Unit IV  ENVIRONENTAL THREATS AND SOLID WASTE MANAGEMENT  9  0  0  9    vcid rain, greenhouse effect and global warming, ozone depletion, photo chemical smog, eutrophication, bio-amplification – biaseter management – origin, effects and management of earthquake and floods. Solid waste management – solid wastes lassification, origin, effects – treatment methods – 3R approach - composting, sanitary land filling – destructive methods – neineration, pyrolysis.    Unit V  SOCIAL ISSUES AND ENVIRONMENTAL ETHICS  9  0  0  9    'rom unsustainable to sustainable development - aim and ways of achieving – urban problems related to energy – water onservation and management – rain water harvesting – waste land reclamation – consumerism – human population – opulation growth – characteristics of population growth – variation of population among nations and based on age structure – opulation explosion - reason, effects and remedy – family welfare program , family planning program – HIV and AIDS.	Uni	t III	ENVIRONMENTAL POLLUTION		9	0	0	9						
Unit IV  ENVIRONENTAL THREATS AND SOLID WASTE MANAGEMENT  9  0  0  9    Acid rain, greenhouse effect and global warming, ozone depletion, photo chemical smog, eutrophication, bio-amplification - lisaster management – origin, effects and management of earthquake and floods. Solid waste management – solid wastes lassification, origin, effects – treatment methods – 3R approach - composting, sanitary land filling – destructive methods – neineration, pyrolysis.  9  0  0  9    Unit V  SOCIAL ISSUES AND ENVIRONMENTAL ETHICS  9  0  0  9    'rom unsustainable to sustainable development - aim and ways of achieving – urban problems related to energy – water onservation and management- rain water harvesting – waste land reclamation – consumerism – human population – opulation growth – characteristics of population growth – variation of population among nations and based on age structure – opulation explosion - reason, effects and remedy – family welfare program , family planning program – HIV and AIDS.	Air pol NO <sub>2</sub> , H pollutic BOD at – decib	llution $-$ I <sub>2</sub> S, CO a on $-$ heav nd COD eel scale $-$	classification of air pollutants gaseous, particulates – source and particulates – control methods – cyclone separator, elec /y metal ions pollutants – organic pollutants, oxygen demand – experimental determination of BOD only – treatment of dor - sources, effects and control measures.	s, effects and contr trostatic precipitate ding waste, aerobic nestic and industria	rol of g or, catal c and ar al waste	aseous p ytic con naerobic water –	oollutan ivertor - decomj Noise p	ts, SO <sub>2</sub> , - Water position ollution						
Acid rain, greenhouse effect and global warming, ozone depletion, photo chemical smog, eutrophication, bio-amplification -    lisaster management – origin, effects and management of earthquake and floods. Solid waste management – solid wastes    lassification, origin, effects – treatment methods – 3R approach - composting, sanitary land filling – destructive methods –    ncineration, pyrolysis.    Unit V  SOCIAL ISSUES AND ENVIRONMENTAL ETHICS  9  0  0  9    'rom unsustainable to sustainable development - aim and ways of achieving – urban problems related to energy – water  onservation and management- rain water harvesting – waste land reclamation – consumerism – human population –    opulation growth – characteristics of population growth – variation of population among nations and based on age structure –    opulation explosion - reason, effects and remedy – family welfare program , family planning program – HIV and AIDS.	Uni	t IV	ENVIRONENTAL THREATS AND SOLID MANAGEMENT	WASTE	9	0	0	9						
Unit V  SOCIAL ISSUES AND ENVIRONMENTAL ETHICS  9  0  0  9    From unsustainable to sustainable development - aim and ways of achieving – urban problems related to energy – water onservation and management- rain water harvesting – waste land reclamation – consumerism – human population – opulation growth – characteristics of population growth – variation of population among nations and based on age structure – opulation explosion - reason, effects and remedy – family welfare program , family planning program – HIV and AIDS.    Total = 45 Periods	Acid rain, greenhouse effect and global warming, ozone depletion, photo chemical smog, eutrophication, bio-amplification – disaster management – origin, effects and management of earthquake and floods. Solid waste management – solid wastes classification, origin, effects – treatment methods – 3R approach - composting, sanitary land filling – destructive methods – incineration, pyrolysis.													
From unsustainable to sustainable development - aim and ways of achieving – urban problems related to energy – water onservation and management- rain water harvesting – waste land reclamation – consumerism – human population – oppulation growth – characteristics of population growth – variation of population among nations and based on age structure – opulation explosion - reason, effects and remedy – family welfare program , family planning program – HIV and AIDS. Total = 45 Periods	Un	it V	SOCIAL ISSUES AND ENVIRONMENTAL	ETHICS	9	0	0	9						
Total = 45 Periods	From u conserv populat populat	unsustain vation an tion grow tion explo	able to sustainable development - aim and ways of achiev ad management- rain water harvesting – waste land recla with – characteristics of population growth – variation of popul osion - reason, effects and remedy – family welfare program	ing – urban proble amation – consum lation among nation , family planning p	ems rela erism - ns and b rogram	ated to – human based on – HIV a	energy n popul age stru nd AID	– water ation – ucture – S.						
						Tota	l = 45 P	Periods						

Tex	t Books:
1	Elements of Environmental science and Engineering, P.Meenakshi, Prenitce — Hall of India, New Delhi, 2009.

2	A Textbook of Environmental Chemistry and Pollution Control: (With Energy, Ecology, Ethics and Society), Revised Edition, Dr. S.S. Dara, D.D. Mishra Published by S. Chand & Company Ltd, 20 14.								
Reference Books:									
1	IntroductiontoEnvironmentalEngineeringandScience,GilbertM.Masters;WendellP.ElaPublisher:Prentice- HallIndia,3rdEdition,2008.								
2	Environmental Science, F;ldren D. Enger, BredleyF.Smith, WCD McGraw Hill 14"Edition 2015.								
E-Re	E-References								
1	www.onlinecourses.nptel.ac.in/								
2	www.ePathshala.nic.in								

Cours	Bloom's		
Upon	Taxonomy Level		
CO1	Play an important role in conservation of natural resources for future generation.	Creating	
CO2	Paraphrase the importance of ecosystem and biodiversity.	Understanding	
CO3	Analyze the impact of pollution and hazardous waste in a global and social context.	Analyzing	
CO4	Understand contemporary issues that result in environmental degradation that would attempt to provide solutions to overcome the problems.	Understanding	
CO5	Consider the issues of environment and human population in their professional undertakings.	Applying	

## **COURSE ARTICULATION MATRIX**

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2	0	0	1	3	2	0	0	0	1	2	0	1
CO2	3	3	2	0	0	1	3	2	0	0	0	1	2	0	1
CO3	3	3	2	0	0	1	3	2	0	0	0	1	2	0	1
CO4	3	3	2	0	0	1	3	2	0	0	0	1	2	0	1
CO5	3	3	2	0	0	1	3	2	0	0	0	1	2	0	1
Avg	3	3	2	0	0	1	3	2	0	0	0	1	2	0	1
3/2/1 – indicates strength of correlation (3- High, 2- Medium, 1- Low)															