Department of Civil Engineering

List of programs in School of Engineering and their POs & PSOs

1. **M.Tech Environmental Engineering**
   School of Engineering and Technology provides M. Tech. degrees in the following programmes:

PROGRAM OUTCOMES OF M. TECH ENVIRONENTAL ENGINEERING

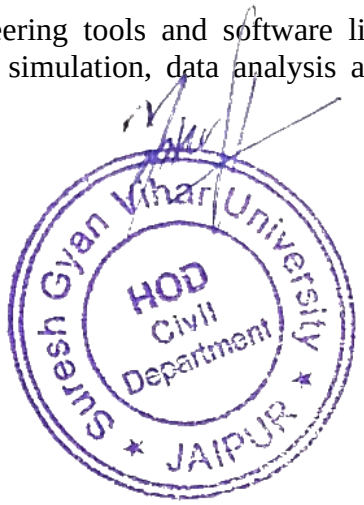
PO1. Engineering knowledge: An ability to carry out research investigation and give engineering solutions to solve practical problems pertaining to environmental engineering.

PO2. Problem analysis: An ability to write and compile technical report documents and deliver technical presentations acquiring good communication skills.

PO3. Design/development of solutions: An ability to demonstrate a degree of mastery over the area as per the specialization of the program, handle environmental engineering projects involving multidisciplinary fields.

PO4. Conduct investigations of complex problems: An ability to design systems and eco-friendly solutions associated with environmental engineering for sustainable infrastructure development.

PO5. Modern tool usage: An ability to apply modern engineering tools and software like EPANET, SEWER-CAD, etc in environmental engineering for simulation, data analysis and solving modern engineering problems.



M. TECH. ENVIRONMENTAL ENGINEERING

Program Specific Outcomes:

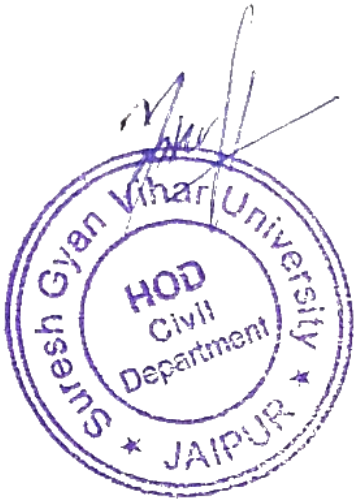
PSO-1: To excel in the core areas of environmental engineering such as waste remediation's, clean development mechanism, design water treatment units, atmospheric dynamics etc.

PSO-2: To develop and design sustainable infrastructure considering the global environmental challenges.

PSO-3: To understand the problems associated with complex environmental activities and provide solutions through appropriate technologies.

PSO-4: Understand the role legislation and policy drivers play in stakeholders' response to the environmental issues

Paper Code	**CEE 501**
Paper Title	**Environmental Chemistry and Microbiology**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	To apply conventional and novel bacterial wastewater treatment processes for nutrient removal.
CO 2	To understand the importance of various microbial processes in wastewater treatment.
CO 3	To assess the bacteriological status of water and aquatic systems.
CO 4	To monitor the health of soils for desired value such as agricultural activity, forestry etc.



Paper Code	**CEE 503**
Paper Title	**Air Pollution and Control**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	To classify and identify the sources of air pollutants and predict the effects of air pollutant on human health and environment.
CO 2	To apply and relate the significance of various air pollution dispersion models.
CO 3	To analyze the air quality and relate with air pollution regulation
CO 4	To design various air pollution control equipment and evaluate its use.

Paper Code	**CEE 505**
Paper Title	**Municipal Solid Waste Management**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	To identify and interpret the criteria for the classification of a substance as a solid/hazardous wastes.
CO 2	To recognize waste minimization and source reduction, assess and describe the procedure for solid and hazardous waste identification and characterization and various waste processing options.

CO 3	To define and elucidate the management, treatment and disposal of hazardous wastes.
CO 4	To apply ecological concepts in reclamation of degraded lands.

Paper Code	**CEE 507**
Paper Title	**Environmental Impact Assessment**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	To Assess the impacts of various projects based on EIA methodologies.
CO 2	To Identify the components of conflicts and the need of public participation in EIA.
CO 3	To Analyse the concept of ISO 14000 and EA with reference to Life cycle of a product.
CO 4	To Understand the various international and national treaties, and convention that laid the foundation for environmental awareness and revolution globally.
CO 5	To Elucidate and assess the Indian regulations on control and prevention of air pollution, water pollution; protection of forest and wildlife, and public liability insurance.

Paper Code	**CEE 502**

Paper Title	**Advanced Water Treatment Technology**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	To understand the unit processes for assessment and the use of relevant methods for advanced water treatment, and to apply these to specific needs.
CO 2	To consider the application of this in research projects, and to contribute to the development of new theories and methods in the field
CO 3	To use knowledge from the discipline for scientific assignments and projects, and to publish research results in recognized national and international channels.
CO 4	To Develop conceptual schematics required for biological treatment of wastewater

Paper Code	**CEE 504**
Paper Title	**Advanced Wastewater Treatment Technology**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	The management of residuals from water and wastewater treatment. .
CO 2	To understand the methods that are used for the design of a water and wastewater treatment plant.
CO 3	To inculcate the basics concepts of waste water treatment, its design and management.

Paper Code	CEE 504
Paper Title	**Groundwater Pollution**
Course outcomes	Upon successful completion students should be able to:
CO 1	To Identify the Types of pollutants in addition, air, water, soil pollution.
CO 2	To Employ recent communication and information technologies effectively in different tasks related to groundwater pollution.
CO 3	To Learn methods to measure and analyze the published data concerned with pollution.

Paper Code	CEE 508
Paper Title	Environmental Hydraulics
Course outcomes	Upon successful completion students should be able to:
CO 1	To explain collection and conveyance and to estimate quantity of wastewater.
CO 2	To describe wastewater characteristics; explain preliminary and primary treatment processes and its design along with effluent standards.
CO 3	To Explain the processes of biological treatment units for wastewater .

CO 4	To Describe low cost treatments, disposal methods and self purification capacity of the stream
CO 3	To Describe low cost treatments, disposal methods and self purification capacity of the stream

Paper Code	**CEE 601**
Paper Title	**Industrial Wastewater Treatment Technology**
Course outcomes	Upon successful completion students should be able to:
CO 1	Distinguish between the quality of domestic and industrial water requirements and Wastewater quantity generation
CO 2	Understand the industrial process, water utilization and waste water generation
CO 3	Acquire the knowledge on operational problems of common effluent treatment plants
CO 4	Impart knowledge on selection of treatment methods for industrial wastewater
CO 5	Specify design criteria for physical, chemical, and biological unit operations

Paper Code	**CEE 603**

Paper Title	**Water quality Modelling**
Course outcomes	Upon successful completion students should be able to:
CO 1	Understand the idea, methodology and basic tools of water quality modelling
CO 2	Understand the different modelling approaches, their scope and limitations
CO 3	Understand the fate and transport of pollutants in different water bodies
CO 4	Become mindful of a wide range of applications of modelling in water resources management & decision making
CO 5	To bring about a thorough exposure to shoring, scaffolding and formwork procedures in construction.

SURESH GYAN VIHAR UNIVERSITY

Accredited by NAAC with 'A' Grade

Department of Civil Engineering

SYLLABI

(Session 2021-22)

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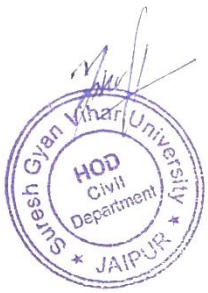

M.Tech

ENVIRONMENTAL ENGINEERING

(Civil Engineering)

SURESH GYAN VIHAR UNIVERSITY

Department Of Civil Engineering

Teaching and Examination Scheme for M.Tech EE.

Session 2021-22

I YEAR **I SEM**

S.NO	Course Code	Course Name	Credit	Contact Hours/Week			Exam Hours	Weightage (%)	
				L	T/S	P		CE	ESE
PROGRAMME CORE									
1	CEE 501	Environmental Chemistry and Microbiology	4	3	1	0	3	40	60
2	CEE 503	Air Pollution and Control	4	3	1	0	3	40	60
3	CEE 505	Municipal Solid Waste Management	4	3	1	-	3	40	60
4	CEE 507	Environmental Impact Assessment	4	3	1	0	3	40	60
5	CEE 551	Water Quality Lab	2	0	0	3		40	60
UNIVERSITY CORE									
6	PC 501	Proficiency in co-curricular activities	2	-	-	-	-	100	
7	EM 501	Employability skills	1	0	2	0	3	100	
8	FD 102	Foundation Course	1	1	0	0	3	25	75
UNIVERSITY ELECTIVE									
9		Students can opt from the list of university Elective							
		Total	**22**	**13**	**6**	**-**	**-**	**-**	**-**

Theory (17 Credit) + Lab (03 Credit) +Proficiency in Co-curricular Activities (2 Credit) + Employability skills (01 Credit) = 23 Credit

L= Lecture **T=Tutorial** **CE=Continuous Evaluation**

S= Seminar **P= Practical** **ESE= End Semester Examination**

SURESH GYAN VIHAR UNIVERSITY

Department Of Civil Engineering

Teaching and Examination Scheme for M.Tech EE.

Session 2021-22

I YEAR **II SEM**

S. No.	Course Code	Course Name	Credits	Contact Hrs/ Wk.			Exam. Hours	Weight age (%)	
				L	T/S	P		CE	ESE
PROGRAMME CORE									
1	CEE 502	Advanced Water Treatment Technology	4	3	1	-	3	40	60
2	CEE 504	Advanced Wastewater Treatment Technology	4	3	1	-	3	40	60
3	CEE 506	Groundwater Pollution	4	3	1	-	3	40	60
4	CEE 508	Environmental Hydraulics	4	3	1	-	3	40	60
5	CEE 552	Practical Training (4 Weeks)	3	-	-	-	3	60	40
6	CEE 554	Wastewater Analysis Lab	1	-	-	2	3	60	40
7	CEE 556	SEMINAR	1	-	-	3	3	60	40
UNIVERSITY CORE									
8	PC 502	Proficiency in co-curricular activities	2	-	-	-	-	100	-
9	EM 502	Employability skills	1	0	2	0	3	100	
10	FD 104	Foundation Course	1	1	0	0	3	25	75
UNIVERSITY ELECTIVE									
11		Students can opt from the list of university Elective							

		Total	**25**	**13**	**7**	**5**			

Theory (18 Credit) + Lab (04 Credit) +Proficiency in Co-curricular Activities (2 Credit) + Employability skills (01 Credit) = 25 Credit

L= Lecture **T=Tutorial** **CE=Continuous Evaluation**

S= Seminar **P= Practical** **ESE= End Semester Examination**

SURESH GYAN VIHAR UNIVERSITY

Department Of Civil Engineering

Teaching and Examination Scheme for M.Tech EE.

Session 2021-22

II YEAR **III SEM**

S. No.	Course Code	Course Name	Credits	Contact Hrs/ Wk.			Exam. Hours	Weight age (%)	
				L	T	P		CE	ESE
PROGRAMME CORE									
1	CEE 601	Industrial Wastewater Treatment Technology	4	3	1	-	3	40	60
2	CEE 603	Water Quality Modelling	4	3	-	-	3	40	60
3	CEE 661	Practical Training (4 Weeks)	4	-	-	-	3	40	60
4	CEE 663	SEMINAR	3	-	-	5	-	60	40
UNIVERSITY CORE									
5	PC 601	Proficiency in co-curricular activities	2	-	-	-	-	100	-
UNIVERSITY ELECTIVE									
		Students can opt from the list of university Elective							
		Total	**17**	**6**	**1**	**5**			
		Grand total		**12**					

Theory (8 Credit) + Lab (07 Credit) +Proficiency in Co-curricular Activities (2 Credit) = 17Credit

L= Lecture **T=Tutorial** **CE=Continuous Evaluation**

S= Seminar **P= Practical** **ESE= End Semester Examination**

SURESH GYAN VIHAR UNIVERSITY

Department Of Civil Engineering

Teaching and Examination Scheme for M.Tech EE.

Session 2021-22

II YEAR **IV SEM**

S. No.	Course Code	Course Name	Credits	Contact Hrs/ Wk.			Exam. Hours	Weightage (%)	
				L	T	P		CE	ESE
		A: Practical And Sessional							
1	DI 602	DISSERTATION	18	-	-	4	3	60	40
		Total	**18**	**0**	**0**	**4**			
		Grand total	**16**						

CEE 501 ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY C(L,T,P) = 4 (3,1,0)

UNIT	COURSE CONTENTS	Hours
I	**INTRODUCTION :**Objective, scope and outcome of the course	7
II	**Physical Chemistry:** Thermodynamics, Free Energy, osmosis, dialysis, law of mass action, chemical equilibrium and basic concepts of chemical kinetics.	7
III	**Biochemistry:** Biochemistry of carbohydrates, proteins, fats and oils, Enzymes, buffers, EMP and TCA pathways, electron transport mechanism and oxidation phosphorylation, photosynthesis.	7
IV	**General Chemistry:** Henry's law, activity coefficients, ionization of weak bases, and acids, solubility product, common ion effect, ways of shifting chemical equilibria, Adsorption isotherms..	**7**
V	**Microbiology:** Morphology and classification of bacteria, algae, fungi and viruses, elements of microscopy, Microorganisms of various aerobic and anaerobic biological waste treatment units, culture media for microorganisms, sterilization.	8
	Total	**36**

Reference Books:

1. B.S Bhal, GD Tuli and Arun Bhal, Essentials of Physical Chemistry, S. Chand & Co Ltd. New Delhi, 2003
2. Arun Kumar De, Environmental Chemistry, 5th ed, New Age International (P) Ltd, New Delhi
3. Stainer, R.Y., Ingrahum, J.L., Wheelis, M.C. and Painter, P.R. General Microbiology, MacMillan Edition Limited, London, 1989.
4. Pichai R. and Govindan, V.S., Edition, Biological processes in pollution control Anna University, Madras, 1988.

CEE 503 AIR POLLUTION AND CONTROL C (L,T,P) = 4 (3,1,0)

UNIT	COURSE CONTENTS	Hours
I	**INTRODUCTION** :Objective, scope and outcome of the course	7
II	**Sources and classification**: Classification of aerosols, gases vapours, natural air pollutants, properties of air pollutants. Meteorology: Factors influencing air pollution, wind roses, plume behaviour, estimation of plume rise. Air pollution standards and indices.	8
III	**Air Quality Monitoring**: Objectives, time and space variability in air quality, air sampling design, analysis and interpretation of air pollution data. **Air Pollution Modelling**: Dispersion models – Basquill model, ASME model, Gaussian plume model assumptions, limitations.	8
IV	**Effects of Air Pollutants**: Effect on man, material, vegetation, art treasurers. Air pollution disasters, Economic effects. Global effects of Air Pollutants: Green house effect, acid rains, ozone hole, heat islands.	**7**
V	**Particulate control Technology**: Dilution, control at source by equipments, setting chambers, cyclones, fabric filters, electrostatic precipitators, scrubbers.Control of Gaseous Pollutants: Adsorption, absorption, combustion, condensation. Indoor air pollution control.	**7**
	Total	**37**

Reference Books:

1. Wark K. & Warner C.F., Air Pollution its origin and Control.
2. Martin Craford (1980), Air Pollution Theory, Tata McGraw Hill Publishers
3. Stern A.C. (1968) Air Pollution, Vol. 1 - 5, Academic Press, New York.
4. Perkins H.C. (1974) Air Pollution, Mc Graw Hill Kogakusha Ltd., Tokyo

HS 501 **SOFT SKILLS TRAININIG I** **C (L, T, P) = 1 (1,1,0)**

Unit	Course Contents	Hours
I	Spoken English – PICTURE (p=pronunciation, I=inflection, C=Clarity & courtesy, T=Tone, U=Understanding and feedback, R=Rate of speech and Repeatition, E=Emphasis), Body Language Training, Active Listening	8
II	Introduction to business terms, Economic Times Reading, Communication skills	8
III	Johari Window Training, Firo-B Training, Relationship Management	10
IV	Role Plays, Conflict Management	7
V	I'm OK U'r OK Training, Time Management Training	6
	Total	39

CEE 505 MUNICIPAL SOLID WASTE MANAGEMENT C (L,T,P) = 3 (3,0,0)

UNIT	COURSE CONTENTS	Hours
I	**INTRODUCTION** :Objective, scope and outcome of the course. General: Problems Associated With Solid Waste Disposal. Generation of Solid Waste: Goals and Objectives of solid Waste Management, Classification of Solid Waste, Factors Influencing Generation of Solid Waste, Characteristics of Solid Waste. Analysis of Solid Waste.	8
II	**Onsite Handling, Storage and Processing**: Public Health and Aesthetics, Onsite handling, Onsite Storage, Dust bins, Community Containers, Container Locations Onsite Processing methods.	7
III	**Solid Waste Collection, Transfer and Transport**: Collection Systems, Equipment and Labour Requirement, Collection Routes, Options for Transfer and Transport Systems.	8
IV	**Processing and Disposal Methods**: Processing Techniques and Methods of Disposal, Sanitary Land filling, Composting and Incineration, Bioremediation.	7
V	**Recovery of Resources, Conversion Products and Energy**: Material Recovery, Energy Generation and Recovery Operation, Reuse in other Industry. Industrial Solid Waste: Nature, Treatment and Disposal methods.	8
	Total	**38**

Reference Books:

1. George Tchobanoglous, Frank Krieth, Handbook of Solid Waste Management, 2nd edition, McGraw Hill Publication, 2002
2. T. V. Ramachandran, Management of Municipal Solid Waste, Centre for Ecological Sciences, IISc Karnataka Research Foundation, 2009
3. George Techobanoglous et al, "Integrated Solid Waste Management", McGraw-Hill Publication, 1993.

CEE 507 ENVIRONMENTAL IMPACT ASSESSMENT C (L,T,P) 4(3,1,0)

UNIT	COURSE CONTENTS	Hours
I	**Introduction** :Objective, scope and outcome of the course Introduction & Concepts of EIA: effect of human activity on environment, concept of ecosystem imbalances, definition of E.I.A, E.I.S, E.M.P, industrial policy of the Govt. of India. International Protocols, Treaties and Conventions: Stockholm and Basal convention, Copenhagen conference, Rio-Earth summit, Indian Scenario: Guidelines of MoEF and CPCB.	7
II	**Methodologies for EIA**: preliminary assessment, quantification, comparison of alternatives and comprehensive E.I.As using Ad hoc, Overlays, Checklist, Matrix and Network methods.	7
III	**Prediction and assessment** of impacts on air, water, biota, noise, land, cultural and socio-economic environment. Water quality impact: Water quality criteria, standards and indices, Impacts on water quality of development projects.	7
IV	**Air quality impact**: Air quality criteria, standards and indices, air quality impact of industry transport systems Noise: Effects of noise on people, noise scales and rating methods, Noise barriers, estimating transportation noise impacts. Land Pollution due to construction activities. Biota: Impact on fauna and flora, mitigation measures, alternatives.	7
V	**Cultural and socio economic impacts**: effect of developmental projects on cultural and social settings and economic profile of the community. Energy impact: EIA of hydro, thermal and nuclear power plants Public Participation in environmental decision making, Some Case Studies of EIA.	8
	Total	**36**

Reference Books:

1. Burke,G., Singh, B.R., and Theodore, L. Handbook of Environmental Management and Technology, 2nd Ed., John Wiley & Sons, 2000.
2. Kulkarni, V. and Ramachandra, T.V., "Environment Management", TERI Press. 2009.
3. MoEF Guidelines and amendments as updated on http://moef.gov.in

CEE 551 **WATER QUALITY LAB** **C (L,T,P) 3 (0,0,3)**

COURSE CONTENTS	**Hours**
Introduction to Standards, Sampling, Collection & Preservation of Samples	**3**
Determination of pH, Colour and Odour for a water sample	**3**
Determination of Acidity and Alkalinity for a water sample	**3**
Determination of Conductivity for a water sample	**3**
Determination of Calcium, Magnesium and Total Hardness for a water sample	**3**
Determination of Turbidity for a water sample	**3**
Determination of Chlorides for a water sample	**3**
Determination of Nitrates for a water sample	**3**
Determination of Optimum Dosage of Alum using Jar test apparatus.	**3**
Determination of available chlorine in bleaching powder and Residual Chlorine for a water sample	**3**

Recommended Text / Reference Books / Manuals:

1. Lab Manual, ISO 14001 Environmental Management, Regulatory Standards for Drinking Water and Sewage disposal.
2. Clair Sawyer and Perry McCarty and Gene Parkin, "Chemistry for Environmental Engineering and Science", McGraw-Hill Series in Civil and Environmental Engineering.
3. Guide manual: Water & wastewater analysis, Central Pollution Control Board, Govt. of India.
4. APHA standard methods for the examination of water and wastewater – 20th edition.
5. Water supply engineering by S.K. Garg- 30th Edition, Khanna Publications, New Delhi
6. Environmental Engg. Laboratory Manual by R.P. Mathur

CE 502 ADVANCED WATER TREATMENT TECHNOLOGY C (L,T,P) = 3(3,0,0)

UNIT	COURSE CONTENTS	Hours
I	**INTRODUCTION** :Objective, scope and outcome of the course. Water Quality Parameters: Significant water quality parameters for Municipal Water Supplies. Standards and Guidelines of Water for drinking purposes.	8
II	**Water Treatment**: Settling types, Discrete particle settling, Flocculent Settling, Theory of Tube Settlers, Plate Settlers, Choice of Clarifires, Ideal sedimentation Tank Concept.	8
III	**Coagulation**: Theory, Chemistry and Mechanism of Coagulants, Coagulant Aids, Flocculation, Orthokinetic, Perikinetic, Mean Velocity Gradient, Long Rectangular Basin, Circular Basin Design of Clariflocculators.	8
IV	**Filtration:** Theory, Carman Kozeny equation, Filter Arrangement, Filter operation. Disinfection: Types, Mechanisms of, Factors Influencing Efficiency of Disinfectants, Chlorine Chemistry, Chlorinator.	7
V	**Miscellaneous Methods**: Process and Application of Ion Exchange, Adsorption, Reverse Osmosis, Electro-dialysis.	7
	Total	**38**

Reference Books:

1. AWWA, (1971), "Water Quality and Treatment "McGraw Hill.
2. CPHEEO Manual, (1991), "Water Supply and Treatment", GO Publications.
3. Peavy, H.S., Rowe and Tchobonoglous,G., (1985), "Environmental Engineering", McGraw Hil

CE 504 ADVANCED WASTEWATER TREATMENT TECHNOLOGY C (L,T,P) =3(3,0,0)

UNIT	COURSE CONTENTS	Hours
I	**INTRODUCTION** :Objective, scope and outcome of the course Wastewater Characteristics and their significance. B.O.D., Methods of Determination of K and Lo, Nitrification, Comparison of various methods of Determination of Organics.	8
II	**Screens**, Grit Chamber, Floatation, Sedimentation, Zone Settling, Classification of biological Wastewater Treatment Process, Design of PST and SST.	7
III	**Aeration of Wastewater**, Oxygen Transfer : Process, Kinetic Relationship of Bio-Kinetic Parameters, Design Procedure, Modifications of A.S.P., Extended Aeration, Contact Stabilization, Step aeration, Tapered aeration, Trickling Filters: Theory, Physical Arrangements, Design of ponds and Lagoons. Theory & Design of Rotating Biological Contactors, Concepts of Sequencing Batch Reactors Anaerobic & Filter UASB Sewage Farming.	7
IV	**Sludge**: Sources, Characteristics, Volume- Mass relationship, Sludge Stabilization, Conventional and High Rate Digesters, Gas Production, Collection, Disposal of Sludge.	7
V	**Tertiary treatment**: Nitrogen removal, Phosphorus Removal.	7

Reference Books:

1. "Water-wastewater engineering", Fair G.M., Geyer J.G and Okun
2. Water Supply and Sanitary Engineering G.S. Bridie & J.S. Bridie, Dhanpat Rai & Sons, New Delhi

CEE 506 **GROUNDWATER POLLUTION** C (L,T,P) = 3(3,0,0)

UNIT	COURSE CONTENTS	Hours
I	**INTRODUCTION** :Objective, scope and outcome of the course WATER QUALITY: Natural occurrence of common solutes in water, Suspended & dissolved constituents, Principle chemical constituents in ground water, water quality criteria for drinking, Agricultural and Industrial uses, Quality of ground water resources.	7
II	**SOURCES OF POLLUTION**: Various sources & causes of ground water pollution. Activities generating contaminants, Types of contaminants & Mechanism of ground water pollution	8
III	**MOVEMENT OF POLLUTANTS**: Principles of Pollutant movement (Darcy's law, Hydraulic Conductivity, Anisotropic Aquifer), Attenuation of pollution in the ground, Pollution dispersion in the ground. Ground water movement in saturated zone. Factors affecting Pathogen movement & Survival, Transportation equation, ground water remediation.	7
IV	**PROBLEMS OF TOTAL DISSOLVED SOLIDS**: Fluoride &Nitrate Pollution of ground water, Natural occurrence of Nitrates & sources related to man's activities. Groundwater Legislation in India and Case histories, Salt water intrusion and related artificial recharge studies.	8
V	**MONITORING GROUNDWATER QUALITY**: General principles, Monitoring Management of Ground Water Quality, Section of Parameters for Monitoring. Economic considerations in ground water quality management.	8
	Total	**38**

Reference Books:

1. Raghunath, Groundwater & Well Hydraulics, Wiley Eastern Ltd, New Delhi, 1992
2. Groundwater Pollution, Volume 41st Edition by J.J. Fried.

CEE508 **ENVIRONMENTAL HYDRAULICS** **C(L,T,P)=3(3,0,0)**

UNIT	COURSE CONTENTS	Hours
I	**INTRODUCTION** :Objective, scope and outcome of the course Evaporation and infiltration: measurement and estimation of evaporation from land and water surfaces. Infiltration, factors affecting infiltration. Hydrograph analyses: Surface runoff, overland flow, factors affecting runoff. Rational formula. Hydrograph analyses, Unit hydrograph, channel and storage routing.	8
II	**Groundwater Development**: Well development, Artificial recharge, Salinity of Ground water, Ground water pollution, Infiltration Galleries	7
III	**Water Distribution System**: General design requirements, Methods of analyses, control of water hammer in long distance transmission. Introduction to optimization of water distribution system.	7
IV	**Sewerage system design**: General design principles of sewers, Recent development in sewerage system design. Urban Storm Drainage: Introduction to drainage problems in difficult climates. Planning concepts, Rainfall intensity-duration-frequency curves. Design of drainage system elements, control of storm water pollution.	7
V	**Water and wastewater pumping**: Classification, selection, installation, operation and maintenance of pumps for water and wastewater pumping, electrical motors, choice and installation, starters and other accessories.	7
	Total	**36**

Reference Books:

1. McGhee, Water supply and sewerage, McGraw Hill, New Delhi (1991).
2. Wurbs RA and James WP, Water resources engineering, PHI New Delhi (2002).
3. Nathanson, JA, Basic environmental technology, PHE, New Delhi (2003).
4. A. Vermjit, " Theory of Groundwater Flow" - MacMillan, 1970
5. H. Boluwer, " Groundwater Hydrology" - McGraw Hill, Kogakusha, 1979

HS 502 **SOFT SKILLS TRAININIG II** **C (L, T, P) = 1(1,0,0)**

Unit	Course Contents	Hours
I	Making impact making business presentations	6
II	Team Management and Collaborative Work Culture	8
III	Training in Anchoring and Public Speaking	6
IV	Emotional Intelligence Training	7
V	Business Games, Business Etiquettes	10
	Total	37

CEE 554 **WASTEWATER ANALYSIS LAB** **C (L, T, P) = 1 (0,0,2)**

S.No.	List of Experiments	Hours
	Measurement of Wastewater / Sewage Parameters	
1	Determination of Total Solids in sewage sample	
2	Determination of Dissolved and Suspended Solids in sewage sample	
3	Determination of Volatile and Fixed Solids in sewage sample	
4	Determination of Settleable Solids in sewage sample	
5	Determination of Dissolved Oxygen in wastewater sample	
6	Determination of BOD in wastewater sample	
7	Determination of COD in wastewater sample	
8	Determination of Heavy Metals in wastewater sample	
9	Introduction to Microscope, its types & applications	
10	Introduction to MPN and MF techniques	

CEE 601 INDUSTRIAL WASTEWATER TREATMENT TECHNOLOGY C (L,T,P) = 4 (3,1,0)

UNIT	COURSE CONTENTS	Hours
I	**INTRODUCTION** :Objective, scope and outcome of the course General: Comparative study of industrial waste water with municipal wastewater, Industrial wastewater problems in India: Effects of discharges of Industrial Waste of Receiving Bodies of Water, Land and Sewer. Effluent and Stream Standards. Historical Development of law related to environmental Protection, Salient feature of Water Act- 1974, Air Act-1981 and Environmental (Protection) Act -1986	7
II	**Specific Industrial Treatment Processes**: Neutralization,Equalization and Proportioning, Volume and strength reduction	8
III	**Raw materials**, Water requirements, Process Characteristics, Composition, effects and treatment, flow sheet of Industrial Wastewaters generated from: Textile (Cotton and Synthetic), tannery, Pulp and Paper, Dairy, Metal Plating (Chromium and Cyanide problem), Slaughter house	8
IV	**Distillery, Dyeing and printing, Fertilizer, Copper & Cement Industry**. Provision of various Indian Standards for above Industries	7
V	**Potential of Wastewater** Recycle and Reuse in Industries, Concept of Common Effluent Treatment Plants	7
	Total	**37**

Reference Books:

1. Mark J. Hammer, Mark J. Hammer, Jr., "Water & Wastewater Technology", Prentice Hall of India.
2. N.L. Nemerrow –Theories and practices of Industrial Waste Engineering.
3. C.G. Gurnham –Principles of Industrial Waste Engineering.
4. Mark J. Hammer, Mark J. Hammer, Jr., "Water & Wastewater Technology", Prentice Hall of India.
5. N.L. Nemerrow –Theories and practices of Industrial Waste Engineering.
6. C.G. Gurnham –Principles of Industrial Waste Engineering.

CEE 603 **WATER QUALITY MODELLING** **C (L,T,P) = 3 (3,0,0)**

UNIT	COURSE CONTENTS	Hours
I	**INTRODUCTION** :Objective, scope and outcome of the course Introduction: concepts of scale in natural systems, brief review of the fate processes in the environment, examples of natural systems, principles of model formulation, calibration, validation, error estimation and sensitivity analysis	7
II	**Derivation of generalized** mass balance equation for contaminants in incompressible fluid(water) in the non-inertial frame of reference	7
III	**River Modelling**: one dimensional advection-dispersion-reaction model, river properties and estimation of parameters, different forcing situations (point, non-point, aerial sources and sinks), sediment water interaction	8
IV	**Estuary Modelling**: types and properties, flow characterization, advection-dispersion models, salt gradient box models; Lake Modelling: box models, generalized models, special considerations for large lakes, sediment mixing and interaction with water column	8
V	**Wetlands**: box models for flow, equilibrium and kinetic geochemical models for red-ox reactions, transport of heavy metals	8
	Total	**38**

Reference Books:

1. Water Quality Modeling for Rivers and Streams by Benedini, Marcello & Tsakiris, George
2. Water Quality Modelling for Rivers, Streams and Estuaries by Dr. R. Manivanan