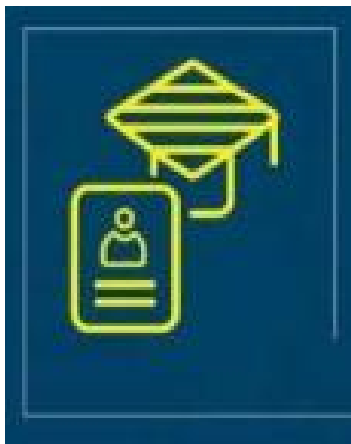




1.3.1



Support Documents

NRI INSTITUTE OF TECHNOLOGY

Pothavarappadu(v), Agiripalli(M), VijayawadaRural-521212

1.3.1 Institution integrates cross-cutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability and other value framework enshrined in Sustainable Development Goals and National Education Policy – 2020 into the Curriculum

2022-23			
Program me	Course Code	Title of the Course	Category
B.Tech	20A3100801	Essence Of Indian Knowledge and Traditions	Human Values
B.Tech	20A3101503	Geo-Technical Engineering - I	Environment & Sustainaibility
B.Tech	20A3101592	Geo-Technical Engineering Lab	Environment & Sustainaibility
B.Tech	20A3101523	Environmental Impact Assessment	Environment & Sustainaibility
B.Tech	20A3201602	Water References Engineering	Environment & Sustainaibility
B.Tech	20A3201603	Geotechnical Engineering-2	Environment & Sustainaibility
B.Tech	20A3201622	Environmental Engineering	Environment & Sustainaibility
B.Tech	20A3201623	Disaster Management	Environment & Sustainaibility
B.Tech	20A3100802	Professional Ethics And Human Values	Professional Ethics
B.Tech	20A3200802	Research Methodology & IPR	Human Values
2021-22			
B.Tech	18A4101492	Environmental Engineering Lab	Environment & Sustainaibility
B.Tech	18A4101513	Environmental Impact Assesment	Environment & Sustainaibility
B.Tech	18A4201525	Water Shed Management	Environment & Sustainaibility
B.Tech	18A4100802	IPR & Patents	Human Values
B.Tech	18A4100803	Indian Constitution	Human Values
B.Tech	20A2100801	Constitution Of India	Human Values
B.Tech	20A2201403	Engineering Geology	Environment & Sustainaibility
B.Tech	20A2201402	Environmental Engineering	Environment & Sustainaibility
B.Tech	20A2201491	Environmental Engineering Lab	Environment & Sustainaibility
B.Tech	20A2200801	Essence Of Indian Traditional Knowledge	Human Values
B.Tech	20A2200802	Professional Ethics And Human Values	Professional Ethics
2020-21			
B. Tech	18A3101513	Environmental Pollution and Control	Environment & Sustainaibility
B. Tech	18A3100801	Indian Constitution	Human Values
B. Tech	18A3101403	Water Resource Engineering-I	Environment & Sustainaibility
B. Tech	18A3201403	Environmental Engineering	Environment & Sustainaibility

B. Tech	18A3201513	Air pollution Engineering	Environment & Sustainability
B. Tech	18A3201523	Industrial waste & waste-water Engineering	Environment & Sustainability
B. Tech	18A3201512	Water Resource Engineering-II	Environment & Sustainability
B. Tech	18A3201524	Docks and Harbour Engineering	Environment & Sustainability
B. Tech	18A3201525	Water Resources system Analysis	Environment & Sustainability
B. Tech	18A3200801	Essence of Indian Knowledge and traditions	Human Values
B. Tech	20A1200801	Environmental Sciences	Environment & Sustainability
2019-20			
B. Tech	18A2100801	Professional Ethics And Human Values	Professional Ethics
B. Tech	18A2201403	Engineering Geology	Environment & Sustainability
B. Tech	18A2201492	Engineering Geology Lab	Environment & Sustainability
2018-19			
B. Tech	18A1100801	Environmental Studies	Environment & Sustainability
M.Tech	18D1121522	Solar Energy Technology	Environment & Sustainability


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Pothavarappadu (V), Agiripalli

ACADEMIC YEAR
2022-23

20A3100801 ESSENCE OF INDIAN KNOWLEDGE AND TRADITIONS

Lecture – Tutorial: 2-0 Hours

Internal Marks: 30

Credits: 0

External Marks: 70

Prerequisites: NONE

Course Objectives:

1. To develop knowledge of fundamental management concepts, skills and tools, to aid in problem solving and decision making.
2. To develop and understanding about the organizational structure and relationship between authority and responsibility in various structures.
3. To discuss the evolution of principles that make it possible to design facilities, processes, and control systems with a degree of predictability as to their performance.
4. To develop comprehensive skills in planning, selecting, motivating, and developing the human references for organizational effectiveness.
5. To understand the broad scope of marketing, societal, ethical and other diverse aspects of marketing.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Understand the concept of Traditional knowledge and its importance

CO2 Know the need and importance of protecting traditional knowledge

CO3 Know the various enactments related to the protection of traditional knowledge

CO4 Understand the concepts of Intellectual property to protect the traditional knowledge

CO5 Develop comprehensive skills in planning, selecting, motivating, and developing the human references for organizational effectiveness.

CO6 Understand the broad scope of marketing, societal, ethical and other diverse aspects of marketing

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2-Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	-	-	-	2		-	-	-	-	-
CO2	2	-	-	-	-	-	-	2		-	-	-	-	-
CO3	2	-	-	-	-	-	-	2		-	-	-	-	-
CO4	2	-	-	-	-	-	-	2		-	-	-	-	-
CO5	2	-	-	-	-	-	-	2		-	-	-	-	-
CO6	2	-	-	-	-	-	-	2		-	-	-	-	-

UNIT I**INTRODUCTION TO TRADITIONAL KNOWLEDGE:**

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge.

UNIT II**PROTECTION OF TRADITIONAL KNOWLEDGE:**

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

LEGAL FRAMEWORK AND TK: A:

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

UNIT III

TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY:

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT IV

TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS:

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs

UNIT-V

Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

TEXT BOOKS:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005.
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN-13:978-8187276333, 2007.
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450-494-X, 2006.

REFERENCE BOOKS:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
2. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino.

E- RESOURCES:

- https://www.youtube.com/watch?v=sSgj_GZOWU8

20A3101503 GEO-TECHNICAL ENGINEERING I

Lecture – 2-1 Hours

Internal Marks: 30

Tutorial:

Credits: 3

External Marks: 70

Prerequisites: NONE**Course Objectives:**

1. To enable the student to find out the index properties of the soil and classify it.
2. To enable the students to differentiate between compaction and consolidation of soils and to determine the consolidation settlement.
3. To enable the student to determine permeability of soils using various methods.
4. To impart the concept of seepage of water through soils and determine the seepage discharge.
5. To impart the concept of effective stress principal.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1 Identify various soils based on their characteristics.

CO2 Characterize and classify soils based on different limits.

CO3 Evaluate permeability and seepage of soils.

CO4 Determine the permeability of soils and stratified soils

CO5 Determine plasticity characteristics of various soils

CO6 Design consolidation process by predicting settlement of soils.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	-	2	-	-	-	-	-	-	-	-	3	
CO2	3	-	-	-	-	-	-	1	-	-	-	-	3	
CO3	3	2	-	-	-	1	-	-	-	-	-	-	2	
CO4	2	2	-	-	-	1	-	-	-	-	-	-	3	
CO5	2	2	-	-	-	1	-	-	-	-	-	-	3	
CO6	2	2	2	-	-	1	-	1	-	-	-	-	3	

UNIT I**TYPES AND CHARACTERISTICS OF SOILS:**

Types of soils - formation and deposition - moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity. Relationship between various soil parameters. Determination of Moisture content, Specific gravity and Unit weight using various methods.

PLASTICITY CHARACTERISTICS OF SOIL:

Consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices. Determination of liquid limit, plastic limit and shrinkage limit. Soil classification based on particle size, texture, unified and Indian standard method.

UNIT II**PERMEABILITY OF SOIL:**

Darcy's law- coefficient of permeability: determination by constant-head and falling-head methods. Permeability of stratified soils - factors affecting - Seepage Analysis- stream and potential functions - flow nets, graphical method to plot flow nets.

UNIT III**EFFECTIVE STRESS PRINCIPLE:**

Introduction, effective stress principle, nature of effective stress, effect of water table. Capillary action, seepage pressure, quick sand condition. Compaction of Soil- theory of compaction- optimum moisture content- maximum dry density.

UNIT IV**STRESSES IN SOILS:**

Stresses in soils due to point load, line load, strip load, uniformly loaded circular, rectangular loaded area. Influence factors, Isobars, Boussinesq's equation, Newmark's Influence

UNIT V**CONSOLIDATION OF SOIL:**

Comparison between compaction and consolidation, initial, primary & secondary consolidation - Terzaghi's theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.

TEXT BOOKS:

1. Soil Mechanics and Foundation Engg., K. R. Arora, Standard Publishers and Distributors, Delhi.
2. Geotechnical Engineering, C. Venkataramiah, New age International Pvt. Ltd, (2002).
3. Geotechnical Engineering, V.N.S.Murthy, BOOK World Enterprises, Mumbai.

REFERENCE BOOKS:

1. Soil Mechanics and Foundation, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi publications Pvt. Ltd., New Delhi
2. Basic and Applied Soil Mechanics, Gopal Ranjan & A. S. R. Rao, New age International Pvt. Ltd, New Delhi.

E-REFERENCES:

- <http://www.btechmaterials.com/download/geotechnical-engineering-gte-material-notes/>
- <http://www.nptelvideos.in/2012/11/soil-mechanics.html>

20A3101592 GEO-TECHNICAL ENGINEERING LAB

Practical	3 Hours	Internal Marks:	30
Credits:	1.5	External Marks:	70

Prerequisites: NONE**Course Objectives:**

- To impart knowledge of determination of index properties (LL,PL&SL).
- To teach how to classify classification of soils.
- To teach how to determine compaction characteristics and consolidation behavior from relevant lab tests.
- Determine permeability of soils.
- To teach how to determine shear parameters of soil through different laboratory tests.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Determine index properties of soil and classify them.
CO2	Determine permeability of soils.
CO3	Determine Compaction characteristics.
CO4	Determine Consolidation characteristics.
CO5	Determine shear strength characteristics.
CO6	Determine field density.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	-	3	-	2	-	2	-	-	-	-	1	2
CO2	3	3	-	3	-	2	-	2	-	-	-	-	1	2
CO3	3	3	-	3	-	2	-	2	-	-	-	-	1	2
CO4	3	3		3		2		2					1	2
CO5	3	3		3		2		2					1	2
CO6	3	3		3		2		2					1	3

List of Experiments

1. To determine Specific gravity of given soil sample.
2. To determine Atterberg's Limits.(LL,PL,&SL).
3. To determine Field density-Core cutter and Sand replacement methods.
4. To classify Grain size analysis by sieving.
5. To classify Grain size analysis by Hydrometer Analysis Test.
6. To determine Permeability of soil - Constant and Variable head tests.
7. To determine water content and dry density by Compaction test.
8. To determine Consolidation test (to be demonstrated).
9. To determine strength parameters by using Direct Shear test.
10. To determine strength parameters by using Triaxial Compression test (UU Test).
11. To determine strength parameters by using Unconfined Compression test.
12. To determine strength parameters by using Vane Shear test.
13. To determine Differential free swell (DFS).
14. To determine CBR Test.

TEXT BOOKS:

1. Soil Mechanics and Foundation Engg., K. R. Arora, Standard Publishers and Distributors, Delhi.
2. Geotechnical Engineering, C. Venkataramiah, New age International Pvt Ltd, (2002).

REFERENCE BOOKS:

1. 'Determination of Soil Properties' by J. E. Bowles.
2. IS Code 2720 – relevant parts.

20A3101523 ENVIRONMENTAL IMPACT ASSESSMENT

Lecture –	2-1 Hours	Internal Marks:	30
Tutorial:		External	70
Credits:	3	Marks:	

PREREQUISITES: ENVIRONMENTAL ENGINEERING, AIR POLLUTION AND CONTROL, SOLID AND HAZARDOUS WASTE MANAGEMENT

Course Objectives:

- To impart knowledge on different concepts of Environmental Impact Assessment.
- To know procedures of risk assessment.
- To learn the EIA methodologies and the criterion for selection of EIA methods.
- To know the procedures for environmental clearances and audit.
- To gain the knowledge of different environmental regulations of Government of India.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- CO1 Explain the role of stakeholder and public hearing in the preparation of EIA
- CO2 Proficient in basics of EIA
- CO3 Proficient in environmental related laws
- CO4 Proficient in components and methods for prediction and assessment of impacts of air, water, etc.
- CO5 Proficient in documentation and monitoring
- CO6 Proficient in preparing EIA report for Projects like Irrigation and power generation

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	1	2	-	2	3	3					2	
CO2	3	-	1	2	-	2	3	3					2	
CO3		-	-	-	-	-	3	3					2	
CO4	2	-	1	-	-	2	3	3					2	3
CO5	2	-	-	-	-	-	3	3					2	3
CO6							3	3					2	3

UNIT I

INTRODUCTION:

Environmental Impact Assessment (EIA) – Objectives of EIA report – Contents of EIA – Environmental Impact Statement (EIS) – Environmental Risk Assessment (ERA) – Legal and regulatory aspects in India – Types and Limitations of EIA – Issues in EIA – National – Cross sectoral – social and cultural.

UNIT II

COMPONENTS AND METHODS:

Components – Scoping – Screening. Identifying and evaluating alternatives. Mitigating measures dealing with uncertainty. Issuing environmental statement matrices – networks – checklists; Importance assessment techniques – cost benefit analysis – analysis of alternatives – methods for prediction and assessment of impact – Air – Water – Soil – Noise – Biological – Cultural – Social – Economic Environments, Standards and Guidelines for evaluation. Public participation in Environmental

decision-making.

UNIT III

DOCUMENTATION AND MONITORING:

Document planning – collection and organization of relevant information – use of visual display materials – team writing – remainder checklists. Environmental monitoring – Guidelines – policies – planning of monitoring programs. Environmental management plan. Post project audit. Expert system in EIA.

UNIT IV

CASE STUDIES:

Case studies of EIA of developmental projects. Dams, Sardar Sarovar Irrigation Project, Highway Projects, Power generation and their Impacts.

UNIT V

EIA notification by Ministry of Environment and Forest (Govt. of India):

Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000. Case studies and preparation of Environmental Impact assessment statement for various Industries.

TEXT BOOKS:

- Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
- Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.
- Glasson, John, and Riki Therivel. Introduction to environmental impact assessment. Routledge, 2013.
- Eccleston, Charles H. Environmental impact assessment. John Wiley & Sons, New York, 2000.

REFERENCE BOOKS:

- Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers
- Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.
- Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

E-REFERENCES:

1.

20A3201602 WATER REFERENCES ENGINEERING

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: HYDRAULICS**Course Objectives:**

- Introduce hydrologic cycle and its relevance to Civil engineering.
- Make the students understand physical processes in hydrology and, components of the hydrologic cycle.
- Appreciate concepts and theory of physical processes and interactions.
- Learn measurement and estimation of the components hydrologic cycle.
- Provide an overview and understanding of Unit Hydrograph theory and its analysis.
- Understand flood frequency analysis, design flood, flood routing.
- Appreciate the concepts of groundwater movement and well hydraulics.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1 Develop design storms and carry out frequency analysis.

CO2 Determine storage capacity and life of reservoirs.

CO3 Develop unit hydrograph and synthetic hydrograph.

CO4 Estimate flood magnitude and carry out flood routing.

CO5 Determine aquifer parameters and yield of wells.

CO6 Model hydrologic processes.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	-	-	1	-	1	-	-	-	-	1	2
CO2	2	2	-	-	-	-	-	-	-	-	-	-	1	2
CO3	3	2	2	-	-	1	-	1	-	-	-	-	1	2
CO4	2	2	-	-	-	-	-	-	-	-	-	-	1	2
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	2
CO6	2	1	-	-	-	-	-	-	-	-	-	-	1	2

UNIT I**ENGINEERING HYDROLOGY AND PRECIPITATION:**

Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.

PRECIPITATION:

Types and forms, measurement, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm.

UNIT II**ABSTRACTIONS FROM PRECIPITATION:**

Initial abstractions. Evaporation: factors affecting, measurement, reduction

Evapotranspiration: factors affecting, measurement, control - Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

UNIT III**RUNOFF AND HYDROGRAPH ANALYSIS:**

Catchment characteristics, Factors affecting runoff, components, computation-empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve. Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

UNIT IV**FLOODS:**

Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management.

FLOOD ROUTING:

Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

UNIT V**IRRIGATION:**

Necessity and importance, principal crops and crop seasons, types, methods of application, soil-water-plant relationship, soil moisture constants, consumptive use, estimation of consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of irrigation, irrigation efficiencies, water logging and drainage, standards of quality for irrigation water, crop rotation.

TEXT BOOKS:

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., (2013), New Delhi
2. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain and Arun Kumar Jain, Lakshmi Publications (P) Ltd.

REFERENCE BOOKS:

1. Engineering Hydrology Subramanya, K, Tata McGraw-Hill Education Pvt Ltd (2013), New Delhi.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.

E-REFERENCES:

- <http://www.nptelvideos.in/2012/11/water-REFERENCES-systemsmodeling.html>
- <http://www.nptelvideos.in/2012/11/advanced-hydrology.html>
- <http://freevideolectures.com/Course/100/Water-REFERENCES-Engineering>
- <http://www.btechmaterials.com/download/water-REFERENCES-engineering-materials-notes/>
- <http://www.btechmaterials.com/download/water-REFERENCES-engineering-ii-materials-notes/>

20A3201603 GEOTECHNICAL ENGINEERING-II

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: GEOTECHNICAL ENGINEERING-I**Course Objectives:**

- 1) To impart knowledge on soil exploration.
- 2) To teach slope stability and safety assessment of earth retaining structures.
- 3) To impart knowledge on bearing capacity and settlement of shallow foundations.
- 4) To impart knowledge on bearing capacity and settlement of pile foundations.
- 5) To throw light on well foundation designs.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

- CO1 Understand the methods of soil exploration.
- CO2 Compile soil investigation report
- CO3 Assess stability of slopes and earth retaining structures
- CO4 Determine safe bearing capacity and settlement of shallow foundations.
- CO5 Design pile foundations.
- CO6 Design well foundations.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	2
CO2	2	2	-	-	-	2	-	-	-	-	-	-	1	2
CO3	2	2	-	-	-	-	-	-	-	-	-	-	1	2
CO4	2	2	3	-	-	2	-	1	-	-	-	-	1	2
CO5	2	3	3	-	-	2	-	1	-	-	-	-	1	2
CO6	2	3	3	-	-	2	-	1	-	-	-	-	1	2

UNIT I**SOIL EXPLORATION:**

Methods of soil exploration – Boring and Sampling methods – Penetration Tests – Pressure meter – Observation of ground water-Geophysical Methods-Programme planning and preparation of soil investigation report.

UNIT II**EARTH RETAINING STRUCTURES:**

Infinite and finite earth slopes in sand and clay – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices – Taylor's Stability Number-Stability of slopes of dams and embankments - different conditions. Rankine's & Coulomb's theory of earth pressure – Culmann's graphical method - earth pressures in layered soils.

UNIT III**SHALLOW FOUNDATIONS:**

Types of foundations and influencing factors - Bearing capacity – determination of bearing capacity – factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory – settlements – Design aspects of

shallow foundations-IS Methods.

UNIT IV

PILE FOUNDATIONS:

Types of piles – Load carrying capacity based on static and Dynamic formulae– Pile load tests - pile groups in sands and clays- pile cap design.

UNIT V

WELL FOUNDATIONS:

Types – Different shapes – Components of well foundation – forces acting on well foundations - Design Criteria – Determination of staining thickness and plug - construction and Sinking of wells – Tilt and shift.

TEXT BOOKS:

1. C. Venkataramiah, Geotechnical Engineering, New age International Pvt . Ltd, (2002).
2. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil Mechanics and Foundation by, Laxmi, publications Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. T. N. Ramamurthy, a textbook of geotechnical engineering (soil mechanics), s. Chand and company limited, new delhi.
2. Purushtoma raj, soil mechanics and foundation engineering, pearson publications.

E-REFERENCES:

- <http://www.nptelvideos.in/2012/11/foundation-engineering.html>
- <http://www.btechmaterials.com/download/foundation-engineering-fe-material-notes/>

20A3201622 ENVIRONMENTAL ENGINEERING

Lecture –	2-1 Hours	Internal Marks:	30
Tutorial:		External Marks:	70
Credits:	3		

Prerequisites: ENVIRONMENTAL STUDIES

Course Objectives:

- 1) To teach requirements of water and its treatment.
- 2) To impart knowledge on sewage treatment methodologies.
- 3) To provide facts on Air pollution and control.
- 4) To enable with design concepts of wastewater treatment units
- 5) To throw light on importance of plumbing.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- CO1 Understand about quality of water and purification process
- CO2 Select appropriate technique for treatment of waste water.
- CO3 Assess the impact of air pollution
- CO4 Understand consequences of solid waste and its management.
- CO5 Design domestic plumbing systems.
- CO6 Selection of suitable treatment flow for raw water treatments.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2							1					1	2
CO2	2							1					1	2
CO3	2							1					1	2
CO4	2							1					1	3
CO5	2	2	3					1					1	3
CO6	2							1					1	3

UNIT I

ESTIMATION OF QUALITY AND QUANTITY OF WATER:

Importance and Necessity of Protected Water Supply systems; Routine water analysis - physical, chemical and bacteriological tests; Standards for drinking water; Water borne diseases, Sources of Water: Surface and Ground water, comparison of sources with reference to quality, quantity and other considerations.

UNIT II

FLOW CHART OF PUBLIC WATER SUPPLY SYSTEM:

Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations factors affecting water demand, Design Period Population Forecasting. - Capacity of storage reservoirs, Mass curve analysis.

UNIT III

TREATMENT OF WATER AND DISTRIBUTION:

Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration-Slow sand and rapid sand filters; Construction and Operation; Disinfection methods- chlorination; Removal of hardness.

Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks.

UNIT IV**ESTIMATION OF QUANTITY AND QUALITY OF SEWAGE:**

Estimation of sewage flow and storm water drainage – fluctuations- classification of sewerage systems – types of sewers - Hydraulics of sewers and storm drains– design diameter of sewers – appurtenances in sewerage – Man holes, Street Inlets

UNIT V**TREATMENT OF SEWAGE AND DISPOSAL:**

Primary treatment-Screens-grit chambers-grease traps– floatation– sedimentation – design of preliminary and primary treatment units. Design of septic tank

SECONDARY TREATMENT:

Aerobic and anaerobic treatment process comparison. Suspended growth process: Activated Sludge Process, principles, and operational problems, Activated Sludge Processes.

TEXT BOOKS:

1. Elements of Environmental Engineering – K. N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.
2. Environmental Engineering water supply Engineering- vol. 1 Santosh kumar Garg ,Khanna Publishers 2018 edition
3. Sewage waste disposal and Air pollution Engineering Santosh kumar Garg ,Khanna Publishers 2018 edition

REFERENCE BOOKS:

1. Environmental Engineering, D. Srivivasan, PHI Learning Private Limited, New Delhi, -2011 edition.
2. Wastewater engineering treatment and reuse - Metclff & Eddy MCGraw Hill Education (India) private Limited- 2003 edition

E-REFERENCES:

20A3201623 DISASTER MANAGEMENT

Lecture –	2-1 Hours	Internal Marks:	30
Tutorial:		External	70
Credits:	3	Marks:	

Prerequisites: NONE**Course Objectives:**

- To explain concepts of fluid mechanics used in Civil Engineering.
- To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
- To impart ability to solve engineering problems in fluid mechanics.
- To enable the student's measure quantities of fluid flowing in pipes, tanks and channels.
- To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces.
- To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

- CO1 Understand the principles of fluid statics, kinematics and dynamics
- CO2 Familiarize basic terms used in fluid mechanics
- CO3 Understand flow characteristics and classify the flows
- CO4 Apply the continuity, momentum and energy principles
- CO5 Estimate various losses in flow through channels
- CO6 Understand fundamentals of kinematics and equations Cartesian coordinates.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3					2		1					1	2
CO2	3												1	2
CO3	3												1	2
CO4	3	2		3				2					1	3
CO5	2	2		3				2					1	3
CO6	2	2		2									1	3

UNIT I**INTRODUCTION:**

Hazard, Risk, Vulnerability, Disaster, Meaning, Nature, Importance, Dimensions & Scope of Disaster Management, Disaster Management Cycle.

NATURAL DISASTERS:

Natural Disasters- Meaning and nature of natural disasters, their types and effects, Hydrological Disasters - Flood, Flash flood, Drought, Geological Disasters- Earthquakes, Tsunamis, Landslides, Avalanches, Volcanic eruptions, Mudflow.

UNIT II**TYPES OF NATURAL DISASTERS:**

Wind related- Cyclone, Storm, Storm surge, Tidal waves, Heat and cold Waves, Climatic Change, Global warming, Sea Level rise, Ozone Depletion.

UNIT III**MAN – MADE DISASTERS:**

CBRN – Chemical disasters, biological disasters, radiological disasters, nuclear disasters, Fire – building fire, coal fire, forest fire, Oil fire.

UNIT IV

TYPES OF MAN – MADE DISASTERS:

Accidents- road accidents, rail accidents, air accidents, sea accidents, Pollution - air pollution, water pollution, Deforestation, Industrial waste.

UNIT V

DISASTER DETERMINANTS:

Factors affecting damage – types, social status, habitation pattern, physiology and climate, Factors affecting mitigation measures, prediction, preparation, communication, area and accessibility, population, physiology and climate.

TEXT BOOKS:

- Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012).
- Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
- Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.

REFERENCE BOOKS:

- Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
- Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD.

E-REFERENCES:

PROFESSIONAL ETHICS & HUMAN VALUES

Lecture – Tutorial:	2-0 Hours	Internal Marks:	30
Credits:	0	External Marks:	70

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others
- To create awareness on assessment of safety and risk

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
CO2	Identify the multiple ethical interests at stake in a real-world situation or practice
CO3	Articulate what makes a particular course of action ethically defensible
CO4	Assess their own ethical values and the social context of problems
CO5	Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
CO6	Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1										
CO2	3	1										
CO3	3	1										
CO4	3	1										
CO5	3	1										
CO6	3	1										

UNIT I

Human Values:

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty –Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality.

Learning outcomes:

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. Develop commitment
4. Learn how to live peacefully

UNIT II

Engineering Ethics:

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg's theory-Gilligan's Theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest - Customs and religion –Uses of Ethical theories –Valuing time –Cooperation – Commitment. Learning outcomes:

1. Learn about the ethical responsibilities of the engineers.
2. Create awareness about the customs and religions.
3. Learn time management
4. Learn about the different professional roles.

UNIT III

Engineering as Social Experimentation:

Engineering As Social Experimentation –Framing the problem –Determining the facts – Codes of Ethics –Clarifying Concepts –Application issues –Common Ground - General Principles –Utilitarian thinking respect for persons. Learning outcomes: 1. Demonstrate knowledge to become a social experimenter. 2. Provide depth knowledge on framing of the problem and determining the facts. 3. Provide depth knowledge on codes of ethics. 4. Develop utilitarian thinking

UNIT IV

Engineers Responsibility for Safety and Risk:

Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk- Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR).

Learning outcomes:

1. Create awareness about safety, risk & risk benefit analysis. 2. Engineer's design practices for providing safety.
3. Provide knowledge on intellectual property rights.

UNIT V

Global Issues:

Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics - Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts - Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research.

Learning outcomes:

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

TEXT BOOKS:

- 1) "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and, V.S.Senthil Kumar-PHI Learning Pvt. Ltd-2009
- 2) "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
- 3) "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGraw- Hill-2003.

4) "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.

5) "Professional Ethics and Human Values" by A.Alavudeen, R.KalilRahman and M. Jayakumaran, Laxmi Publications.

6) "Professional Ethics and Human Values" by Prof.D.R.Kiran-"Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication.

MECH B.TECH. III YEAR NRAI20 REGULATIONS SYLLABUS

III B.TECH I SEMESTER

Course Code: 20A3200802

Research Methodology & IPR

Lecture – Practical:	2-0 Hours	Internal Marks:	30
Credits	0	External Marks:	70

Prerequisites: None

Course Objectives

- 1) To understand the objectives and characteristics of a research problem.
- 2) To analyze research related information and to follow research ethics
- 3) To understand the types of intellectual property rights.
- 4) To learn about the scope of patent rights.
- 5) To understand the new developments in IPR.

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1 Judge the characteristics of a research problem

CO2 Justify research related information

CO3 Interpret intellectual property rights

CO4 Utilize scope of patent rights

CO5 Develop New IPR's

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						√	√	√	√			√
CO2						√	√	√	√			√
CO3						√	√	√	√			√
CO4						√	√	√	√			√
CO5						√	√	√	√			√

UNIT I

Research problem: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT II

Literature study: Effective literature studies approaches, analysis Plagiarism, Research ethics, Technical writing: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT III

MECH B.TECH. III YEAR NRA20 REGULATIONS SYLLABUS

Nature of Intellectual Property: Patents, Designs, Trade and Copyright.

Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT IV

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications

UNIT V

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc, Traditional knowledge Case Studies, IPR and IITs.

Text Book:

- 1) Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
- 2) Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- 3) Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"

REFERENCE BOOKS:

- 1) Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd , 2007.
- 2) Mayall, "Industrial Design", McGraw Hill, 1992.
- 3) Niebel, "Product Design", McGraw Hill, 1974.
- 4) Asimov, "Introduction to Design", Prentice Hall, 1962.

ACADEMIC YEAR
2021-22

18A4101492-ENVIRONMENTAL ENGINEERING LAB

Lecture – Tutorial:	3 Hours	Internal Marks:	40
Credits:	1.5	External Marks:	60

Prerequisites:

Environmental Engineering

Course Objectives:

- Estimation some important characteristics of water and wastewater in the laboratory
- It also gives the significance of the characteristics of the water and wastewater–

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Determine some important characteristics of water and wastewater in the laboratory
CO2	Outline some conclusion and decide whether the water is potable or not.
CO3	Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments
CO4	Determine strength of the sewage in terms of BOD and COD

Contribution of Course Outcomes towards achievement of Program

Outcomes (1- Low, 2- Medium, 3 – High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	3	3	-	-	-	3	-	2	3	-	-	3
CO2	3	3	-	-	-	3	-	2	3	-	-	3
CO3	3	3	-	-	-	3	-	2	3	-	-	3
CO4	3	3	-	-	-	3	-	2	3	-	-	3

LIST OF EXPERIMENTS

- Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
- Determination and estimation of Total Hardness–Calcium & Magnesium.
- Determination of Alkalinity/Acidity– Determination of Chlorides in water and soil
- Determination and Estimation of total solids, organic solids and inorganic solids and settleable solids by Imhoff Cone.
- Determination of Iron.
- Determination of Dissolved Oxygen with D.O. Meter & Winklers Method and B.O.D.
- Determination of N, P, K values in solid waste Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
- Determination of C.O.D.
- Determination of Optimum coagulant dose.
- Determination of Chlorine demand
- Presumptive Coliform test.

TEXT BOOKS:

1. Standard Methods for Analysis of Water and Waste Water – APHA Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi

REFERENCE BOOKS:

1. Relevant IS Codes.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.

PROFESSIONAL ELECTIVE-IV

18A4101513-ENVIRONMENTAL IMPACT ASSESSMENT

Lecture – Tutorial: 2-1 Hours

Internal Marks: 40

Credits: 3

External Marks: 60

Prerequisites:

Course Objectives:

1. To impart knowledge on different concepts of Environmental Impact Assessment
2. To teach procedures of risk assessment
3. To teach the EIA methodologies and the criterion for selection of EIA methods
4. To teach the procedures for environmental clearances and audit

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Explain the role of stakeholder and public hearing in the preparation of EIA.

CO2 Identify the risks and impacts of a project.

CO3 Choose an appropriate EIA methodology.

CO4 Evaluate the EIA report.

CO5 Estimate the cost benefit ratio of a project.

CO6 Prepare EMP, EIS, and EIA report.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	-	3	-	-	-	-	-
CO2	3	-	-	1	-	-	3	-	-	-	-	-
CO3	3	-	-	1	-	-	3	2	-	-	-	-
CO4	3	-	1	-	-	-	3	-	-	-	-	-
CO5	3	-	2	-	-	-	3	-	-	-	2	-
CO6	3	-	-	1	-	2	3	3	-	-	-	-

UNIT I

Environmental Acts and Notifications:

The Environmental protection Act, The water preservation Act, The Air (Prevention & Control of pollution Act), Wild life Act - Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000.

LO: 1. Understand the importance of environmental protection acts

2. Explain acts and notifications in Environmental legislation

UNIT II

Impact of Developmental Activities and Land Use

Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives. Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact.

LO: 1. Study the factors causing impact of development activities

2. Decide mitigation measures of pollution on environment

UNIT III

Assessment of Impact on Vegetation, Wildlife and Risk Assessment

Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation - Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-advantages of Environmental Risk Assessment

LO: 1. Understand effect of development activities on environment.

2. Design procedures for assessment of environmental risk

UNIT IV

Methodologies of EIA

Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters- Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis.

LO: 1. Understand the elements of EIA.

2. Explain criteria for selection of EIA methodology

TEXT BOOKS:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y.Anjaneyulu,B. S. Publication, Hyderabad.

REFERENCE BOOKS:

1. Environmental Engineering, Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985
2. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers
3. Environmental Science and Engineering, Suresh K. Dhaneja,S.K., Katania& Sons Publication, New Delhi.
4. Environmental Pollution and Control, H. S. Bhatia , Galgotia Publication (P) Ltd, Delhi

E-RESOURCES:

- [https://www.iitr.ac.in/wfw/web_ua_water_for_welfare/education/Teachers Manual/Teacher manual master EIA.pdf](https://www.iitr.ac.in/wfw/web_ua_water_for_welfare/education/Teachers_Manual/Teacher_manual_master_EIA.pdf)
- <https://lecturenotes.in/subject/608/environmental-impact-assessment-management>

PROFESSIONAL ELECTIVE-VI
18A4201525-WATER SHED MANAGEMENT

Lecture – Tutorial: 2-1 Hours
Credits: 3

Internal Marks: 40
External Marks: 60

Prerequisites:

Course Objectives:

1. Introduce the concept of watershed management.
2. Understand the watershed characteristics
3. Learn the principles of soil erosion and measures to control erosion
4. Appreciate various water harvesting techniques.
5. Learn land management practices for various land use/land cover.
6. Introduce concepts of watershed modelling.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Determine watershed parameters and analyse watershed characteristics to take appropriate management action.
CO2	Quantify soil erosion and design control measures.
CO3	Apply land grading techniques for proper land management.
CO4	Suggest suitable harvesting techniques for better watershed management.
CO5	Explain appropriate models for watershed management.
CO6	Explain concepts of watershed modelling.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	-	-	-	2	-	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	3	-	-	-	-	-	2	-	-	-	-	-
CO4	3	-	-	-	-	-	2	-	-	-	-	-
CO5	3	-	-	-	-	-	2	-	-	-	-	-
CO6	3	-	-	-	-	-	2	-	-	-	-	-

UNIT I

Introduction

Concept of watershed development, objectives of watershed development, need for watershed development, Integrated and multidisciplinary approach for watershed management.

Characteristics of Watersheds

Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT II

Principles of Erosion:

Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion- Universal soil loss equation. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, check dams, rock-fill dams, brushwood dam, Gabion.

UNIT III

Water Harvesting:

Techniques of rain water harvesting- rain water harvesting from roof top, surface flow harvesting, subsurface flow harvesting, stop dams, farm ponds and dugout ponds, percolation tanks.

UNIT IV

Land Management:

Land use and Land capability classification, management of forest, agricultural, grassland and wild land, land grading operation, Reclamation of saline and alkaline soils.

Watershed Modelling

Data of watershed for modelling, application and comparison of watershed models, model calibration and validation, advances of watershed models.

TEXT BOOKS:

1. 'Watershed Management' by Das MM and M.D Saikia, PHI Learning Pvt. Ltd, 2013.
2. 'Land and Water Management' by Murthy.VVN, Kalyani Publications, 2007.

REFERENCE BOOKS:

1. 'Water Resource Engineering by Wurbs R A and James R A, Prentice Hall Publishers, 2002.
2. 'Watershed Hydrology' by Black P E, Prentice Hall, 1996.
3. 'Watershed Management' by Murthy J V S, New Age International Publishers, 2006

E-RESOURCES:

- <https://nptel.ac.in/courses/105/101/105101010/>
- <https://www.slideshare.net/GhassanHadi/watershed-1-42316353>

IPR & Patents

Lecture - Tutorial:	2-0	Internal Marks:	40
Credits:	0	External Marks:	60

Course Objectives:

- To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.
- Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.

Course Outcomes:

- IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.
- Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements.

Upon successful completion of the course, the student will be able to:

CO1	To know the importance of Intellectual property rights
CO2	To know the importance which plays a vital role in advanced Technical disciplines.
CO3	To know the importance which plays a vital role in advanced Scientific disciplines.
CO4	Imparting IPR protections
CO5	Imparting IPR regulations for further advancement
CO6	Familiar with latest developments

Contribution of Course Outcomes towards achievement of Program Outcomes

(1- Low, 2- Medium, 3 - High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	3	2						3				
CO2	3	2						3	2			
CO3	3	2						3	2			
CO4	3	2						3	2			
CO5	3	2						3	2			
CO6	3	2						3	2			

UNIT I

Introduction to Intellectual Property Rights (IPR) Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

UNIT II

Copyrights and Neighboring Rights Introduction to Copyrights – Principles of

Copyright Protection – Law Relating to Copyrights – Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works – Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law – Semiconductor Chip Protection Act.

UNIT III

Patents Introduction to Patents – Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent – Patent Search – Patent Registration and Granting of Patent – Exclusive Rights – Limitations – Ownership and Transfer – Revocation of Patent – Patent Appellate Board – Infringement of Patent – Compulsory Licensing – Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

UNIT IV

Trademarks Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law – Trade Mark Registration – Trade Mark Maintenance – Transfer of rights – Deceptive Similarities – Likelihood of Confusion – Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

Text books:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E. Bouchoux: Intellectual Property, Cengage Learning, New Delhi.

References:

1. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
2. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
3. Kompal Bansal & Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
4. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
5. R. Radha Krishnan, S. Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
6. M. Ashok Kumar and Mohd Iqbal Ali: Intellectual Property Rights, Serials Pub.

E-Resources:

1. <http://nptel.ac.in/courses.php>
2. <http://jntuk-coeerd.in/>
3. [https://ocw.mit.edu/courses/electrical-engineering- /](https://ocw.mit.edu/courses/electrical-engineering-/)

MANDATORY COURSE
INDIAN CONSTITUTION

Lecture – Tutorial:	3-0 Hours	Internal Marks:	40
Credits:	0	External Marks:	60

Prerequisites: Civics, Basics of Political Science.

Course Objectives:

- Understand the importance of constitution.
- Understand the structure of executive, legislature and judiciary.
- Understand philosophy of fundamental rights and duties.
- Understand the central and state relations, financial and administrative duties.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the meaning, history, features and characteristics of Indian Constitution.
CO2	Gain knowledge on fundamental rights duties and Principles and importance of State Policy.
CO3	Understand the powers of Union, the States and Indian President.
CO4	Know about amendments of the constitution and Emergency Provisions.
CO5	Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.
CO6	Analyze the decentralization of power between central, state and local self-government.

Course Content(Syllabus)

UNIT I

Meaning of the constitution law and constitutionalism, Historical perspective of the constitution of India, Salient features and characteristics of the constitution of India.

UNIT II

Fundamental Rights under Indian constitution, scheme of the fundamental Rights, Scheme of the fundamental Right to Equality, Scheme of the fundamental Right to certain freedoms under Article 19 Scope of the right to life and personal Liberty under Article 21.

UNIT III

Federal structure and distribution of legislative and financial powers between the union and the states, Parliamentary form of government in India-the constitution powers and status of the President of India, Amendment of the constitutional powers and procedure, The historical perspectives of the constitutional amendments in India, Local self government-Constitutional Scheme in India.

UNIT IV

Emergency Provisions, National Emergency, President Rule, Financial Emergency
Statutory Institutions: Elections-Election Commission of India, National Human Rights Commission, National Commission for Women.

TEXT BOOKS:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, –*Framing of Indian Constitution*, 1st Edition, 2015.

REFERENCES:

1. M. P. Jain, –*Indian Constitution Law*, 7th Edition., Lexis Nexis, 2014.
2. D.D. Basu, –*Introduction to the Constitution of India*, Lexis Nexis, 2015.
3. Subhash Kashyap, *Our Parliament*, National Book Trust, New Delhi

4. Peu Ghosh, Indian Government & Politics, Prentice Hall of India, New Delhi
 5. B.Z. Fadia & Kuldeep Fadia, Indian Government & Politics, Lexis Nexis, New Delhi

**Contribution of Course Outcomes towards achievement of Program Outcomes
 (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
C01	3	2	-	-	-	3-	-	-	-	-	-	-	-	-
C02		3	2	-	-	-	-	2	-	-	-	-	-	-
C03	3	-	2	-	-	-	3	-	3	-	-	2	-	-
C04	-	-	3	-	-	-	-	2	-	-	-	2	-	-
C05		2	-	3	-	-	-	-	-	-	-	-	-	-
C06	3	2	-	-	-	-	-	-	-	-	-		-	-

20A2100801-CONSTITUTION OF INDIA

Lecture – Tutorial: 2-0 Hours **Internal Marks:** 30
Credits: 2 **External Marks:** 70

Prerequisites: Engineering Physics, Engineering Mechanics

Course Objectives:

5. To Enable the student to understand the importance of constitution
6. To understand the structure of executive, legislature and judiciary
7. To understand philosophy of fundamental rights and duties
8. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
9. To understand the central and state relation inancial and administrative.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- C01 Apply the knowledge on directive principle of state policy & analyze the History, features of Indian constitution
- C02 Explain the structure of Indian government & Differentiate between the state
- C03 Analyze the role Governor and Chief Minister & explain the role of state Secretariat
- C04 Compare and contrast district administration role and importance
- C05 Analyze the role of Myer and elected representatives of Municipalities
- C06 Know the role of Election Commission apply knowledge & Analyze role of state election commission

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	3	2	-	-	-	-	-	-	-	-	-	2
C02	3	3	2	-	-	-	-	2	-	-	-	-
C03	3	-	2	-	-	-	-	-	-	-	-	2
C04	-	-	3	-	-	-	-	2	-	-	-	2
C05	3	3	2	-	-	-	-	2	-	-	-	-
C06	3	-	2	-	-	-	-	-	-	-	-	2

UNIT I

Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

UNIT III

State Government and its Administration Governor - Role and Position - CM and

Council of ministers, State Secretariat: Organisation, Structure and Function

UNIT IV

Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Pachayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat; Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials -Importance of grass root democracy

UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission; Functions of Commissions for the welfare of SC/ST/OBC and women

TEXT BOOKS:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice - Hall of India Pvt Ltd.. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust

REFERENCE BOOKS:

1. J. Raj Indian Government and Politics
2. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice - Hall of India Pvt Ltd.. New Delhi
3. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right)

E-RESOURCES:

- nptel.ac.in/courses/109104074/8
- nptel.ac.in/courses/109104045/
- nptel.ac.in/courses/101104065/
- www.hss.iitb.ac.in/en/lecture-details
- www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

20A2201403-ENGINEERING GEOLGOY Integrated (Theory & Lab)

Lecture – Practical: 2-2 Hours **Internal Marks:** 30
Credits: 3 **External Marks:** 70

Prerequisites: Engineering Physics, Engineering Mechanics

Course Objectives:

1. To introduce the course: Engineering Geology to the Civil Engineering graduates.
2. To enable the students, understand what minerals and rocks are and their formation and identification.
3. To highlight significance/ importance/ role of Engineering Geology in construction of Civil Engineering structures.
4. To enable the student, realise its importance and applications of Engineering Geology in Civil Engineering constructions.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- C01 Identify and classify the geological minerals
- C02 Measure the rock strengths of various rocks
- C03 Classify and measure the earthquake prone areas to practice the hazard zonation
- C04 Classify, monitor and measure the Landslides and subsidence
- C05 Prepares, analyses and interpret the Engineering Geologic maps
- C06 Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	3	-	-	-	-	-	-	-	-	-	-	-
C02	3	2	-	-	-	-	-	-	-	-	-	-
C03	3	1	-	-	-	-	-	-	-	-	-	-
C04	1	3	-	-	-	-	-	-	-	-	-	-
C05	3	3	-	1	-	-	-	-	-	-	-	-
C06	3	3	-	1	-	-	-	-	-	-	-	-

UNIT I

Basics of Geology: Branches of Geology, Importance of Geology in Civil Engineering with case studies.

Weathering: Weathering of rocks, Geological agents, weathering process of Rock, Rivers and geological work of rivers.

UNIT II

Mineralogy and Petrology: Definitions of mineral and rock-Different methods of study of mineral and rock. Physical properties of minerals and rocks for megascopic study for the following minerals and rocks. Common rock forming minerals: Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite and Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt

etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate

UNIT III

Structural Geology: Strike, Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

UNIT IV

Ground Water: Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques. Earthquakes and Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic belts, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides. **Geophysics:** Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

UNIT V

Geology of Dams, Reservoirs and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Geology consideration for successful constructions of reservoirs, Life of Reservoirs. Purpose of Tunneling, effects, Lining of Tunnels. Influence of Geology for successful Tunneling.

TEXT BOOKS:

1. 'Engineering Geology' by D. Venkat Reddy, Vikas Publishing House pvt. Ltd, 2013.
2. 'Engineering Geology' by N. Chennkesavulu, Trinity Press (Laxmi Publications), 2nd Edition, 2014.
3. 'Engineering Geology' by Vasudev Kanithi, University Press.

REFERENCE BOOKS:

1. 'Engineering Geology for Civil Engineers' by P.C. Varghese, PHI learning pvt. Ltd.
2. 'Geology for Engineers and Environmental Society' by Alan E Kehew, person publications, 3rd edition
3. 'Fundamentals of Engineering Geology' by P.G.Bell, B.S.P. Publications, 2012.
4. 'Engineering Geology' by V.Parthesarathi et al., Wiley Publications
5. 'Environmental Geology' by K.S.Valdiya, McGraw Hill Publications, 2nded.

E-RESOURCES:

- <https://www.allintuworld.in/download/engineering-geology-eg-materials-notes/>
- <http://www.nptelvideos.in/2012/11/engineering-geology.html>

20A2201402-ENVIRONMENTAL ENGINEERING**Lecture – Tutorial:** 2-1 Hours**Internal Marks:** 30**Credits:** 3**External Marks:** 70**Prerequisites:****Course Objectives:**

- Outline planning and the design of water supply systems for a community/town/city and selection of source based on quality and quantity
- Design of water treatment plant for a village/city
- Impart knowledge on design of water distribution network
- Design of sewers and plumbing system for buildings
- Design of Sewage Treatment Plant

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

- C01 Select a source based on quality and quantity
- C02 Estimate design population and water demand
- C03 Design a water treatment plant for a village/city
- C04 Design the water distribution network
- C05 Design a sewer by estimating DWF and Storm water flow and plumbing system for buildings
- C06 Design a Sewage Treatment Plant for a town/city.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	2	-	-	-	-	-	-	1	-	-	-	-
C02	2	-	-	-	-	-	-	1	-	-	-	-
C03	2	-	-	-	-	-	-	1	-	-	-	-
C04	2	-	-	-	-	-	-	1	-	-	-	-
C05	2	2	3	-	-	-	-	1	-	-	-	-
C06	2	-	-	-	-	-	-	1	-	-	-	-

UNIT I

Introduction: Importance and Necessity of Protected Water Supply systems, Water borne diseases, Flow chart of public water supply system, Role of Environmental Engineer.

Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - factors affecting water demand, Design Period, Population forecasting.

Sources of Water: Lakes, Rivers, Comparison of sources with reference to quality, quantity and other considerations- Ground water sources: springs, Wells and Infiltration galleries, Characteristics of water- Physical, Chemical and Biological characteristics and WHO guidelines for drinking water - IS 10500 2012 - Water quality standards for Agriculture, Industries and Construction.

UNIT II

Treatment of Water: Treatment methods: Theory and Design of Sedimentation, Coagulation, Filtration. **Disinfection:** Theory of disinfection-Chlorination and other Disinfection methods.

Removal of color and odors- Removal of Iron and Manganese - Adsorption- Fluoridation and defluoridation-Reverse Osmosis- Solar stills- Freezing

UNIT III

Collection and Conveyance of Water: Factors governing the selection of the intake structure, Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, Design of economical diameter of pumping main, HP of pump and monthly expenditure for an apartment and a village. Laying and testing of pipe lines- Capacity of storage reservoirs, Mass curve analysis.

Distribution of Water: Methods of Distribution system, Layouts of Distribution networks, Water main appurtenances - Sluice valves, Pressure relief valves, air valves, check valves, hydrants, and water meters-Ideal water supply system. Case studies.

UNIT IV

Sewerage: Estimation of sewage low and storm water drainage - luctuations - types of sewers -design of sewers.

Sewer appurtenances - cleaning and ventilation of sewers. **Sewage pumps.**

House Plumbing: Systems of plumbing-sanitary fittings and other accessories-one pipe and two pipe systems - Design of drainage in Gated communities, Apartments and Hotels.

Septic Tank - working Principles and Design

UNIT V

Sewage characteristics -Characteristics of sewage - BOD equations. ThOD, COD and BOD.

Treatment of Sewage: Primary treatment. **Secondary treatment:** Activated Sludge Process, principles, designs, and operational problems. Oxidation ponds, Trickling Filters - classification - design, operation and maintenance problems. RBCs. Fluidized bed reactors -Anaerobic digestion of sludge, Sludge Drying Beds.

Ultimate Disposal of sewage: Methods of disposal - disposal into water bodies- Oxygen Sag Curve- Disposal into sea, disposal on land, Crown corrosion, Sewage sickness. Effluent standards.

TEXT BOOKS:

1. Rural Municipal and Industrial water management, KVSG Murali Karishna, Environmental Protection Society, Kakinada, 2021.
2. Industrial Water and Wastewater Management, K.V.S.G. Murali Krishna, Paramount Publications, Visakhapatnam, 2018.
3. Elements of Environmental Engineering - K. N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.

REFERENCE BOOKS:

1. Water Supply Engineering - P. N. Modi.
2. Water Supply Engineering - B. C. Punmia
3. Water Supply and Sanitary Engineering - G. S. Birdie and J. S. Birdie
4. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.
5. Environmental Engineering, Ruth F. Weiner and Robin Matthews - 4th Edition Elsevier, 2003
6. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

E-RESOURCES:

- <https://www.allintuworld.in/download/environmental-engineering-ee-materials-notes/>

20A2201491-ENVIRONMENTAL ENGINEERING LAB

Labs / Instructions	3 Hours	Internal Marks:	30
Hours/Week		External Marks:	70
Credits:	1.5		

Prerequisites: Environmental Engineering**Course Objectives:**

- Estimation some important characteristics of water and wastewater in the laboratory
- It also gives the significance of the characteristics of the water and wastewater

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

- CO1 Determine some important characteristics of water and wastewater in the laboratory
- CO2 Outline some conclusion and decide whether the water is potable or not.
- CO3 Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments
- CO4 Determine strength of the sewage in terms of BOD and COD

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	3	-	2	3	-	-	3
CO2	3	3	-	-	-	3	-	2	3	-	-	3
CO3	3	3	-	-	-	3	-	2	3	-	-	3
CO4	3	3	-	-	-	3	-	2	3	-	-	3

List of Experiments

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness–Calcium & Magnesium.
3. Determination of Alkalinity/Acidity
4. Determination of Chlorides in water and soil
5. Determination and Estimation of total solids, organic solids and inorganic solids and settleable solids by Imhoff Cone.
6. Determination of Iron.
7. Determination of Dissolved Oxygen with D.O. Meter & Wrinklers Method and B.O.D.
8. Determination of N, P, K values in solid waste
9. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
10. Determination of C.O.D.
11. Determination of Optimum coagulant dose.
12. Determination of Chlorine demand.
13. Presumptive Coliform test.

TEXT BOOKS:

1. Standard Methods for Analysis of Water and Waste Water – APHA Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi

REFERENCE BOOKS:

1. Relevant IS Codes.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.

E-RESOURCES:

vlab.co.in

II B. Tech II Semester

20A2200801: ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Lecture - Tutorial: 2

Internal Marks: 30

Credits: 0

External Marks: 70

Prerequisites:

- Students are expected to have knowledge on
1. Reasoning and inference sustainability is at the course of Indian traditional knowledge system
 2. legal framework and traditional knowledge and biological diversity and geographical indication act
 3. Mechanism of traditional knowledge and protection
 4. Traditional knowledge in different sector

Course Objectives:

1. The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledge system
2. To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act 2003
3. The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection
4. To know the student traditional knowledge in different sector

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- CO1 Understand the concept of Traditional knowledge and its importance
- CO2 Know the need and importance of protecting traditional knowledge
- CO3 Know the various enactments related to the protection of traditional knowledge
- CO4 Understand the concepts of Intellectual property to protect the traditional knowledge
- CO5 Understand the Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture
- CO6 Know the importance of TK and biotechnology, TK in agriculture

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	1	2	1	1	2	-	1
CO2	-	-	-	-	-	1	1	1	2	1	-	1
CO3	-	-	-	-	-	1	2	1	1	1	-	1
CO4	-	-	-	-	-	2	1	1	1	1	-	1
CO5	-	-	-	-	-	2	2	2	1	2	-	1
CO6	-	-	-	-	-	1	2	2	2	2	-	-

UNIT I

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and

social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT II

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

UNIT IV

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT V

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

REFERENCE BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan 2012.
3. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
4. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

e-Resources:

- 1) <https://www.youtube.com/watch?v=LZP1StpYEPM>
- 2) <http://nptel.ac.in/courses/121106003/>

20A2200802: Professional Ethics & Human Values

Lecture – Tutorial- Practical:	0-2-0	Internal Marks:	30
Credits:	0	External Marks:	70*
Prerequisites:			

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others
- To create awareness on assessment of safety and risk

Course Outcomes

Students will be able to:

- Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
- Identify the multiple ethical interests at stake in a real-world situation or practice
- Articulate what makes a particular course of action ethically defensible
- Assess their own ethical values and the social context of problems
- Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
- Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
- Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

Unit I- Human Values:

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality.

Learning outcomes:

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. Develop commitment
4. Learn how to live peacefully

Unit II – Engineering Ethics:

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg's theory-Gilligan's Theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest –Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment.

Learning outcomes:

1. Learn about the ethical responsibilities of the engineers.
2. Create awareness about the customs and religions.
3. Learn time management
4. Learn about the different professional roles.

Unit III Engineering as Social Experimentation:

Engineering As Social Experimentation –Framing the problem –Determining the facts – Codes of Ethics –Clarifying Concepts –Application issues –Common Ground –General Principles –Utilitarian thinking respect for persons. Learning outcomes:

1. Demonstrate knowledge to become a social experimenter.

2. Provide depth knowledge on framing of the problem and determining the facts.

3. Provide depth knowledge on codes of ethics.

4. Develop utilitarian thinking

Unit IV

Engineers Responsibility for Safety and Risk: Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR). Learning outcomes:

1. Create awareness about safety, risk & risk benefit analysis.
2. Engineer's design practices for providing safety.
3. Provide knowledge on intellectual property rights.

Unit IV

Global Issues: Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts – Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research. Learning outcomes:

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

TEXT BOOKS:

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and, V.S.Senthil Kumar-PHI Learning Pvt. Ltd-2009
- 2) "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
- 3) "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGrawHill–2003.
- 4) "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
- 5) "Professional Ethics and Human Values" by A.Alavudeen, R.KalilRahman and M. Jayakumaran, Laxmi Publications.
- 6) "Professional Ethics and Human Values" by Prof.D.R.Kiran-"Indian Culture, Values and Professional Ethics" by P.S Murthy-BS Publication

ACADEMIC YEAR
2020-21

PROFESSIONAL ELECTIVE-1
18A3101513-ENVIRONMENTAL POLLUTION AND CONTROL

Lecture – 3-0 Hours

Internal Marks: 40

Tutorial:

Credits: 3

External Marks: 60

Prerequisites: Environmental Studies

Course Objectives:

- 1) Impart knowledge on aspects of air pollution & control and noise pollution
- 2) Impart concepts of treatment of waste water from industrial source.
- 3) Differentiate the solid and hazardous waste based on characterization
- 4) Introduce sanitation methods essential for protection of community health.
- 5) Provide basic knowledge on sustainable development.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Identify the air pollutant control devices
CO2	Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.
CO3	Identify the air pollutant control devices and have knowledge on the NAAQ standards and air emission standards.
CO4	Differentiate the treatment techniques used for sewage and industrial wastewater treatment.
CO5	Inventing the methods of environmental sanitation and the management of community facilities without spread of epidemics.
CO6	Appreciate the importance of sustainable development while planning a project or executing an activity.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	-	2	1	-	-	-	-
CO2	2	-	-	-	-	-	2	1	-	-	-	-
CO3	2	-	-	-	-	-	2	1	-	-	-	-
CO4	2	-	-	-	-	-	2	1	-	-	-	-
CO5	2	-	-	-	2	-	2	1	-	-	-	-
CO6	2	2	-	-	-	-	2	1	-	-	-	-

UNIT I

Air Pollution:

Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards. Noise Pollution: Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000.

- LO: 1. Understand control mechanism of air pollutants
 2. Design noise reduction techniques

UNIT II

Industrial waste water Management:

Strategies for pollution control – Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants – Recirculation of industrial wastes – Effluent standards.

LO: 1. Understand the importance of treatment process of industrial effluents.

2. Design treatment plants

UNIT III

Solid Waste Management: solid waste characteristics – basics of on-site handling and collection – separation and processing – Incineration- Composting-Solid waste disposal methods – fundamentals of Land filling. Hazardous Waste: Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods.

LO: 1. Classification of solid waste and separation and procession solid waste

2. Identification of Hazardous wastes

3. Plan and execute solid waste and hazardous waste management.

UNIT IV

Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

LO: 1. Understand importance of hygienic environment

2. Suggest appropriate rural sanitation methods to keep surrounding clean.

TEXT BOOKS:

1. Peavy, H. S., Rowe, D.R, Tchobanoglous, **Environmental Engineering**, G.Mc-Graw Hill International Editions, New York 1985.
2. J. G. Henry and G.W. Heinke, **Environmental Science and Engineering**, Pearson Education.

REFERENCE BOOKS:

1. G. L. Karia and R.A. Christian, **Waste water treatment- concepts and design approach**, Prentice Hall of India
2. Ruth F. Weiner and Robin Matthews **Environmental Engineering**, 4th Edition Elsevier, 2003

E-RESOURCES:

<http://www.nptelvideos.in/2012/11/envirenmental-air-pollution.html>

18A3100801-INDIAN CONSTITUTION

Type of Course: Audit Course

Lecture - Tutorial- 0-1-2

Practical::

Internal Marks: 40

Credits: 0

External Marks: 60

Prerequisites:

Course Objectives:

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the meaning, history, features and characteristics of Indian Constitution
CO2	Gain knowledge on fundamental rights duties and Principles and importance of State Policy
CO3	Understand the powers of Union, the States and Indian President.
CO4	Know about amendments of the constitution and Emergency Provisions

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2-Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	2	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	2
CO4	-	-	3	-	-	-	-	2	-	-	-	2

UNIT I

- Meaning of the constitution law and constitutionalism
- Historical perspective of the Constitution of India
- Salient features and characteristics of the Constitution of India

UNIT II

- Scheme of the fundamental rights
- The scheme of the Fundamental Duties and its legal status
- The Directive Principles of State Policy - Its importance and implementation

UNIT III

- Federal structure and distribution of legislative and financial powers between the Union and the States
- Parliamentary Form of Government in India - The constitution powers and status of the President of India

UNIT IV

- Amendment of the Constitutional Powers and Procedure
- The historical perspectives of the constitutional amendments in India
- Emergency Provisions : National Emergency, President Rule, Financial Emergency

Reference Books

1. Durgadas Basu - Introduction to the Constitution of India
2. Sharma, Sharma B. K. - Introduction to the Constitution of India
3. Randhir Sarma Srkar - The Constitution of India
4. Govt. of India - The Constitution of India

18A3101403-WATER RESOURCE ENGINEERING-1

Lecture –	2-1 Hours	Internal Marks:	40
Tutorial:		External Marks:	60
Credits:	3		

Prerequisites: Hydraulics

Course Objectives:

- Introduce hydrologic cycle and its relevance to Civil engineering
- Make the students understand physical processes in hydrology and components of the hydrologic cycle
- Appreciate concepts and theory of physical processes and interactions
- Learn measurement and estimation of the components hydrologic cycle.
- Provide an overview and understanding of Unit Hydrograph theory and its analysis
- Understand flood frequency analysis, design flood, flood routing
- Appreciate the concepts of groundwater movement and well hydraulics

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- CO1 Develop design storms and carry out frequency analysis
- CO2 Determine storage capacity and life of reservoirs.
- CO3 Develop unit hydrograph and synthetic hydrograph
- CO4 Estimate flood magnitude and carry out flood routing.
- CO5 Determine aquifer parameters and yield of wells.
- CO6 Model hydrologic processes

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	3	-	-	1	-	1	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	1	-	1	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

UNIT I

Engineering hydrology and Precipitation

Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data. **Precipitation:** Types and forms, measurement, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm

- LO 1. Understand basics of engineering hydrology and its applications.**
- 2. Demonstrate measurement techniques of precipitation.**
- 3. Learn curves related to frequency of rainfall.**

UNIT II

Abstractions from Precipitation:

Initial abstractions. Evaporation: factors affecting, measurement, reduction
Evapo transpiration: factors affecting, measurement, control - Infiltration:
factors affecting, Infiltration capacity curve, measurement, infiltration indices.

LO 1. Attain knowledge on factors influencing evaporation.

2. Analyze factors influencing infiltration.

UNIT III**Runoff and Hydrograph analysis:**

Catchment characteristics, Factors affecting runoff, components, computation-empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve. Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

UNIT IV

Floods: Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management. **Flood Routing:** Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

LO 1. Develop knowledge on floods and its effects.

2. Understand flood routing techniques.

TEXT BOOKS:

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., (2013), New Delhi
2. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain and Arun Kumar Jain, Lakshmi Publications (P) Ltd.

REFERENCE BOOKS:

1. Engineering Hydrology Subramanya, K, Tata McGraw-Hill Education Pvt Ltd (2013), New Delhi.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers

E-RESOURCES:

- <http://www.nptelvideos.in/2012/11/water-resources-systemsmodeling.html>
- <http://www.nptelvideos.in/2012/11/advanced-hydrology.html>
- <http://freevideolectures.com/Course/100/Water-Resources-Engineering>
- <http://www.btechmaterials.com/download/water-resources-engineering-materials-notes/>
- <http://www.btechmaterials.com/download/water-resources-engineering-ii-materials-notes/>

18A3201403- ENVIRONMENTAL ENGINEERING

Lecture – Tutorial: 3-0 Hours

Internal Marks: 40

Credits: 3

External Marks: 60

Prerequisites: Environmental Studies

Course Objectives:

- 1) To teach requirements of water and its treatment.
- 2) To impart knowledge on sewage treatment methodologies.
- 3) To provide facts on Air pollution and control.
- 4) To enable with design concepts of wastewater treatment units
- 5) To throw light on importance of plumbing.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- CO1 Understand about quality of water and purification process
- CO2 Select appropriate technique for treatment of waste water.
- CO3 Assess the impact of air pollution
- CO4 Understand consequences of solid waste and its management.
- CO5 Design domestic plumbing systems.
- CO6 Selection of suitable treatment flow for raw water treatments.

Contribution of Course Outcomes towards achievement of Program

Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	-	-	1	-	-	-	-
CO2	2	-	-	-	-	-	-	1	-	-	-	-
CO3	2	-	-	-	-	-	-	1	-	-	-	-
CO4	2	-	-	-	-	-	-	1	-	-	-	-
CO5	2	2	3	-	-	-	-	1	-	-	-	-
CO6	2	-	-	-	-	-	-	1	-	-	-	-

UNIT I

Estimation of quality and quantity of water- Importance and Necessity of Protected Water Supply systems; Routine water analysis - physical, chemical and bacteriological tests; Standards for drinking water; Water borne diseases, Sources of Water: Surface and Ground water, comparison of sources with reference to quality, quantity and other considerations

Flow chart of public water supply system, Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations factors affecting water demand, Design Period Population Forecasting. - Capacity of storage reservoirs, Mass curve analysis.

- LO: 1** Teach causes for water borne diseases.
2. Estimation of water demand for a colony /town/city.
 3. Able to identify the sources of water.

UNIT II

Treatment of Water and distribution: Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration-Slow sand and rapid sand filters; Construction and Operation; Disinfection methods-chlorination; Removal of hardness.

Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks.

- LO:**
1. Enlightens the efforts involved in converting raw water into clean potable water.
 2. Able to apply treatment methods
 3. Impart knowledge on water distribution network

UNIT III

Estimation of quantity and quality of sewage - Estimation of sewage flow and storm water drainage – fluctuations- classification of sewerage systems – types of sewers - Hydraulics of sewers and storm drains– design diameter of sewers – appurtenances in sewerage – Man holes, Street Inlets

Sewage characteristics – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination- Measurement of BOD and COD - BOD equations.

- LO:**
1. Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city
 2. Summarize the appurtenance in sewerage systems and their necessity
 3. Provide knowledge of characterization of wastewater generated in a community.

UNIT IV

Treatment of sewage and disposal: Primary treatment-Screens-grit chambers-grease traps– floatation– sedimentation – design of preliminary and primary treatment units. Design of septic tank

Secondary treatment: Aerobic and anaerobic treatment process comparison.

Suspended growth process: Activated Sludge Process, principles, and operational problems, Activated Sludge Processes, Attached Growth Process: Tricking Filters– mechanism of impurities removal- classification–operation and maintenance problems. Methods of disposal – disposal into water bodies-Oxygen Sag Curve-Disposal into sea, disposal on land- sewage sickness

- LO:**
- 1 Impart understanding of treatment of sewage and the need for its treatment.
 2. Teach planning, and design of septic tank.
 3. Effluent disposal method and realize the importance of regulations in the disposal of effluents in Rivers.

TEXT BOOKS:

1. Elements of Environmental Engineering – K. N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.
2. Environmental Engineering water supply Engineering- vol. 1 Santosh kumar Garg ,Khanna Publishers 2018 edition
3. Sewage waste disposal and Air pollution Engineering Santosh kumar Garg ,Khanna Publishers 2018 edition

REFERENCE BOOKS:

1. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, -2011 edition.
2. Wastewater engineering treatment and reuse - Metclff & Eddy MCGraw Hill Education (India) private Limited- 2003 edition

E-RESOURCES:

- <https://www.allintuworld.in/download/environmental-engineering-ee-materials-notes/>

PROFESSIONAL ELECTIVE-II

18A3201513-AIR POLLUTION ENGINEERING

Lecture –	3-0 Hours	Internal Marks:	40
Tutorial:		External Marks:	60
Credits:	3		

Prerequisites: -----

Course Objectives:

- 1) To teach the basics of air pollution
- 2) To impart the behaviour of air due to metrological influence
- 3) To throw light on air quality management
- 4) To teach the design of air pollution control methods

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Evaluating the ambient air quality based on the analysis of air pollutants
CO2	Design particulate and gaseous control measures for an industry
CO3	Judge the plume behaviour in a prevailing environmental condition
CO4	Estimate carbon credits for various day to day activities
CO5	Pollution control methods
CO6	Properties of atmosphere

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	3	-	-	1	-	1	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	1	-	1	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-

UNIT I

Air Pollution:

Sampling and analysis of air pollutants, conversion of ppm into $\mu\text{g}/\text{m}^3$. Definition of terms related to air pollution and control - secondary pollutants - Indoor air pollution - Ozone holes and Climate Change and its impact - Carbon Trade.

LO: 1. Learn the basics of air pollutants.

2. Estimate the impact of air pollution

UNIT II

Thermodynamics and Kinetics of Air-pollution:

Applications in the removal of gases like SO_x , NO_x , CO and HC - Air-fuel ratio- Computation and Control of products of combustion, Automobile pollution. Odour pollution control, Flares.

LO: 1 Analyse and compute the parameters of air pollutants

2. Evaluate procedures for control of pollution

UNIT III

Meteorology and Air Pollution:

Properties of atmosphere: Heat, Pressure, Wind forces, Moisture and relative Humidity, Lapse Rates - Influence of Terrain and Meteorological phenomena

on plume behavior and Air Quality - Wind rose diagrams and Isopleths
Plume Rise Models

LO: 1. Study properties of atmosphere

2. Learn plume behaviour in different environmental conditions

UNIT IV

Air Pollution Control Methods:

Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of Control Equipments –Control of NOx and SOx emissions – Environmental friendly fuels - In-plant Control Measures, process changes, methods of removal and recycling. Environmental criteria for setting industries and green belts.

LO: 1. Acquire the design principles of particulate and gaseous control.

2. Develop environmental friendly fuels and study properties

TEXT BOOKS:

1. M. N. Rao and H. V. N. Rao, Air Pollution, Tata McGraw Hill Company.
2. K. V. S. G. Murali Krishna, Air Pollution and Control Laxmi Publications, New Delhi, 2015.

REFERENCE BOOKS:

1. R. K. Trivedy and P. K. Goel, An Introduction to Air pollution, B.S. Publications.
2. Wark and Warner, Air Pollution, Harper & Row, New York.

E-RESOURCES:

<http://www.nptelvideos.in/2012/11/environmental-air-pollution.html>

PROFESSIONAL ELECTIVE-III

18A3201523-INDUSTRIAL WASTE & WASTE-WATER ENGINEERING

Lecture – Tutorial: 3-0 Hours

Internal Marks: 40

Credits: 3

External Marks: 60

Prerequisites: -----

Course Objectives:

- 1) To teach Health and Environment Concerns in waste water management
- 2) To teach material balance and design aspects of the reactors used in waste water treatment.
- 3) To impart knowledge on selection of treatment methods for industrial waste water
- 4) To teach common methods of treatment in different industries
- 5) To provide knowledge on operational problems of common effluent treatment plant

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Design treatment methods for any industrial wastewater.
CO2	Examine the manufacturing process of various industries.
CO3	Assess need for common effluent treatment plant for an industry
CO4	Test and analyse BOD, COD, TSS and MPN in wastewater.
CO5	Understand options for waste water disposal.
CO6	Understand the character of waste water from Steel plants and refineries

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	-	-	1	-	1	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-

UNIT I

Industrial water Quantity and Quality requirements:

Boiler and cooling waters–Process water for Textiles, Food processing, Brewery Industries, power plants, fertilizers, sugar mills Selection of source based on quality, quantity and economics. Use of Municipal wastewater in Industries – Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, Freezing, Elutriation, Removal of Colour, Odour and Taste.

LO: 1. Learn the procedures for assessment of quality of Industrial water

2. Suggest different processes of handling waste water

UNIT II

Basic theories of Industrial Wastewater Management: Industrial waste survey - Measurement of industrial wastewater Flow-generation rates - Industrial wastewater sampling and preservation of samples for analysis - Wastewater characterization-Toxicity of industrial effluents-Treatment of wastewater-unit operations and processes-Volume and Strength reduction - Neutralization and Equalization, Segregation and proportioning- recycling, reuse and resources recovery

LO: 1. Measurement of Industrial waste water

2. Characterize waste water

3. Suggest techniques for treatment of waste water.

UNIT III

Industrial wastewater disposal management: Discharges into Streams, Lakes and oceans and associated problems, Land treatment - Common Effluent Treatment Plants: advantages and suitability, Limitations and challenges- Recirculation of Industrial Wastes- Effluent Disposal Method

LO: 1. Understand options for waste water disposal.

2. Explain functioning of common effluent treatment plants

UNIT IV

Process and Treatment of specific Industries-1: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Steel plants, Fertilizers, Textiles, Paper and Pulp industries, Oil Refineries, Coal and Gas based Power Plants

LO: 1. Understand the character of waste water from Steel plants and refineries

2. Suggest suitable waste water treatment techniques

TEXT BOOKS:

1. M. N. Rao and A. K. Dutta, Wastewater Treatment, Oxford & IBH, New Delhi.
2. K.V. S. G. Murali Krishna, Industrial Water and Wastewater Management

REFERENCE BOOKS:

1. A. D. Patwardhan, Industrial Wastewater treatment, PHI Learning, Delhi
2. Metcalf and Eddy Inc., Wastewater Engineering, Tata McGraw Hill co., New Delhi.
3. G. L. Karia & R.A. Christian Wastewater Treatment- Concepts and Design Approach, Prentice Hall of India.

PROFESSIONAL ELECTIVE-II

18A3201512-WATER RESOURCE ENGINEERING-II

Lecture –	3-0 Hours	Internal Marks:	40
Tutorial:		External Marks:	60
Credits:	3		

Prerequisites: Hydraulics, Water resource engineering-I

Course Objectives:

- 1) To discuss the importance of site investigation;
- 2) To narrate various exploration techniques
- 3) To describe soil sampling techniques.
- 4) To train with insitu sub soil exploration methods
- 5) To demonstrate instrumentation for sub soil exploration.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Estimate irrigation water requirements
CO2	Design irrigation canals and canal network
CO3	Design irrigation canal structures
CO4	Plan and design diversion head works
CO5	Analyse stability of gravity and earth dams
CO6	Design ogee spillways and energy dissipation works

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	-	-	-	2	-	1	-	-	-	-
CO2	2	3	3	-	-	2	-	1	-	-	-	-
CO3	2	3	3	-	-	2	-	1	-	-	-	-
CO4	2	3	3	-	-	2	-	1	-	-	-	-
CO5	2	2	-	-	-	2	-	1	-	-	-	-
CO6	2	3	3	-	-	2	-	1	-	-	-	-

UNIT I

Irrigation: Necessity and importance, principal crops and crop seasons, types, methods of application, soil-water-plant relationship, soil moisture constants, consumptive use, estimation of consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of irrigation, irrigation efficiencies, water logging and drainage, standards of quality for irrigation water, crop rotation.

UNIT II

Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible Canals -Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.

Canal Structures:

Falls: Types and location, design principles of Sarda type fall and straight glacis fall.

Regulators: Head and cross regulators, design principles

UNIT III

Cross Drainage Works: Types, selection, design principles of aqueduct, siphon aqueduct and super passage. **Outlets:** types, proportionality, sensitivity and flexibility

River Training: Objectives and approaches

Diversion Head Works: Types of diversion head works, weirs and barrages, Layout of diversion head works, components. causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for Subsurface flow, exit gradient.

UNIT IV

Reservoir Planning: Investigations, site selection, zones of storage, yield and

Storage capacity of reservoir, reservoir sedimentation.

Dams: Types of dams, selection of type of dam, selection of site for a dam.

Gravity dams: Forces acting on gravity dam, causes of failure of a gravity dam,

Elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis, drainage galleries, grouting.

Earth Dams: Types, causes of failure, criteria for safe design, seepage, measures

For control of seepage-filters, stability analysis-stability of downstream slope during steady seepage and upstream slope during sudden drawdown conditions.

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates. Energy dissipation below spillways-stilling basin and its appurtenances.

TEXT BOOKS:

1. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok

Kumar Jain, Arun Kumar Jain, Lakshmi Publications (P) Ltd.

2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna

Publishers.

REFERENCE BOOKS:

1. Irrigation and Water Resources Engineering, Asawa G L (2013), New Age International Publishers

2. Irrigation Water Resources and Water Power Engineering, Modi P N (2011), Standard Book House, New Delhi

E-RESOURCES:

- <http://www.nptelvideos.in/2012/11/water-resources-systemsmodeling.html>
- <http://www.nptelvideos.in/2012/11/advanced-hydrology.html>
- <http://freevideolectures.com/Course/100/Water-Resources-Engineering>
- <http://www.btechmaterials.com/download/water-resources-engineering-materials-notes/>
- <http://www.btechmaterials.com/download/water-resources-engineering-ii-materials-notes/>

PROFESSIONAL ELECTIVE-III

18A3201524-DOCKS AND HARBOUR ENGINEERING

Lecture – Tutorial:	3-0 Hours	Internal Marks:	40
Credits:	3	External Marks:	60

Prerequisites: -----

Course Objectives:

- 1) To teach Water Transportation in India.
- 2) To impart knowledge on water waves and effects on harbour and structure design
- 3) Development of facilities that are required for setting up of a port
- 4) Planning of ports for effective cargo handling and economical considerations

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Enhance the knowledge on Docks and Harbour Engineering for water transportation in the context of regional and intercontinental transportation.
CO2	Know techniques of planning the Infrastructures required for Harbour and Port area.
CO3	Know techniques of designing the Infrastructures required for Harbour and Port area.
CO4	Analyze cargo and passenger demand forecasting cargo handling capacity of ports and economic evaluation of port project.
CO5	Understand environmental and other impact impended due to water transportation and port activities.
CO6	Procedure to follow during planning of ports.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-

UNIT I

Water Transportation:

Scope, Merits, Developments of Water Transportation in India, Inland waterways, River, canal, Inland water Transportation, Development of Port & Harbors, Harbor Classification, Site Selection, Harbor Dimensioning

LO: 1. Classify different modes of transportation by water

2. Explain development and classification of ports and harbors

UNIT II

Natural Phenomena: Wind, Tides, Water waves, Wave decay & Ports, Wave Diffraction Breaking, Reflection, Littoral drift, Sedimentation transport, Effects on Harbor and Structure Design

LO: 1. Understand effects of natural forces

2. Understand conditions for design of harbors

Harbor Infrastructure:

Types of Break Waters, Jetty, Dock Fenders, Wharves, Dolphin Mooring accessories, Repair facilities, Wet Docks, Lift Docks, Dry Docks, Gates for Graving docks, Floating Docks, Slipways, Locks and Gates

LO: 1. Understand components of harbor.

UNIT III

Port Facility:

Transit Shed, Warehouses, Cargo handling, Container Handling, Inland port facility, Navigational Aids, Types, Requirements of Signals, Lighthouses, Beacon lights, Buoys, Dredging & Coastal protection, Types of Dredges, Choices, usage of dredge material, Sea wall protection, Sea wall revetments, bulkhead.

LO: 1. Knowledge on facilities to be developed in ports.

2. Decide different features to be incorporated in ports

UNIT IV

Planning of Ports:

Regional and intercontinental transportation development, forecasting cargo & Passenger demand, regional connectivity, Cargo handling, Capacity of Port, Economic Evaluation of Port projects, Impact of Port activities.

LO: 1. Study procedure to follow during planning of ports.

TEXT BOOKS:

1. Bindra, S.P, A Course in Docks and Harbor Engineering, Dhanpat Rai and Sons, New Delhi, India, 1992.
2. R. Srinivasa Kumar, Transportation Engineering: Railways, Airports, Docks and Harbors, Universities Press Pvt Ltd, Hyderabad. 2014.

REFERENCE BOOKS:

1. Seetharaman, S., Dock and Harbour Engineering, Umesh Publications, New Delhi, India, 1999.
2. V.N. Vazirani and S.P. Chandola, Docks and Harbour Engineering – Text book of Transport Engineering Vol. II, Khanna Publishers, New Delhi.

PROFESSIONAL ELECTIVE-III

18A3201525-WATER RESOURCES SYSTEM ANALYSIS

Lecture –	3-0 Hours	Internal Marks:	40
Tutorial:		External Marks:	60
Credits:	3		

Prerequisites: Water Resource Engineering

Course Objectives:

- 1) Teach Concepts of systems techniques in water resources engineering
- 2) Teach Linear Optimization concepts
- 3) Demonstrate the Development system approach to reservoir operation
- 4) Planning water allocation to different crops
- 5) Expertise on River operation policies

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Apply basic principles of system approach.
CO2	Judging Economics of water resources of multipurpose projects.
CO3	Apply optimization principles to single and multi crop applications.
CO4	Designing reservoir operation leading to optimum crop water application.
CO5	Apply optimization methods to solve problems related to water resource systems
CO6	Formulate optimization models for decision making in water resources systems.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	1	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-
CO6	2	2	-	-	-	-	-	1	-	-	-	-

UNIT I

UNIT 1

Concept of System and System Analysis - Definition and Types of Systems - Basic Principles of Systems Approach and Analysis. Systems Techniques in Water Resources.

LO: 1. Understand the concepts of water resource system.

Introduction to Optimization - Linear and Dynamic Programming - Simulation - Combined Simulation and Optimization. Economics of Water Resources Projects - Cost Benefit Analysis - Cost Allocation among various projects in a Multi-purpose Project.

LO: 1. Explain optimization of water resource projects.

2. Carryout cost analysis on different projects

UNIT II

Systems Approach to Reservoir - Deterministic Flows - Reservoir Sizing and Reservoir Operations. Basic Concepts of Random Flows Reliability.

LO: 1. Learn types of operations in water resource system.

UNIT III

Application of Linear Programming to Water Resources Systems - Irrigation Water Allocation for Single and Multiple Crops. Reservoir Operation for Irrigation and Hydropower Generation.

LO: 1. Understand applications of linear programming on applications of water resource system for crops.

UNIT IV

Applications of Dynamic Programming to Water Resources Systems - Optimal Crop Water Application - Steady State Reservoir Operating Policy for Irrigation. Real Time Reservoir Operation for Irrigation.

LO: 1. Develop knowledge on operating systems for irrigation.

TEXT BOOKS:

1. Loucks, D. P. and Eelco Van Beek, Water Resources systems planning and management: An Introduction to methods, models and applications. (2005), UNESCO.
2. Vedula, S. and Mujumdar, P. P., Water resources Systems: Modeling techniques and analysis, (2005), Tata McGraw Hill, New Delhi.

REFERENCE BOOKS:

1. Simonovic, S.P., Managing water resources: Methods and tools for a systems approach, (2009). UNESCO Publishing, France.
2. R. K. Sharma & T. K. Sharma, A Textbook Of Irrigation Engineering, S. Chand and Company Limited, New Delhi

E-RESOURCES:

- <http://www.nptelvideos.in/2012/11/water-resources-systemsmodeling.html>
- <http://www.nptelvideos.in/2012/11/advanced-hydrology.html>
- <http://freevidelectures.com/Course/100/Water-Resources-Engineering>
- <http://www.btechmaterials.com/download/water-resources-engineering-materials-notes/>
- <http://www.btechmaterials.com/download/water-resources-engineering-ii-materials-notes/>

18A3200801-ESSENCE OF INDIAN KNOWLEDGE AND TRADITIONS

Lecture – Tutorial: 2-0 Hours

Internal Marks: 40

Credits: 0

External Marks: 60

Prerequisites: -----

Course Objectives:

6. To develop knowledge of fundamental management concepts, skills and tools; to aid in problem solving and decision making.
7. To develop and understanding about the organizational structure and relationship between authority and responsibility in various structures.
8. To discuss the evolution of principles that make it possible to design facilities, processes, and control systems with a degree of predictability as to their performance.
9. To develop comprehensive skills in planning, selecting, motivating, and developing the human resources for organisational effectiveness.
10. To understand the broad scope of marketing, societal, ethical and other diverse aspects of marketing.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

C01	Understand the concept of Traditional knowledge and its importance
C02	Know the need and importance of protecting traditional knowledge
C03	Know the various enactments related to the protection of traditional knowledge
C04	Understand the concepts of Intellectual property to protect the traditional knowledge
C05	Develop comprehensive skills in planning, selecting, motivating, and developing the human resources for organisational effectiveness.
C06	Understand the broad scope of marketing, societal, ethical and other diverse aspects of marketing

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	2	-	-	-	-	-	-	2	-	-	-	-
C02	2	-	-	-	-	-	-	2	-	-	-	-
C03	2	-	-	-	-	-	-	2	-	-	-	-
C04	2	-	-	-	-	-	-	2	-	-	-	-
C05	2	-	-	-	-	-	-	2	-	-	-	-
C06	2	-	-	-	-	-	-	2	-	-	-	-

UNIT I

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT II

Protection of traditional knowledge: the need for protecting traditional knowledge
Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act);**B:** The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

UNIT III

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT IV

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

TEXT BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan 2012.

REFERENCE BOOKS:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
2. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

20A1200801: ENVIRONMENTAL Sciences
(Common to CE,EEE,ME and ECE)

Lecture – Tutorial:	2-0	Internal Marks:	30+70
Credits:	0	External Marks:	

Prerequisites:**Course Objectives:**

The objectives of the course are to impart:

- ❖ Overall understanding of the natural resources,
- ❖ Basic understanding of the ecosystem and its diversity.
- ❖ Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- ❖ An understanding of the environmental impact of developmental activities.
- ❖ Awareness on the social issues, environmental legislation and global treaties.

Course Outcomes:

CO1	➤ Illustrate the importance of sustainability in the progress of a nation. (L2)
CO2	➤ Infer the existence of ecosystems in maintaining ecological balance. (L2)
CO3	➤ Recall the importance of biodiversity and its conservation. (L1)
CO4	➤ Summarize the role of natural resources for the sustenance of life on earth and recognize the need to conserve them. (L2)
CO5	➤ Identify the environmental pollutants and the abatement devices to be used. (L3)
CO6	➤ Interpret environmental related acts and social issues. (L2)

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	-	-	2	3	2	-	-	2	2
CO2	3	2	2	-	-	2	3	2	-	-	2	2
CO3	3	2	2	-	-	2	3	2	-	-	2	2
CO4	3	2	2	-	-	2	3	2	-	-	2	2
CO5	3	2	2	-	-	2	3	2	-	-	2	2
CO6	3	2	2	-	-	2	3	2	-	-	2	2

UNIT I**(6hrs)**

Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Food chains, food webs and ecological pyramids- Ecological succession.

UNIT II**(4hrs)**

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social value. India as a mega diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. Endangered and endemic species of India – Conservation of biodiversity.

UNIT III**(7hrs)**

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT IV**(5hrs)**

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V**(6hrs)**

Social Issues and the Environment: Urban problems related to energy, rain water harvesting. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act. Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS. Ecotourism, Green Campus – Green business and Green politics.

TEXT BOOKS:

- 1) Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014
- 2) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
- 3) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
- 4) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCE BOOKS:

- 1) Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
- 2) A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
- 3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

E-RESOURCES: 1. <http://nptel.ac.in/courses.php>.

2. <http://jntuk-cocerd.in/>

ACADEMIC YEAR
2019-20

18A2100801- PROFESSIONAL ETHICS AND HUMAN VALUES

(Common to CE, CSE and IT)

Lecture – Tutorial: 2-0 Hours

Internal Marks: 40

Credits: 0

External Marks: 60

Prerequisites: Basic understanding about Engineering profession.

Course Objectives:

- 1) To create awareness on engineering ethics and human values.
- 2) To understand social responsibility of an engineer.
- 3) To instill moral and social values and loyalty.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Grooms themselves as ethical, responsible and societal beings.
CO2	Discuss ethics in society and apply the ethical issues related to engineering.
CO3	Exhibit the understanding of ethical theories in professional environment.
CO4	Recognize their role as social experimenters (engineers) and comprehend codes of ethics.
CO5	Identify the risks likely to come across in the professional world, analyzing them and find solutions.
CO6	Realize the responsibilities and rights of engineers in the society.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	1	1	2	-	-	-	1
CO2	-	-	-	-	-	1	1	2	-	-	-	1
CO3	-	-	-	-	-	1	1	2	-	-	-	1
CO4	-	-	-	-	-	1	1	2	-	-	-	1
CO5	-	-	-	-	-	1	1	2	-	-	-	1
CO6	-	-	-	-	-	1	1	2	-	-	-	1

UNIT I

Human Values: Objectives, Morals, Values, Ethics, Integrity, Work ethics, Service learning, Virtues, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Cooperation, Commitment, Empathy, Self-confidence, Challenges in the work place.

UNIT II

Engineering ethics Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III

Engineering as Social Experimentation: Engineering as experimentation, Engineers as responsible experimenters, Codes of ethics, Industrial standards, A balanced outlook on law, Case study: The challenger.

UNIT IV

Safety, Responsibilities and Rights: Safety and risk, types of risks, Assessment of safety and risk, Safe exit, Risk-benefit analysis, safety lessons from 'the challenger' , Case study: Power plants, Collegiality and loyalty, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, whistle blowing, Intellectual property rights, professional rights.

TEXT BOOKS:

- 'A Text book on Professional Ethics and Human Values' by R.S Naagarazan- New Age International Publishers.
- " Engineering Ethics includes Human Values" by M. Govindarajan, S. Natarajan and V. S. Senthil Kumar- PHI Learning Pvt. Ltd-2009

REFERENCE BOOKS:

"Professional Ethics and Human Values" by A. Alavudeen, R. Kalil Rahman and M. Jayakumaran- Laxmi Publications.

E-RESOURCES:

- www.onlineethics.org
- www.nspe.org
- www.globalethics.org
- www.ethics.org

18A2201403- ENGINEERING GEOLOGY

Lecture – Tutorial: 2-0 Hours

Internal Marks: 40

Credits: 2

External Marks: 60

Prerequisites: None

Course Objectives:

- 1) To understand weathering process and mass movement
- 2) To distinguish geological formations
- 3) To identify geological structures and process of rock mass quality.
- 4) To identify subsurface information and groundwater potential sites through geophysical investigations
- 5) To apply geological principles of mitigation of natural hazards and select sites for dams and tunnels

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Gain basic knowledge on characteristics of rocks and minerals.
CO2	Identify and differentiate rocks using geological classification.
CO3	Apply concepts of structural geology for civil engineering structures.
CO4	Understand the seismic zones of India.
CO5	Understanding about Geophysical investigation methods & Carryout geo physical investigations using various methods
CO6	Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	3	-	1	-	-	-	-	-	-	-
CO2	2	3	3	-	2	-	-	-	-	-	2	-
CO3	2	3	3	-	3	-	-	-	-	-	2	-
CO4	-	2	3	-	3	-	-	-	-	-	2	2
CO5	3	-	3	-	2	-	-	-	-	-	2	1
CO6	-	-	3	-	3	-	-	-	-	-	-	-

UNIT I

Earth Science

Application of Earth Science in Civil Engineering Practices, Understanding the earth, internal structure and composition. Weathering, erosion and denudations process on earth material and natural agencies, Geological work of wind, river underground water and glaciers Mineralogy: Mineral properties, composition and their use in the manufacture of construction materials – Quartz Group; Feldspar Group; Kaolin; Asbestos; Carbonate Group ; Gypsum; Mica Group; Ore minerals - Iron ores; pyrite; Chlorite

LO: 1. Explain the formation of earth and its internal structure

2. Understand weathering and formation of natural minerals

3. Explain composition of minerals and their utilization in construction industry.

UNIT II

Definition of rock - Rock forming processes - Geological classification of rocks - Dykes and sills, common structures and textures - Megascopic study, Chemical and Mineralogical Composition of rock (Granite, Gabbro, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Tuff, Felsite, Gneiss, Schist, Quartzite, Breccia, Marble, Porphyries, Charnockite and Slate).

Structural Geology:

Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints – their important types. Their importance insitu and drift soils, common types of soils, their origin and occurrence in India

LO: 1. Understand classification of rocks

2. Demonstrate chemical composition

3. Identify mineral composition of rock

4. Explain formation of folds strike and dip of geological structures

5. Assess importance of soils

6. Locate origin of different types of rocks and soils and their origin India

UNIT III

Geomorphology, hydrogeology and seismology:

Ground water, Water table - ground water exploration. Site selection for dams and tunnels – analysis of failures in dams and tunnels - Seismic zones of India - Earth quakes, their causes and effects. Seismic waves, Richter scale. Landslides - causes and effects; Tsunami – causes and effects.

LO: 1. Understand geomorphology

2. Identify procedures for site selection of important structures

3. Contrast seismic Zonation of India in stages

4. Understanding about Geophysical investigation methods

5. Carryout geo physical investigations using various methods.

UNIT IV

Geology of Dams, Reservoirs and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Life of Reservoirs Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

TEXT BOOKS:

1. N. Chenna Kesavulu, Text Book of Engineering Geology, 2nd Edition (2009), Macmillan Publishers India.

2. Vasudev Kanithi, Engineering Geology, Universities Press Pvt Ltd, Hyderabad. 2012.

REFERENCE BOOKS:

1. Parbin Singh, Engineering and General Geology, 8th Edition (2010), S K Kataria & Sons.

2. J. C. Harvey, Geology for Geotechnical Engineers, Cambridge University Press (1982).

3. Richard E. Goodman, Engineering Geology, Rock in Engineering Construction by John Wiley & Sons, Inc. 1993.

4. Billings, M. P., Structural Geology, Prentice-Hall India, 1974, New Delhi

E-RESOURCES:

18A2201492- ENGINEERING GEOLOGY LAB

Practical 2 Hours

Internal Marks: 40

Credits: 1.

External Marks: 60

Prerequisites: Engineering geology

Course Objectives:

Course Outcomes:

1. Identify minerals and rocks
2. Measure strike and dip of the bedding planes
3. Interpret geological maps

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	2	3	3	2	1	1	1	-	-	-	-
CO2	2	3	2	2	2	1	2	2	-	-	-	-
CO3	1	3	2	2	2	-	1	1	-	-	-	-

LIST OF EXPERIMENTS

1. Physical properties of minerals: Mega-scopic identification of
 - a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc...
 - b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc...
2. Megasopic description and identification of rocks.
 - a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc...
 - b) Sedimentary rocks – Sand stone, Ferruginous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc...
 - c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc...
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
4. Simple Structural Geology problems.
5. Bore hole problems

18A2201493- ADVANCED SURVEYING LAB

Practical Credits: 3 Hours
1.5

Internal Marks: 40
External Marks: 60

Prerequisites: Surveying

Course Objectives:

To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.

Course Outcomes:

1. Conduct survey and collect field data.
2. Prepare field notes from survey data
3. Interpret survey data and compute areas and volumes.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	-	1	1	-	-	-	-	-	-	2
CO2	2	1	-	1	1	-	-	-	-	-	-	-
CO3	3	3	-	2	1	-	-	-	-	-	-	2

LIST OF EXPERIMENTS

1. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of Repetition method.
2. Theodolite Survey: Finding the distance between two inaccessible points.
3. Theodolite Survey: Finding the height of far object.
4. Tachometric Survey: Heights and distance problems using tachometric principles.
5. One Exercise on Curve setting.
6. One Exercise on contours.
7. Total Station: Introduction to total station and practicing setting up, levelling up and elimination of parallax error.
8. Total Station: Determination of area using total station.
9. Total Station: Traversing
10. Total Station: Contouring
11. Total Station: Determination of Remote height.
12. Total Station: distance between two inaccessible points.

ACADEMIC YEAR
2018-19

ENVIRONMENTAL STUDIES
(Common to CE,EEE,ME,CSE and IT)

Lecture – Tutorial: 2-1
Credits: --

Internal Marks: 40
External Marks: 60

Prerequisites:

Course Objectives:

- Basic understanding of ecosystem and to know the importance of biodiversity.
- Understanding of natural resources.
- To understand different types of pollutants effecting the environment.
- To know global environmental problems, problems associated with over population and burden on environment.

COURSE OUTCOMES:

Upon successful completion of the course, the student will be able to:

- CO1 Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
- CO2 Understand the role of natural resources for the sustenance of life on earth and recognize the need to conserve them.
- CO3 Identify the environmental pollutants and abatement devices.
- CO4 Gain the importance of sustainability.

Contribution of Course Outcomes towards achievement of Program Outcomes

(1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2		3			2	3	2			2	1
CO2	2		3			2	3	2			2	1
CO3	2		3			2	3	2			2	1
CO4	2		3			2	3	2			2	1

UNIT I

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Ecological succession. - Food chains, food webs and ecological pyramids, flow of energy, biogeochemical cycles.

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity, India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity.

UNIT II

Natural Resources: Natural resources and associated problems

Forest resources - Use and over - exploitation, deforestation - Timber extraction - Mining, dams and other effects on forest and tribal people.

Water resources - Use and over utilization of surface and ground water -

Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources. Case studies.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction.

Land resources: land as a resource, land degradation, wasteland reclamation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT III

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards, Technological solutions for pollution control, Role of an individual in prevention of pollution with case studies.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Biomedical, Hazardous and E-waste management, carbon credits.

Disaster management: floods, droughts, earthquakes, cyclones.

UNIT IV

Social issues and the environment: Global environmental challenges- global warming and climate change, acid rains, ozone layer depletion.

Towards sustainable future: From unsustainable to sustainable development, population and its explosion, urban problems related to energy, rain water harvesting, consumerism and waste products, role of IT in environment and human health, HIV/ AIDS, environmental ethics.

Environmental management and acts: Impact assessment and significance, various stages of EIA, environmental management plan (EMP), green belt development. Environmental Law (Air, Water, Wildlife, Forest, Environment protection act).

The student should visit an industry/ Ecosystem and submit a report individually on any issues related to environmental studies course and make a power point presentation.

TEXT BOOKS:

1. Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2018
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCE BOOKS:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada.
3. Erach Bharucha, 2010 "Text Book of Environmental Studies", University Grants Commission, University Press (India) Pvt. Ltd., Hyderabad.
4. Text book of Environmental Science and Engineering by G. Tyler Miller Jr, 2006 Cengage learning.

E-RESOURCES:

1. <http://nptel.ac.in/courses.php>.
2. <http://jntuk-coeerd.in/>

18METE106B SOLAR ENERGY TECHNOLOGY

Lectures : 4 Periods / Week

Semester end Exam : 3 hrs

Credits : 3

Internal Assessment : 40

Semester end Examination : 60

UNIT - I

Introduction – Solar energy option, specialty and potential – Sun – Earth – Solar radiation, beam and diffuse – measurement – estimation of average solar radiation on horizontal and tilted surfaces – problems – applications. Capturing solar radiation – physical principles of collection – types – liquid flat plate collectors – construction details – performance analysis – concentrating collection – flat plate collectors with plane reflectors – cylindrical parabolic collectors – Orientation and tracking – Performance Analysis.

UNIT - II

DESIGN OF SOLAR WATER HEATING SYSTEM AND LAYOUT

Power generation – solar central receiver system – Heliostats and Receiver – Heat transport system – solar distributed receiver system – Power cycles, working fluids and prime movers, concentration ratio.

UNIT - III

THERMAL ENERGY STORAGE: Introduction – Need for – Methods of sensible heat storage using solids and liquids – Packed bed storage – Latent heat storage – working principle – construction – application and limitations. Other solar devices – stills, air heaters, dryers, Solar Ponds & Solar Refrigeration, active and passive heating systems.

UNIT - IV

DIRECT ENERGY CONVERSION: solid-state principles – semiconductors – solar cells – performance – modular construction – applications. conversion efficiencies calculations.

UNIT - V

ECONOMICS: Principles of Economic Analysis – Discounted cash flow – Solar system – life cycle costs – cost benefit analysis and optimization – cost based analysis of water heating and photo voltaic applications.

TEXT BOOK:

1. Principles of solar engineering/ Kreith and Kerider/Taylor and Francis/2nd edition

REFERENCES:

1. Solar energy thermal processes/ Duffie and Beckman/John Wiley & Sons
2. Solar energy: Principles of Thermal Collection and Storage/ Sukhatme/TMH/2nd edition
3. Solar energy/ Garg/TMH
4. Solar energy/ Magal/Mc Graw Hill
5. Solar Thermal Engineering Systems / Tiwari and Suneja/Narosa
6. Power plant Technology/ El Wakil/TMH