Curriculum & Syllabi

of

Master of Technology

In

Hill Area Development Engineering

(w.e.f. 2014-15)

Vision

Mission

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Overall Credit Structure

Curriculum

Syllabus

Offered By

DEPARTMENT OF CIVIL ENGINEERING

M. M. M. UNIVERSITY OF TECHNOLOGY,

GORAKHPUR-273010, UP

August 2021

M. Tech. Hill Area Development Engineering

Vision:

To become a premier centre of learning and research in Civil Engineering, nurturing sustainable development by the year 2025.

Mission:

1. To provide the quality education in the area of Civil Engineering to transform students into graduates with high professional values.
2. To share and disseminate expertise for use in the solution of problems faced by Civil engineering industry and by society.
3. To ensure the continuous improvement in the quality of life of people in the society.
4. To conduct need based research projects giving priority to the needs of industry

Programme Educational Objectives (PEO)

PEO1: To be well familiar with the concepts of Hill Area Development Engineering for leading a successful career in industry or as entrepreneur or to pursue higher education.

PEO2: To develop techno-commercial skills for providing effective solutions to complex problems using domain knowledge of Hill Area Development Engineering.

PEO3: To instill lifelong learning approach towards constantly evolving technologies with innovative and ethical mindset for solving the engineering problems specific to hilly areas.

Programme Outcome (POs)

Graduates of the Hill area development Engineering Programme will be able to:

PO1: Apply the knowledge of engineering fundamentals, and Hill Area Development Engineering specialization to the solution of complex problems pertaining to Hilly Areas.

PO2: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety and cultural, societal and environmental considerations.

PO4: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex Hill Area Development engineering activities, with an understanding of the limitations.

PO5: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO6: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO7: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Hill Area Development engineering practice.

PO8: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO9: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO11: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcome (PSOs)

PSO1: Ability to apply the Hill Area Development engineering knowledge for proposing solutions to real world problems through incubation of innovative ideas.

PSO2: To understand modern management and construction techniques to complete projects within stipulated time and budget.

Curriculum

First Year, Semester I

S.N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	M	MMS606/ MAS-112	Advanced Engineering Mathematics	3	1	0	4
2.	PC	MCE-000	Advances in Civil Engineering	3	1	0	4
3.	PC	MCE-102	Water Resources Development	3	1	0	4
4.	PC	MCE-103	Hill Transportation	3	1	2	5
5.	AC		Audit Subject				-
			Total	**12**	**4**	**2**	**17**

First Year, Semester II

S.N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	PC	MCE-104	Land Resources Management	3	1	0	**4**
2.	PC	MCE-105	Hill Habitat, Water Supply and Sanitation	3	1	2	**5**
3.	PC	MCE–101	Ecology and Eco-development	3	1	0	**4**
4.	PE1	MCE-***	Programme Elective	3	1	0	**4**
5.	AC		Audit Subject				-
			Total	**12**	**4**	**2**	**17**

Second Year, Semester III

S.N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	PE2	MCE-***	Programme Elective-2	3	1	0	**4**
2.	PE3	MCE-***	Programme Elective-3	3	1	0	**4**
3.	MP	MCE-120	Minor Project	0	0	8	**4**
4.	D	MCE-130	Dissertation Part-I	0	0	8	**4**
			Total	**6**	**2**	**16**	**16**

Second Year, Semester IV

S. N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	S	MCE-140	Seminar	0	0	4	**2**
2.	D	MCE-150	Dissertation Part-II	0	0	28	**14**
			Total	**0**	**0**	**32**	**16**

Programme Core for M. Tech. (Hill Area Development Engineering)

S.N.	Paper Code	Subject Name	Prerequisite Subjects	L	T	P	Credits
1.	MCE-101	Ecology and Eco-development	-	3	1	0	4
2.	MCE-102	Water Resources Development	-	3	1	0	4
3.	MCE-103	Hill Transportation	-	3	1	2	5
4.	MCE-104	Land Resources Development	-	3	1	0	4
5.	MCE-105	Hill Habitat, Water Supply and Sanitation	-	3	1	2	5
6.	MCE-120	Minor Project	-	0	0	8	4

7.	MCE-130	Dissertation Part-I	-	0	0	8	4
8.	MCE-140	Seminar	-	0	0	4	2
9.	MCE-150	Dissertation Part-II	Dissertation Part-I	0	0	28	14

Programme Electives (PE1)

S.N.	Paper Code	Subject Name	Prerequisite Subjects	L	T	P	Credits
1.	MCE-151	Environmental Quality Management	-	3	1	0	4
2.	MCE-152	Earth and Environment	-	3	1	0	4
3.	MCE-153	Principles of Remote Sensing	-	3	1	0	4
4.	MCE-154	Applied Geology	-	3	1	0	4
5.	MCE-157	Systems Analysis and Management	-	3	1	0	4

Programme Electives (PE2)

S.N.	Paper Code	Subject Name	Prerequisite Subjects	L	T	P	Credits
1.	MCE-156	Environmental Impact Assessment and Management	-	3	1	0	4
2.	MCE-162	Non-conventional Sources of Energy	-	3	1	0	4
3.	MCE-158	Solid Waste Management	-	3	1	0	4
4.	MCE-159	Groundwater Management	-	3	1	0	4
5.	MCE-167	Geographic Information System Techniques	-	3	1	0	4

Programme Electives (PE3)

S. No.	Paper Code	Subject	Prerequisite Subjects	L	T	P	Credits
1.	MCE-169	Disaster Management	-	3	1	0	4
2.	MCE-166	Water Pollution	-	3	1	0	4
3.	MCE-163	Earthquake Resistant Design of Buildings	-	3	1	0	4
4.	MCE-164	Geo-technique of Hill Area	-	3	1	0	4
5.	MCE-168	Water Retaining Structures	-	3	1	0	4

Courses for other Departments

S. No.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	MCE-191	Earth and Environment	-	3	1	2	5
2.	MCE-192	Environmental Impact Assessment and Management	-	3	1	0	4

Audit Courses for M. Tech. (Hill Area Development Engineering)

S. No.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	MAS-105	Applied Probability and Statistics	-	3	1	0	4
2.	MBA-109	Research Methodology	-	3	1	0	4
3.	MAS-109	Foreign Language-French	-	2	1	0	3
4.	MAS-110	Foreign Language-German	-	2	1	0	3
5.	BCS-68	Neural Network and Fuzzy System	-	3	1	0	4

Besides above elective, the students may be offered other elective subject to prior approval from competent authority.

SYLLABI

MMS 606 ADVANCED ENGINEERING MATHEMATICS

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisites	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, assignments, quizzes, One Minor and One Major Theory Examination.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course

1. To find out the dimension of vector spaces
2. To describe the differences between finite-difference and finite-element methods for solving PDEs;
3. To solve Elliptical (Laplace/Poisson) PDEs using finite differences;
4. To solve functional using Euler method.

Topics Covered

UNIT-I

Vector spaces and Linear transformation: Vector spaces, subspaces, Linear dependence, Basis and Dimension, Linear transformations, Kernel & images, matrix representation of linear transformation, change of basis, Eigen values and Eigen vectors of linear operators, diagonalization. 9

UNIT-II

Numerical Techniques: Solution of algebraic and transcendental equations using bisection, Regula Falsi and Newton Raphson's method, Numerical solution to linear system, LU factoring decomposition, Cholesky method, Gauss Seidal method, Numerical eigen value problem, Jacobi, Givens method 9

UNIT-III

Calculus of Variation: Functionals, Euler's equation and its generalization. One and several independent variables. Initial value problems. Weierstrass's sufficiency condition for weak and strong minima and maxima 9

UNIT-IV

Numerical Solution of Partial Differential Equations: Classification of partial differential equations of the second order. Laplace equations and its solution by Liebmann's process. Poisson equation. Solution of Parabolic, Eliptic and Hyperbolic Equations. Applications to Engineering. 9

Textbooks

1. K. Hoffman, R Kunze, Linear Algebra, Prentice Hall of India, 1971.
2. I. M. Gelfrand, S. V. Fomin, Calculus of Variation, Dover Publications.
3. M. D. Raisinghania, Advanced Differential Equations, Schand Publishers.
4. P. Kandasamy, K.Thilagavathy & K.Gunavathy, Numerical Methods, S. Chand Publ.

MCE-000	**ADVANCES IN CIVIL ENGINEERING**	**4 Credits (3-1-0)**

Course category	:	Engineering Fundamental (EF)
Contact hours/week	:	Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	:	4
Course Assessment	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.
Course Objectives	:	This course has been designed to brush-up as well as to enhance the knowledge of all freshly admitted students of the department.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Know different methods for calculating the stress strain.
2. Able to apply Hook's law.
3. Able to draw the Mohr's circle for calculating the stress and strain in different direction.
4. Understand how to calculate the reactions, bending moment and shear force, and also able to draw the bending moment and shear force diagram for different type of structures. The students may learn to design a water or wastewater treatment component.
5. The students can learn how to characterize source water, for physical and chemical treatment of drinking water.
6. The students can learn how to characterize wastewater, physical, chemical and microbiological treatment of wastewater.
7. The students will learn the water demand, sources of water and intake structures.
8. To identify the different types of flow in open channel.
9. To understand the concept of hydraulic jump.
10. To classify the various types of flow profile able to understand how to control project schedule, cost, quality and risk.
11. Develop the ability to analyze the risk and feasibility of real estate projects throughout their lifecycle.
12. Students will be able to know the different types of equipment to be used in the construction projects.

Topics Covered

UNIT-I

Shear Strength of Soils: Mohr-Coulomb Failure Criterion, Methods of Shear Strength Determination: Direct Shear Test, Triaxial test, total and effective Stress Parameters, Pore Water Pressure Parameters, Stress-Strain Behavior of Sands.

Compression and Consolidation of Soils: Compressibility Characteristics Normally Consolidated and Over- Consolidated Clays, Estimation of Pre-consolidation Stress, Terzaghi's Theory.

UNIT-II

Hydraulic Jump, Hydraulic Jump characteristics and its application in Civil Engineering, Stilling Basin types and Design (One complete problem on stilling Basin Design and Drawing).

UNIT-III

Equipment management, Productivity, operational cost, owning and hiring cost and the work motion study. Simulation techniques for resource scheduling. Construction Equipment for earth moving, Hauling equipment, Hoisting equipment Conveying equipment, Concrete Production equipment. Importance of estimation, different types of estimates, specifications: general and detailed. Methods of estimation, Estimates of RC works, Estimates of Buildings.

UNIT-IV

Beneficial uses of water and quality requirements, standards, sources of water, unit operations, process and flow sheets in water treatment.

Waste water characteristics, Preliminary, primary, secondary and tertiary treatment processes of waste water, aerobic and anaerobic treatment process, recycling, reuse and recrimination of waste water, waste water disposal.

Textbooks/ Reference books

1. Brij Mohan Das – Geotechnical Engineering, CENGAGE Learning
2. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics, New Age Intl (P)Ltd.
3. K.R.Arora–SoilMechanics&FoundationEngg.StandardPublishers&Distributors,Delhi
4. Chow,V.T.,OpenchannelHydraulics,McGrawHillInternational,NewYork,1959
5. Subramanya,K.,FlowinOpenChannels,TataMcGrawHill.,4th Edn.,2015
6. IS4997:Criteriafordesignofhydraulicjumptypestillingbasinswithhorizontalandslopingapron.by Bureau of Indian Standards
7. Construction Planning and Management by U.K. Srivastava.
8. Construction, Planning, Equipment and Methods by R.L. Peurify
9. Estimating and Costing by B. N. Dutta.
10. Estimating, Costing and Valuation in Civil Engineering by M. Chakraborty.
11. Peavy, Rowe and Tchobanoglous: Environmental Engineering
12. Metcalf and Eddy Inc.: Wastewater Engineering
13. Garg: Water Supply Engineering (Environmental Engineering Vol.–I)
14. Garg: Sewage Disposal and Air Pollution Engineering (EnvironmentalEngineeringVol.–II).

MCE-101	ECOLOGY AND ECO-DEVELOPMENT	4 Credits (3-1-0)

Course category : Engineering Fundamental (EF)

Contact hours/week : Lecture: 3, Tutorial:1,Practical: 0

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives : The objective of the course is to acquaint the students with basic knowledge of the biological organisms, their population, communities, and their living environment. The course will also provide the understanding of the principles of ecology and concept of eco-development in hilly area and advantages of Sukhomajari model.

Course Outcomes : At the end of this course, the student will be able to:

1. Define and describe the concept of ecosystem and their types
2. Explain the ecological processes and their interaction with the environment
3. Explain flow of energy in ecosystem, Development and evolution of ecosystems,
4. Adopting sustainability as a practice in life, society and industry.

UNIT-I **9**

EcologyLevelsoforganization,SubdivisionofEcologyprinciplesandconceptspertainingtoEcosystems, examplesofalake,awatershedunit,aforest,asecosystems.Homeostasisofanecosystem.

UNIT-II **9**

Principles and concepts of pertaining to flow of energy in ecosystems, principles and concepts pertaining to biogeochemical cycles, Principles pertaining to limiting factors, Development and evolution of ecosystems, Ecosystem development with regard to shifting cultivation. Fresh water ecology and terrestrial ecology of hilly regions, systems approach and mathematical modeling in ecology.

UNIT-III **9**

Remotesensingasatoolforthestudyandmanagementofecosystems,Eco-development,Theexistingtrendsof economic development in hill, The adverse impacts of water resources, industrial, agricultural, horticultural tourist development in hills. The concept of Eco-development, Sukhomajri models.

UNIT-IV **9**

Socioeconomic development coordinated, action oriented research. Post-harvest operation, A groand

plant based industries, Institutional framework, forest policy.

Books & References:

1. Fundamentals of Ecology-Eugene O dum, Gary W. Bewet, Brooks Cole
2. Essentials of Ecology - Jr. G. Tylor miller, Brooks Cole
3. ElementsofEcology-RobertL.Smith,ThomasH.Smith,GrahamC.Hickman,SusanM.Hickman, Benjamin Cummings
4. Ecology: Principles & Applications- J. L. Chopra & M.J. Reiss (Cambridge University Press)

MCE-102	WATER RESOURCES DEVELOPMENT	4 Credits (3-1-0)

Course category : Engineering Fundamental (EF)

Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 0

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course objectives : In we are working in the field of irrigation Engg. We should know how much water is going into the ground from where the plants can take their water.

If we are concerned about the water resources, we should know how much water is going into the river so that we can control the floods or we can avoid the lack of water for irrigation other area.

1. The knowledge of hydrology is prerequisite for the irrigation engineering and for design of hydraulic structure. So, one of the objectives of this course is to impart the knowledge of hydrology that deals with the occurrence, distribution, movement and properties of water on the earth.
2. To impart the knowledge of various irrigation techniques, requirements of the crops.
3. To learn about distribution systems for canal irrigation, design of unlined and lined irrigation canals design sediment problems associated with canal.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Various components of hydrologic cycle that affect the movement of water in the earth.
2. Various Stream flow measurements technique.
3. The concepts of movement of ground water beneath the earth.
4. The basic requirements of irrigation and various irrigation techniques, requirements of the crops.
5. Distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals design.
6. Basic components of river Training works.
7. Apply math, science, and technology in the field of water resource Engineering.

UNIT-I **9**

Benefit cost ratio, systems approach to planning projects on river systems. Fixing optimum capacities by dynamic programming, fixing priority of projects.

UNIT-II **9**

Design of high dams in seismic region and their foundation problems. Design of arch and shell dams, concrete membrane dams and rolled fill concrete dams. Hydel power and its advantages and disadvantages.

UNIT-III **9**

Economics of peaking power and frequency control. Different types of power plants and their planning. Layout of a hydel power station and its fixtures.

UNIT-IV **9**

Design of powerhouse structures, fore bay, penstocks, spiral casing, draft tube and superstructure, foundations of a powerhouse.

Books & References:

1. Irrigation Engineering & Hydraulic Structures-S. R. Sahasrabudhe (Katson Book, Delhi)
2. Irrigation Engineering &Hydraulic Structures- S. K. Garg (Khanna Publishers, Delhi)
3. Water Resources Engineering-S.R. Sahasrabudhe (Katson Books)

MCE-103	HILL TRANSPORTATION	5 Credits (3-1-2)

Course category : Engineering Fundamental (EF)

Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives:

1. To understand the concept of hill roads, various components of hill roads.
2. To study the various materials required for pavement construction including their characterization.
3. To analyse the different types of pavements and subsequently their design.
4. To study the various methods of construction of different methods of pavements.
5. To study the functional and structural evaluation of existing pavements and method to distressed pavements.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Types of pavements and their components.
2. Materials used for highway construction.
3. Various methods of design of flexible and rigid pavement including IRC method.
4. Construction and maintenance of different types of pavements.
5. Different types of curves provided in hilly roads.
6. Different types of traffic control system.

UNIT-I **9**

Introduction: Special aspects of hill roads, preliminary investigations, Classification of hill roads, Environmental considerations and their impacts.

UNIT-II **9**

Alignment of Hill Roads: Basic considerations, Survey and requirements of alignments, Gradient and selection of alignments, Future traffic considerations, Cross-drainage.

Geometric Design of Hills Roads: Types of hill zones and terrain, Geometric Elements, Width offormation and land, Right of way, Speed limit requirement, Camber, Gradients, Sight distances, Horizontal curves Super- elevation curves, Super-elevations, Transition curves, Pavement widening curves, Hair-pin-bends, Over-taking crossing places, Vertical curves, Minimum vertical clearance.

UNIT-III **9**

Rock Blasting and Cutting Techniques: Rock cutting and blasting, Mechanism of blasting, Explosives for rock blasting and techniques for blasting, Drilling pattern.

Retaining Walls: Types of retaining walls, Stability of slopes, Back pressure on retaining walls, Design of retaining walls.

UNIT-IV **9**

Drainage in Hill Roads: Drainage of water form hill slope, Road side drains, Cross drainage, sub-surface drainage.

Maintenance Problems of Hill Roads: Common problems and their causes, Landslide Problems, Types of Landslides, Measures to prevent landslides, Breast walls.

Safety Requirements and Labour Laws: Importance of safety and Labour laws on hill roads, type of accidents, accidents during hill cutting and blasting. Accidents with machines, various safety measures, Remedial measures, Labour regulation laws.

LABORATORY WORK

1. Crushing Value Test of Aggregate
2. Impact Value Test of Aggregate
3. Los Angeles Abrasion Value of Aggregate
4. Shape Test (Flakiness Index, Elongation Index)of Aggregate
5. Penetration Test of Bituminous Sample
6. Softening Point Test of Bituminous Sample
7. Stripping Test of Bituminous Sample
8. Ductility Test of Bituminous Sample
9. Flash & Fire Point Test of Bituminous Sample
10. Classified both directional Traffic Volume Study
11. Traffic Speed Study (Using Radar Speedometer or Enoscope)
12. Marshall test

Books & References:

1. Highway Engineering-S.P. Bindra (Dhanpat Rai Publication,New Delhi)
2. TransportationEngineering(Vol.1)-V.N.Vazirani&S.P.Chandola(KhannaPublications,New Delhi)
3. HighwayEngineering-L.R. Kadiyali&Dr. N.B.Lal(KhannaPublications,New Delhi)

MCE-104	LAND RESOURCES DEVELOPMENT	4 Credits (3-1-0)

Coursecategory : Engineering Fundamental(EF)

Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 0

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives :

1. Students will develop an understanding of land resources and factors impacting on their management, including principles of sustainable land use, the processes of land degradation (physical, chemical and biological), control of land degradation and practical development of land management plans.
2. A feature of this course is the examination of environmental, economic and social consequences of the use of land for agriculture and other purposes.

CourseOutcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. This course helps to know about the fixing land and soil degradation that has been happening.
2. Students will understand how the environment influences plant growth and crop yields, and ways to modify the environment to improve plant growth and yields.
3. Students will understand how to propagate, plant, and sustainably grow, manage and harvest fruit, vegetable, grain and/or forage crops within various environmental, marketing and financial conditions.
4. Students will be able to identify soil types and how they are formed and ways to modify soil structure and drainage to reduce erosion and improve water quality and water availability to plants.

5. Students will understand how soil fertility is determined and how plant nutrient deficiencies are identified, and means of improving soil fertility and adding nutrients for plant growth.
6. Students will be able to recognize how soil type and topography affects recommended agricultural, commercial and residential use and water quality at varying locations.
7. Students will understand how to identify and sustainably manage plant diseases in various production systems.
8. Students will understand how to identify and sustainably manage insects in various plant production systems.

UNIT-I **9**

Land capability classification, climate index for agricultural potential at high altitudes. A study of crops in the hills, crop-rotation, crop water and soil water relationship.

UNIT-II **9**

Crop yield/wateruse production, functions, Agriculture systems, Jhum cultivation, Problems of agricultural plant resources, Terrace cultivation Economic, social and industrial aspects of the area and systems approach to optimum development of the potential.

UNIT-III **9**

Hill irrigation, contour channels and diversion works, side channel spillways, lift channels. Techniques of accurate water placement trickle and sprinkler irrigation. Drainage to prevent washing away offields crop cover effect.

UNIT-IV **9**

Drainage to prevent erosion by rains splash, Mathematical treatment of over land flow on surface and in drains.

Books & References:

1. Irrigation & Water Power Engineering- Dr. B.C. Punamia & Dr. Pande B. B.Lal(Lakshmi Publishers,Delhi)
2. Irrigation&WaterPowerEngineering-B.C.Punamia,AshokKrJain,ArunKrJain(LakshmiPublisher, Delhi)

MCE-105	HILL HABITAT,WATER SUPPLY AND SANITATION	5 Credits (3-1-2)

Course category : Engineering Fundamental(EF)

Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 2

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives : To make students aware of hill habitat and make an understanding to develop water supply and sanitation systems which are best suited under hilly habitat.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Student should be able to make technology choice to deal with water quality issues, operate and maintain working treatment systems and do troubleshooting of the problems in these systems.
2. The student will be able to apply the knowledge gained from the subject in EIA studies for water component and water pollution control strategies.

UNIT-I **9**

Hill Habitats: Planning aspects, Site-selection, Orientation and General building requirements in relation to hilly settlements. Utilization of locally available materials like stones, timber, bamboo and mud etc., Precast and energy efficient construction technologies suitable for hilly settlements.

UNIT-II **9**

Water Supply: Sources of water supply, Water quality and impurities, Estimation of Water

demand, collection and distribution techniques.

UNIT-III **9**

Water Conservation: Dual Water Supply systems, Concept of Domestic and Potable Water, Contour Bunds, Rain water harvesting and ground water recharge techniques.

UNIT-IV **9**

Sanitation: Principles of sanitation and vector control, Community sanitation. Refuse collection and disposal techniques, Low cost toilets.

EXPERIMENTS

1. To estimate the hardness of the given water sample.
2. To estimate the pH and turbidity of the given water sample.
3. To estimate the acidity of the given water sample.
4. To estimate the alkalinity of the given water sample.
5. To estimate the chloride concentration of the given water sample.
6. To estimate the total solids and total dissolved solids of the given water sample.
7. To estimate the MPN count of total coli-forms in the given water sample.
8. To determine the BOD of given water sample.
9. To determine the COD of given water sample.

MCE-151	ENVIRONMENTAL QUALITY MANAGEMENT	4 Credits (3-1-0)

Coursecategory : Engineering Fundamental(EF)

Contacthours/week : Lecture: 3 , Tutorial: 1 , Practical: 0

NumberofCredits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives :

1. Students will develop an understanding of natural resources and factors impacting on their management, including principles of sustainable use, the processes of environmental degradation (physical, chemical and biological), control of land degradation and practical development of quality management plans.
2. A feature of this course is the examination of environmental, economic and social consequences of the use of land for agriculture and other purposes.

Course Outcomes **:** The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Provide definitions of environment, management, systems and organisations in relation to environmental management.
2. Describe organisations as systems and their role in environmental management.
3. The students can understand the usefulness of systems thinking in relation to environmental management in organisations.
4. Explain how environmental management can be used as environmental protection and how organisations can define and manage risk.

UNIT-I **9**

Introduction, Development Needs, Environmental Impact Assessment (EIA), Environmental Statement (ES)

UNIT-II **9**

Environmental Management Plan (EMP), Environmental Audit (EA), ISO-14000, Rules and Regulation for getting Consent to establish and Operate Industry

UNIT-III **9**

General Provisions and salient features of Water Act, Cess Act, Air Act, EPA Act, Hazardous Waste Act/Rules, Biomedical Waste Act/Rules, Noise Rules

UNIT-IV **9**

Municipal Solid Waste Rules, Ozone Depleting Substances Rules, Various International Treaties Related to Environmental issues

MCE-152	EARTH AND ENVIRONMENT	4 Credits (3-1-0)

Course category : Engineering Fundamental (EF)

Contact hours/week : Lecture: 3, Tutorial: 1 , Practical: 0

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives :

1. Explain the dynamic behavior of the Earth as a complex system.
2. Discuss issues related to human population growth and its impact on the natural world.
3. Discuss evidence of global climate change and impacts of anthropogenic warming.
4. Describe appropriate locations for waste disposal.
5. Explain the causes of soil, air and water pollution.
6. Explain the factors that go into determining our resource footprint.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Describe the scientific method as applied in the earth sciences.
2. Describe common earth materials and their relationship to natural hazards.
3. Explain how earth and solar system processes create hazards to life and property.
4. Describe and explain the most common methods used to mitigate and prepare for each type of hazardous natural process.
5. Explain the causes and effects of global climate change.

UNIT-I **9**

Introduction, Biosphere and Environment, Importance of Clean Environment, Assimilation Capacity of Environment, Conservation of Environment

UNIT-II **9**

Impact of Development on Environment, Thermal Pollution, Radioactivate and non-radioactive pollution, Soil and Land Pollution.

UNIT-III **9**

Impact of Mining and Deforestation, Green House Effect and Global Warming, Depletion of Ozone

UNIT-IV **9**

Biodiversity, Sustainable Development, e-Waste, Plastic Waste

Books & References:

1. Chemistry of Environmental Engineering - C. N. Sawer, P. L. McCarty and G. F. Perkai (Tata McGraw Hill)
2. Environmental Chemistry- A. K. De (New Age International Pvt. Ltd., New Delhi)
3. Prospective in Environmental Studies-A. Kaushik & C. P. Kaushik (New Age International Pvt. Ltd.)

MCE-153	PRINCIPLESOFREMOTESENSING	4 Credits (3-1-0)

Course category : Engineering Fundamental (EF)

Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 0

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives : To learn the principles of remote sensing phenomenon including image acquisition, analysis and processing to extract information.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Understand the sources of electromagnetic radiation and their characteristics and their active and passive utilization for remote sensing.
2. Understand the interaction of electromagnetic radiation with atmosphere and earth surface objects..
3. Be familiar with different types of sensors and remote sensing space missions that are used to detect and record certain parts of the electromagnetic spectrum
4. Understand simple image enhancement, filtering operations over digital images and other restoration techniques.
5. Develop a knowledge and understanding of spectral classification of images for feature extraction.
6. Develop an understanding of Image transformations such as NDVI and principal component analysis.

UNIT-I **9**

Remote sensing- Introduction, Sources of energy for remote sensing-active and passive sources, electromagnetic radiation and their characteristics, thermal emission

UNIT-II **9**

Interaction of EMR with atmosphere-atmospheric windows, interaction of EMR with earth surface-spectral reflection curves. Multi concept of remote sensing, idealisms and real sequence of remote sensing, sensors and orbital characteristics

UNIT-III **9**

Various sensing platformsforremotesensing,principle ofRemotesensingdevices (RBV,MSS,LISS),IRSand othersensingsystemssuchasLandsat,andSpot,Remotesensingdataproductsandtheiruses.

UNIT-IV **9**

DigitalImageProcessing-Introduction,digitalimagerepresentationandcharacterization,histogramsandscatter plot, image enhancement-contrast stretching, pattern recognition and featureextraction.
Imageclassification-unsupervisedandsupervisedtechniques,classificationaccuracyassessment,NDVI, Principle componentanalysis.

Books & References:

1. Remote Sensing & Geographic Information System-M.Anji Reddy (BSPublication)
2. Remote Sensing &GIS - B. Bhatta (OxfordUniversity Press)
3. Remote Sensing & Geographic Int. System –KalicharanSahu (Atlantic Publishers)

MCE-154	APPLIED GEOLOGY	4 Credits (3-1-0)

Coursecategory : Engineering Fundamental(EF)

Contacthours/week : Lecture: 3 , Tutorial: 1 , Practical: 0

NumberofCredits : 4

CourseAssessment :Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives :

1. This course is about deciphering the earth's history from the pages of the earth's past written in the sedimentary rocks.
2. This course is about the sediments, sedimentary rocks and the processes operating in their formation to arm the students with the knowledge of ancient events and environments on the ever evolving face of earth.

CourseOutcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. The students will have depended knowledge in issues related to the processes of rock formation and differentiation in specific environments.
2. The students know the influence of these processes on the formation of the Earth, and the formation of mineral, fluid and gaseous resources.
3. The students can analyze the results of analyses with regard to prospecting for resources, geomaterial and mineral resources application in science and industry.
4. The students can achieve the expected goals in a most simple and most effective way, using a wide range of geological research works.

UNIT-I **9**

Type of mountains, The Himalayas, classification of Himalayan range, Origin of Himalayas, structure of Himalayas, otter mountain ranges of India, Tunneling in geologically weak and structurally disturbed media, Methods of tunnel excavation in rock, over break tunnel hazards,

UNIT-II **9**

Geologicalconsiderationsinstabilityandsafetyofspillways,damsandpowerhousesandremedialmeas ures, Problems posed by adverse geological features in alignment of hill channels and their remedial measures, Geological aspects of highway planning, Foundations of bridge piers on rocks, Stability of hill slopes and cuttings,landslidesandsubsidence,types,causes,significationofgeologicalfactorsandcontroloflandsl ides. **UNIT-III** **9**

Earthquakes, geological considerations for seismic design of structures, seismic zones of India, elements of earthquake forecasting, Blasting, drilling and quarrying

UNIT-IV **9**

Classification of rocks, engineering properties and behavior of rocks, laboratory tests, in situ measurement techniquesandinstrumentationforstressandstrain, creepdeformation,fractureofrocks. Shearstrengthofrocks,
rocksboltsanddowels,applicationofprinciplesofrockmechanicstotunnel,apexingdrafttubepenstockcavi ties.

MCE-156	ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT	4 Credits (3-1-0)

- **course category** : Engineering Fundamental (EF)
- **Contact hours/week** : Lecture: 3 , Tutorial: 1 , Practical: 0
- **Number of Credits** : 4
- **Course Assessment** : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.
- **Course Objectives**:

1. Appreciate the purpose and role of EIA in the decision-making process.
2. Understand strengths & limitations of environmental management procedures.

3. Understand screening & scoping processes.
4. Interpret options for evaluating environmental and social impacts.
5. Know formats of EIA Report (Environmental Impact Statement, or Environmental Statement).
6. Understand the purpose of developing follow-up procedures, and options for designing these procedures.

• **Course Outcomes** The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Explain the concepts about the Environmental Impact Assessment (EIA).
2. Express environment law, aim and concept.
3. Explain the necessity of EIA.
4. Evaluate the subjects which must be considered in EIA projects.
5. Know important plant or animal groups.
6. Identify these species or have these species identified.

UNIT-I 9

Environmental Impact Assessment, Historical Background Global Environmental Policy Need for EIA.

UNIT-II 9

Definition, Aims and Methodology of EIA, Role of EIA as a Planning Tool

UNIT-III 9

Environmental Impacts of developmental projects- Recent Case Studies

Management and Audit Traditional Approach vs. the ISO 14000 Environmental Management Systems Approach,

UNIT-IV 9

Management through Environmental Legislations Management through Awareness, Environmental Education and Incentives Environmental Audit-Definition and role of EA, Methodology of EA Current Stratus of EA.

Books & References:

1. Environmental Impact Assessment- Training ResourceManual,UNEP
2. EIA Notification - MOEP, Govt.ofIndia
3. EnvironmentalScienceandEcologicalStudies-S.K.Garg,RajeshwariGargand RanginiGarg

MCE-157	SYSTEMANALYSISANDMANAGEMENT	4 Credits (3-1-0)

Course category : Engineering Fundamental (EF)

Contact hours/week : Lecture:3 , Tutorial: 1 , Practical: 0

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives :

1. This course is designed to instruct the student in the essential concepts of Project Management as it applies to information management systems for environmental management.
2. This course includes a comprehensive introduction to the different Project Management Knowledge areas and their

relationship to the Project Management Process Groups.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Complete projects that require the integration of project management principles through team work, meeting scheduled milestones, utilization of presentation, writing and communications skills.
2. Analyze real project cases; develop complete project documents i.e. plans, reports, financials etc.
3. Summarize and evaluate project and people performance while exploiting project management concepts.
4. Develop hands-on experience with basic word processing; spread sheet and power point tools in addition to Microsoft Project.

UNIT-I **9**

Introduction to Computer languages, Linear, Quadratic, Geometric, Direct and Non-Linear Programming.

UNIT-II **9**

Concept of Optimization, Application of Optimization techniques.

UNIT-III **9**

Theory of random variables, Modeling and Simulation.

UNIT-IV **9**

Design and Management of information systems applicable in Environmental management.

MCE-158	SOLID WASTE MANAGEMENT	4 Credits (3-1-0)

Course category : Engineering Fundamental(EF)

Contact hours/week : Lecture: 3 , Tutorial: 1 , Practical: 0

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives :

1. To characterize the waste and apply the knowledge of laws for municipal solid waste management, for handling of biomedical wastes and for handling of plastic wastes.
2. To apply the knowledge of mathematics, science, and engineering for effective solid waste collection systems, for waste collection route optimization and for processing of solid waste.
3. To design composting systems, maintain and operate the aerobic and anaerobic composting process for effective organic waste recycling.
4. To manage construction and operations of landfill facilities, energy recovery systems and management of leachate systems.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Evaluate the subject from the technical, legal and economical points by learning of all terms related to general solid waste management.
2. Explain the hierarchical structure in solid waste management and a requirement for an integrated solution.
3. Examine the technical points that are required to set up a solid waste management system.
4. Apply the legal legislation related to solid waste management.
5. Make an economical analysis of the solid waste management system.
6. Set up a municipal solid waste management system.
7. Make physical and chemical analysis of municipal solid wastes and apply them for a management system that will be set up.

UNIT-I **9**

Introduction, Overview of Solid Waste Management, Types of Solid wastes, sources of Solid wastes, Properties of Solid wastes.

UNIT-II **9**

Solid waste Generation, On-site handling, Storage, Collection, Transfer and Transport, processing techniques.

UNIT-III **9**

Ultimate Disposal, Resources and Energy Recovery Systems, Biomedical Waste Management.

UNITIV **9**

Introduction to Hazardous Waste and Fly Ash Management, Site Selection Criteria for Landfill.

MCE-159	GROUNDWATERMANAGEMENT	4 Credits (3-1-0)

Course category : Engineering Fundamental(EF)

Contact hours/week : Lecture: 3 , Tutorial: 1 , Practical: 0

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives :

1. This course will provide an insight into the field of groundwater hydrology.
2. The students will equip themselves with the knowledge of interpretation of groundwater data, conducting the surface and subsurface investigations for the groundwater using the latest methods and tools.
3. The students will be able to learn basic fundamentals of groundwater flow, storage and yield. They will also learn various methods of well development.
4. The concepts of groundwater basin management, conjunctive use, competing demands, recharge and mining will add in equipping students to take better decisions in groundwater management.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. To learn basic fundamentals of groundwater flow.
2. To learn the hydraulics of different kinds of wells.
3. Conjunctive use of ground water along with other fresh water sources.

UNIT-I **9**

Introduction, Occurrence of ground water, Hydrological Cycle, Ground water movement.

UNIT-II **9**

Well Hydraulics and Water Wells, Ground Water Modeling Techniques.

UNIT-III **9**

Surface and Subsurface Investigations of Ground Water.

UNIT-IV **9**

Artificial discharge and Recharge of Ground Water, Ground Water Management Techniques.

Books & References:

1. GroundWaterAssessmentDevelopment&Management-K.R.Karanth(TataMcGrawHill)
2. Water Resources Systems Planning & Management -M. C. Chaturvedi (TataMcGrawHill)

MCE-162	NON-CONVENTIONAL SOURCES OF ENERGY	4 Credits (3-1-0)

Course category : Engineering Fundamental (EF)

Contact hours/week : Lecture:3 , Tutorial: 1 , Practical: 0

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives :

1. The energy has become an important and one of the basic infrastructures for the economic development of the country. it is imperative for the sustained growth of the economy.
2. This course envisages the new and renewable source of energy, available in nature and to expose the students on sources of energy crisis and the alternates available, also stress up on the application of non-conventional energy technologies.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Demonstrate the generation of electricity from various Non-Conventional sources of energy, have a working knowledge on types of fuel cells.
2. Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation.
3. Explore the concepts involved in wind energy conversion system by studying its components, types and performance.
4. Illustrate ocean energy and explain the operational methods of their utilization.
5. Acquire the knowledge on Geothermal energy.

UNIT-I **9**

Definition of micro, mini and small hydrous, Role of micro-mini and small hydrous in power development, their advantages and disadvantages, Problems in operation and maintenance, Planning new micro-mini and small hydrous especially in hilly tracts, Diversion works, conveyance channels appurtenant structures

UNIT-II **9**

Layout of conveyance channels, Layout of power plant, design of various structures of the power plant panchakkis, Standard tubular turbines, bulb turbines and other type soft Turbines, their selection and layout. Power form existing irrigation works, methods of combining several falls. Power form wind, geysers, biogas and other renewable sources.

UNIT-III **9**

Design of Biogas plants and windmills and their comparison with hydel power, Concept of partial benefit from diversion tunnels, Development of power from partial heads by mobile runners, Interim benefits as making available power during construction period.

UNIT-IV **9**

Lifting water by pumps coupled to turbines and by windmills and hydr.am schemes

Books & References:

1. Alternative Energy Sources-T.Negat Veziroglu(TMH)
2. Non-Conventional Sources of Energy - G. D. Roy (Khanna Publisher, New Delhi)

MCE-163	EARTHQUAKERESISTANTDESIGNOFBUILDINGS	4 Credits (3-1-0)

Course category : Engineering Fundamental(EF)

Contact hours/week : Lecture:3, Tutorial: 1 , Practical: 0

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives : This course integrates information from various engineering and scientific disciplines in order to provide a rational basis for the design of earthquake-resistant structures.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Describe seismicity of the world and the role of plate tectonics.
2. Accurately interpret response spectra presented in the different formats including the Acceleration-Displacement Response Spectrum (ADRS) diagram for quantifying potential seismic hazards on infrastructure.
3. Accurately interpret performance limit states.
4. Predict damage to un-reinforced masonry buildings and identify the vulnerable features
5. Assess existing building structures and provide plans for their effective retrofitting.
6. Assess seismic performance of vulnerable buildings and components in regions of low and moderate seismicity taking into account the effects of soil resonance and identify effective means of retrofitting.
7. Assess seismic performance of non-structural components and building contents and identify effective measures to mitigate potential damage.

UNIT-I **9**

Introduction-Origin of Earthquakes, magnitude, intensity, ground motions, sensors, Strong motion characteristics

UNIT-II **9**

Concepts of Earthquake Resistant Design of Reinforced Concrete Buildings – Earthquake and vibration effects on structure, identification of seismic damages in R.C. buildings, Effect of structural irregularities on the performance of R.C. buildings during earthquakes and seismo resistant building architecture

UNIT-III **9**

S.D.O.F. Systems-Equation of motion, free and forced vibrations, damping, Response spectrum. M.D.O.F. Systems-

UNIT-IV **9**

Two degree and multi-degree freedom systems, Seismic Analysis and Modeling of R.C. Buildings-Codal procedure for determination of design lateral loads, in-fill walls, seismic analysis of R.C. building as per IS: 1893(Part1).EarthquakeResistantDesignofBuildings-Ductilityconsiderations,E.R.D.ofR.C.building,Design of load bearing buildings, Design of shear wall.

MCE-164	GEO-TECHNIQUE OF HILL AREA	4 Credits (3-1-0)

Course category : Engineering Fundamental(EF)

Contacthours/week : Lecture: 3 , Tutorial: 1 , Practical: 0

NumberofCredits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives :

1. To impart knowledge on the various factors governing the Engineering behaviour of soils and the suitability of soils for various Geotechnical Engineering applications.
2. To characterize stress-strain behaviour of soils, the failure criteria and to evaluate the shear strength and compressibility parameters of soils.
3. To acquire knowledge for computing stress and settlement at any point in the semi-infinite elastic soil medium, anisotropic medium and evaluation of stability of foundations, slopes, cuts and retaining structures both for the conditions of undrained and drained loading through theorems of plastic collapses.

CourseOutcomes **:** The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. The course will provide an understanding of the conceptual and dynamic aspects of landform development.
2. Students will also learn the relevance of applied aspects of Geomorphology in various fields.
3. Students should be able to understand the mean global atmospheric circulations and disturbances, world climate

systems, climatic variability and change.

4. Students will become sensitized to concept and classification of resources, use or misuse and will learn conservation methods and techniques.

UNIT-I **9**

RetainingWalls: Type, Proportioning, Application of Lateral Earth Pressure Theories to Design, Stability Checks,OtherTypesofPossibleFailures,Drainage,BreastWall,ReinforcedEarthStructures.

UNIT-II **9**

SlopeMovement: Types and Processes, Recognition and Identification. Field Investigation, Methods of Stability Analysis Design and Construction of Soil Slopes, Engineering of Rock Slopes.

Foundation: Capacity of Foundation on Slopes, Bearing Capacity of Foundations on Difficult Grounds e.g. Sanitary Landfills, Collapsing Soil etc.

Grouting and Underpinning: Types of Grouting Suspension Grouts, Solution Grouts, Grouting Equipment and Methods, Grouting Design and Layouts for Seepage Control, Underpinning.

UNIT-III **9**

Geo-synthetics: Types, Testing, Design and Application in Hilly region.

Frozen Ground: Introduction, Physical and Thermal Properties, Thaw Behavior, Mechanical Properties of Frozen Soil, Foundations in Frozen Soils, Field investigations.

Blasting Techniques: Purpose, Drilling Patterns, Type of Explosives, Safety measures.

UNIT-IV **9**

Rockmechanics:Introduction,Classification&IndexPropertiesofRocks,RockStrengthandFailureCriteria, Initial Stresses in Rocks and Their Measurement Plane of weakness and Deformability, Application in Underground Openings and FoundationEngineering.

MCE-166	WATER POLLUTION	4 Credits (3-1-0)

Course category : Engineering Fundamental(EF)

Contact hours/week : Lecture:3 , Tutorial: 1 , Practical: 0

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives : This course is designed to explain the concepts behind the interrelations between environment and the development. It also includes the hazards and safety related issues.

CourseOutcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Describe the chemical compositions of natural waters, and explain how and why these compositions vary.
2. Describe the main sources of water pollution, the main types of pollutant and how. each type may be controlled.
3. Outline the extent of water pollution and in selected global locations.
4. Identify the criteria for drinking water acceptability and outline the processes used to treat water for a public water supply.
5. Outline how sewage may be treated before discharge to the environment.

UNIT-I **9**

Definition of pollution, Effluent Standards, Development of Water Quality Standards, Water Quality Index, River Water Classification.

UNIT-II **9**

Classification and impacts of Pollution Variables, Stream Surveys, Pollution zones and classification.

UNIT-III **9**

Physical, Chemical and Biological Water Purification Processes in Natural Systems, BOD Kinetics assimilation and DO sag, Impoundments and their effects, Pollution control strategies including legislative approach.

UNIT-IV9

Surface Water Modeling.

MCE-167	GEOGRAPHICINFORMATIONSYSTEMS	4 Credits (3-1-0)

Course category : Engineering Fundamental(EF)

Contact hours/week : Lecture: 3 , Tutorial: 1 , Practical: 0

Number of Credits : 4

Course Assessment : Continuous Assessment through Tutorials, Assignments, Quizzes and Three Minor Tests and One Major Theory Examination.

Course Objectives **:** To learn the concepts and techniques of geographic information systems to include data formats, acquisition, processing and analysis for a set of applications using spatial modelling.

Course Outcomes **:** The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Define what GIS is and know different types of spatial and non-spatial data.
2. Know what the questions that GIS can answer are.
3. Differentiate between Raster and Vector Models.
4. Create maps and overlay features/raster data for basic analyses.
5. Understand the concepts of spatial modeling for problem solving using Classification, Aggregation, overlay, buffers, inter-visibility and Network Analysis.
6. Understand the applications of GIS in the in planning of utility lines, Water resources, Erosion modeling, and Environmental Impact Assessment.

UNIT--I **9**

Geographic Information System(GIS)-Introduction,Geographicalconceptsandterminology,Componentsof GIS.

UNITII **9**

Data acquisition, Raster and vector formats, Inter-conversion between raster and vector formats, Scanners and digitizers, Methods of digitization, Data pre-processing, form conversion, Data reduction and generalization.

UNIT-III **9**

Attributedatabase: scale and sources of inaccuracy Database structures. Conventional database management systems, Spatial database management.

UNIT-IV **9**

Datamerging, Edge matching, registration and re-sampling, Data manipulation and analysis, Representation of real world problems, Problem solving and spatial modeling. Classification, Aggregation, overlay, buffers, and inter-visibility, Network Analysis, Application of GIS in planning of utility lines, Water resources, Erosion modeling, Environmental Impact Assessment.

Books & References:

1. Remote Sensing & Geographic Information System - M. Anji Reddy (BS Publication)
2. Remote Sensing & GIS - B. Bhatta (Oxford University Press)
3. Remote Sensing & Geographic Int. System - KalicharanSahu (Atlantic Publishers)

MCE-168	WATERRETAININGSTRUCTURES	4 Credits (3-1-0)

Course category : Engineering Fundamental(EF)

Contact hours/week : Lecture: 3 , Tutorial: 1 , Practical: 0

Number of Credits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination methods.

Course Objectives :

1. To increase the understanding of dams and water retaining structures and the influence of geotechnics and civil engineering materials on their design.
2. To develop an appreciation of material performance in respect of design and compliance testing.
3. To develop an appreciation and understanding of the constituent and environmental factors influencing deterioration of construction materials.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Apply the concepts of structure design to special structural elements like curved beams, domes, water retaining structures, along with relevant IS code requirements.
2. Design and draw working structural drawings of staircase,foundation,domes and water retaining structures.

UNIT-I **9**

Project planning, Site Investigations, Choice of type of dams, Cost benefit studies

UNIT-II **9**

Non-overflow dams: Gravity, Arch and Buttress, Rock-fill and Earthen Dams, their Design. Different types of Spillways and Energy Dissipations, their design

UNIT-III **9**

Preparation and Protection for dams, Model analysis of hydraulic structures, Instrumentation in Dams, Temperature control in Concrete Dams

UNIT-IV **9**

Water Harvesting: Types of storage Structures, Water Yield from Catchments, Runoff diversion; Pondsand Reservoirs; Earth Embankments

MCE-169	DISASTERMANAGEMENT	4 Credits (3-1-0)

Coursecategory : Engineering Fundamental(EF)

Contacthours/week : Lecture:3 , Tutorial: 1 , Practical: 0

NumberofCredits : 4

Course Assessment : Continuous assessment through tutorials, attendance, home assignments, quizzes and

One Minor tests and One Major Theory Examination methods.

Course Objectives :

1. To provide basic conceptual understanding of disasters and its relationships with development.
2. To gain understand approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction.

CourseOutcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of disasters during the next iteration of the cycle.
2. The complete disaster management cycle includes the shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure.
3. Capacity to obtain, analyze, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.

UNIT-I **9**

Type of disasters, Accent on land slides, earthquakes flashflood, avalanches, snow blizzards. Causes, consequences and mitigation techniques, Flash floods their management and relief, Contingency planning for dam failures.

UNIT-II **9**

Characteristics of glaciers and protection of important monuments from glacial flow.

UNIT-III **9**

Landslides, their classification, causes, & preventive measures. Concept, growth presents trends status in India and concept of contingency planning and systems approach of disaster management. Sociology of disasters, Human and media response and role.

UNIT-IV **9**

Disaster prevention techniques, Disaster legislation, Disaster prone area building codes, Vulnerability analysis, Health and sanitation aspects, Relief administration in India and role of engineers in disaster mitigation.