SYLLABUS

OF

M. TECH
(Environmental Engineering)
II YEAR

(CBCS)

DEPARTMENT OF CIVIL ENGINEERING

INTEGRAL UNIVERSITY
LUCKNOW

SYLLABUS AND EVALUATION SCHEME

M.Tech. (Environmental Engineering)

Semester – III

S. No.	Course Category	Code No	Name of Subject	Periods			Credits	Evaluation Scheme				Subject Total
				L	T	P	C	Continuous Assessment (CA)			Exam ESE	
								UE	TA	Total		
1	DE		Elective –II	3	1	-	4	40	20	60	40	100
2	DE		Elective –III	3	1	-	4	40	20	60	40	100
3	DE		Elective –IV	3	1	-	4	40	20	60	40	100
4	DC	CE636	Directed Study	-	-	-	4	-	-	-	100	100
5	DC	CE699	M.Tech Dissertation	-	-	-	4	-	-	60	40	100
Total							**20**					**500**

Semester – IV

S. No.	Course Category	Code No	Name of Subject	Periods			Credits	Evaluation Scheme				Subject Total
				L	T	P	C	Continuous Assessment (CA)			EXAM ESE	
								UE	TA	Total		
1	DC	CE699	M.Tech Dissertation	-	-	-	4	-	-	60	40	100
2	DC	CE699	M.Tech Dissertation	-	-	-	4	-	-	60	40	100
3	DC	CE699	M.Tech Dissertation	-	-	-	4	-	-	60	40	100
4	DC	CE699	M.Tech Dissertation	-	-	-	4	-	-	60	40	100
Total							**16**					**400**

TA- Teacher Assessment; **ESE –** End Semester Examination; **CT-** Cumulative Test.
Note: Duration of ESE shall be 03 (Three) hours per subject

M.Tech (Environmental Engineering)

List of the Elective Paper:

Elective – I

CE524	Transport of Water and Wastewater
CE525	Industrial Wastewater Management
CE526	Air Pollution Control
CE534	Unit Operations and Processes in Water and Wastewater Treatment

Elective – II

CE621	Air and Water Quality Modeling
CE622	Ecological Engineering
CE623	Principles of Environmental Science

Elective – III

CE626	Fundamentals of Sustainable Development
CE627	Cleaner Production
CE628	Environmental Geotechnology

Elective – IV

CE631	Environmental Engineering Structures
CE632	Surface and Ground Water Modeling
CE633	Water Resources Systems Management

TA- Teacher Assessment; ESE – End Semester Examination; CT- Cumulative Test.

Note : Duration of ESE shall be 03 (Three) hours per subject.

Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	CE623	**Title of the Course**	Principles of Environmental Science	**L**	**T**	**P**	**C**
Year	2nd	**Semester**	3rd	3	1	0	4
Pre-Requisite	NIL	**Co-requisite**	NIL				
Course Objectives	• Student will be able to understand the basics of physical science and chemical science. • Student will be able to understand the basics of Environmental Ecology. • Student will learn about different microorganism present in water and M.F techniques to control the problems caused by microorganism and algae. • Student will be able to understand the basics of different enzymic reactions and the basic Structure of the atmosphere.						

Course Outcomes	
CO1	Structure of Environment – interaction between biological and chemical components, Basics of hydrosphere, atmosphere, lithosphere, biosphere, scope and importance of environmental science..
CO2	Student will be able to explain the interaction between different species of the environment.
CO3	Student will learn about different microorganisms present in environment and their significance.
CO4	Student will be able to understand the basics of different enzymes reactions and the basic of aquatic chemistry.
CO5	Student will be able to understand the basics of atmospheric chemistry.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction of Environmental Science	Structure of Environment – interaction between biological and chemical components, Basics of hydrosphere, atmosphere, lithosphere, biosphere, scope and importance of environmental science	8	CO1
2	Biological Systems	Plants Animals distribution, interaction, biomass classification, salient features, nutrients and microorganisms, environmental factors.	8	CO2
3	Microbiology of Environment	Microbiology of water – soil – air. Indicator organisms, - coliforms MPN index M.F.technique – Biological indices. Biomonitoring methods – Eutrophication. Biological treatment of wastewater – bacterial reductions.Algae in water supply systems – problems and control. Macrophytes in water bodies –role – control.	8	CO3
4	Chemistry of Aquatics	Common organic reactions, Enzymes and factors influencing enzymatic reactions, Pesticides and syndets Transformation and degradation of pollutants.	8	CO4
5	Atmospheric Chemistry	Structure of the atmosphere, Photochemistry of the atmosphere, ozone layer depletion, Acid rain, Greenhouse gases and global warming.	8	CO5

Reference Books:

Water Supply Engineering: Environmental Engineering v. 1, S. K. Garg, 29th Edition, Khanna Publication, 2013.
Environmental Engineering, Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, 1st Edition 1985, McGraw Hill Education; Reprint 2013.
Gilbert M. Masters, Wendell P. Ela, Introduction to Environmental Engineering and Science, Prentice Hall, 3rd Edition, 2007
K.V.S.G. Murali Krishna, Air Pollution and Control, , Laxmi Publications, 1st Edition, 2017.
StevenC.Chapra, "Surface Water quality modeling", The McGraw-Hill-Companies Inc. 1st Edition, 2008.

e-Learning Source:

https://www.hindawi.com/journals/tswj/2013/231768/
http://envirocomp.org

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	0	0	0	0	0	3	0	0	0	0	0	2	3
CO2	3	0	0	0	0	0	3	0	0	0	0	0	2	3
CO3	3	0	0	0	0	0	3	0	0	0	0	0	3	2
CO4	3	0	0	0	0	0	3	0	0	0	0	0	3	2
CO5	3	0	0	0	0	0	3	0	0	0	0	0	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	CE626	**Title of the Course**	Fundamentals of Sustainable Development	**L**	**T**	**P**	**C**
Year	2nd	**Semester**	3rd	3	1	0	4
Pre-Requisite	NIL	**Co-requisite**	NIL				
Course Objectives	To educate the students on the basic principles of sustainable development, its national and international aspects.						

Course Outcomes	
CO1	To inculcate the basic concept of Principles of Sustainable Development.
CO2	To impart the knowledge of Indians Judiciary System & Sustainable Development.
CO3	To enhance the fundamentals of Socio-economic Sustainable Development Systems.
CO4	To impart the knowledge of documentation and monitoring of developmental projects.
CO5	To edify the global aspects of sustainable development.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Principles of Sustainable Development	History and emergence of the concept of Sustainable Development, Definitions, Environmental issues and crisis, Resource degradation, greenhouse gases desertification social insecurity Industrialization Globalization and Environment.	8	CO1
2	Indian Judiciary System & Sustainable Development	Sustainable development in Indian scenario, Judicial System in India Induction of sustainability concepts through legal systems concepts principles doctrines case laws.	8	CO2
3	Sustainable Development and International Contribution	Components of sustainability, Complexity of growth and equity, International Summits, Conventions Agreements, Transboundary issues Action plan for implementing sustainable development – Moral obligations and Operational guidelines.	8	CO3
4	Socio-economic Sustainable Development Systems	Socio-economic policies for sustainable development- Strategies for implementing eco development programs – Sustainable development through trade – Economic growth Carrying Capacity – Public participation.	8	CO4
5	Global Aspects of Sustainable Development	Role of developed countries in the sustainable development of developing countries – Demographic dynamics and sustainability – Integrated approach for resource protection and management.	8	CO5

Reference Books:

Okechukwu Ukaga, Chris Maser, Michael Reichenbach, Sustainable Development, CRC Press, 1 edition, 2010.
Mackenthun, K.M., Basic Concepts in Environmental Management, 2nd edition, CRC Press, 2001.
Yehia Bahei-El-Din, Maguid Hassan, Advanced Technologies for Sustainable Systems, Springer; 1st ed., 2016.
Keekok Lee, Alan Holland, Desmond McNeil, Global Sustainable Development in the Twenty-First Century, Keele University Press (13 June 2000).

e-Learning Source:

https://onlinecourses.nptel.ac.in/noc22_hs61/preview

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	0	0	0	0	0	3	0	0	0	0	0	2	3
CO2	3	0	0	0	0	0	3	0	0	0	0	0	2	3
CO3	3	0	0	0	0	0	3	0	0	0	0	0	3	2
CO4	3	0	0	0	0	0	3	0	0	0	0	0	3	2
CO5	3	0	0	0	0	0	3	0	0	0	0	0	2	2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	CE633	**Title of the Course**	Water Resources Systems Management	**L**	**T**	**P**	**C**
Year	2nd	**Semester**	3rd	3	1	0	4
Pre-Requisite	NIL	**Co-requisite**	NIL				
Course Objectives	• Student will be able to understand about the planning of reservoir. • Student will be able understand about the quality of water required by various crops and rain water harvesting method. • Student will learn about droughts and its managements. • Student will be able to learn the different software used in reservoir operation. • Student will be able to learn different optimization and modeling in water recourse system.						

Course Outcomes	
CO1	Student will be able to characterize different types of reservoir and dams.
CO2	Student will be able to explain about the quality of water used for various crops production and rain water harvesting methods.
CO3	Student will be able to explain the classification of drought.
CO4	Student will be able to use different software used in water recourse system.
CO5	Student will be able to explain different optimization method in water resource system.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Reservoir Planning	Reservoir planning and Management, Multi reservoir systems, Real time operation, River basin planning, water logging, soil salinity, salinity control.,Design of Dams, Non gravity dams, Weirs and Barrages, Conjunctive use of Irrigation water.	8	CO1
2	Quality of Water	Quality of Irrigation water, Contaminants and their effects on various crops. Rainwater Harvesting and Management – Different Types and Methods of Harvesting in urban and agricultural areas.	8	CO2
3	Droughts	Draught analysis, NCA classification, Direct and Indirect losses, Drought severity assessment, Drought Monitoring, Drought Management.	8	CO3
4	Floods	Introduction to systems approach, Linear programming, Problem formulation, Solution by simplex method, Application to design and operation of reservoir, Non Linear Programming, Sensitivity analysis, Monte Carlo simulation.	8	CO4
5	Optimization Methods in Water System Modelling	Ex situ and in situ remediation – solidification, bio – remediation, incineration, soil washing, electro kinetics, soil heating, verification, bio venting – Ground water remediation – pump and treat, air sparging, reactive well- application of geo synthetics in solid waste management – rigid or flexible liners.	8	CO5

Reference Books:

Dilip Kumar Majumdar, "Irrigation Water Management (Principles & Practices)",Prentice Hall of India (P), Ltd, 2nd edition, 2013

B L Gupta, "Water Resources Systems & Management", Standard Publications, 1st edition, 2008.

Pramod R. Bhave,"Water Resources Systems", Narosa publication, 1st edition, 2011.

Metcalf and Eddy, "Wastewater Engineering: Treatment, and Reuse Recovery", McGraw-Hill Education; 5 edition, 2013.

e-Learning Source:

http://www.nptel.ac.in/courses/105108081/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	0	0	2	0	0	2	0	0	0	0	0	2	3
CO2	1	0	0	2	1	0	2	0	0	0	0	1	2	3
CO3	1	0	0	2	0	0	2	0	0	0	0	0	3	2
CO4	1	1	1	2	1	0	2	0	0	0	0	1	3	2
CO5	1	0	0	2	0	0	2	0	0	0	0	0	2	2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	CE654	**Title of the Course**	Directed Study	**L**	**T**	**P**	**C**
Year	2nd	**Semester**	4th	0	0	0	4
Pre-Requisite	NIL	**Co-requisite**	NIL				
Course Objectives	• To make learner aware about the latest technology and engineering practices in industries.						

Course Outcomes	
CO1	Awareness regarding the latest technology, engineering methodology and practices being used in industries.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	0	0	2	3	3	0	0	3	3	0	3	1	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2019-20							
Course Code	CE699	**Title of the Course**	M Tech dissertation	**L**	**T**	**P**	**C**
Year	2nd	**Semester**	3rd and 4th	0	0	0	20
Pre-Requisite	------	**Co-requisite**	------				
Course Objectives	• To develop individuality and problem analysis skill. • To nurture ability to perform literature review. • To improve critical thinking ability for formulation of plan. • To develop skill to use various engineering and technological tools. • To develop skill to think critically on research results. • To enhance the writing skill for research paper and dissertation.						

Course Outcomes	
CO1	Capability to work independently on a research-based problem.
CO2	Skill to perform review of available literature effectively to present research gap.
CO3	Aptitude to plan methodology for the attainment of various research objectives.
CO4	Competency to apply of various engineering and technological tools to carry research.
CO5	Ability to conclude work using critical thinking.
CO6	Proficiency in preparing presentation and report.

Unit No.	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Undergo industrial training in any respective industry in order to get familiar with the latest technology, engineering techniques and practices being used in the industry. Have to absorb some skill from the training identifying the area of improvement. The concepts/skills must be clearly understood and presented by the student. A hard copy of the report should be submitted to the Department after the completion of directed study.	03hrs	CO1, CO2, CO3, CO4, CO5 and CO6

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	0	0	0	3	3	0	0	3	3	3	0	3	0	3
CO2	0	0	0	3	3	0	0	3	3	3	0	3	0	3
CO3	0	0	0	0	3	0	0	0	3	3	0	3	0	3
CO4	0	0	0	3	3	0	0	0	3	0	0	3	0	3
CO5	0	0	0	3	3	0	0	3	3	3	0	3	0	3
CO6	0	0	0	0	3	0	0	3	3	3	0	3	0	3

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**