

**INTEGRAL UNIVERSITY**  
**DEPARTMENT OF CIVIL ENGINEERING**

**PROGRAMME:** M. TECH. ENVIRONMENTAL ENGINEERING.

**PROGRAM SPECIFIC OUTCOMES (PSO):**

**PSO-1:** Facilitate and develop knowledge based on water/waste water, Air and solid waste management and research based on Environmental Engineering.

**PSO-2:** Able to become professionals such as Environmental Engineer, solid waste manger, Waste water expert etc.

**PROGRAM EDUCATIONAL OBJECTIVES (PEO):**

**PEO-1:** The student will become effective Environmental engineer by facilitating appropriate theoretical concepts in dealing with practical based real-life problems associated with Environmental Engineering and develop the necessary tools for the same.

**PEO-2:** Students will provide solution in Environmental Engineering problems in account for economical, societal and ethical by applying Environmental engineering knowledge.

**PEO-3:** Students will deliver effective lifelong learning and maintain the technical and professional growth.

**PROGRAM OUTCOMES (PO):**

- PO1- Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2- Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3- Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4- Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5- Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6- The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7- Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8- Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9- Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10- Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11- Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12- Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**COURSE: STATISTICS FOR ENVIRONMENTAL ENGINEERS****COURSE CODE: CE521/CEE521****COURSE OBJECTIVES:**

- To develop the knowledge of measures of centre tendency, principle of least square, rank correlation.
- To develop the knowledge of estimates for population proportion, sample distribution.
- To develop the knowledge of testing of hypothesis of small samples.
- To develop the knowledge of testing of large samples.
- To develop the knowledge of different linear programming methods.

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Student will be able to determine mean, median and able to understand principle of least squares and its respective applications.
CO2	Student will be able to determine mean, median and able to understand principle of least squares and its respective applications.
CO3	Student will be able to test small samples using-r, chi-square & f-distribution.
CO4	Student will be able to test large samples based on normal distribution.
CO5	Student will be able to do problems using graphical, sine pleas, Big M method and also can solve transportation & assignment problem.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Student will be able to determine mean, median and able to understand principle of least squares and its respective applications.	3	3	1	3	3	2	1	0	2	2	0	1
CO2	Student will be able to determine mean, median and able to understand principle of least squares and its respective applications.	3	3	1	3	3	2	1	0	2	2	0	1
CO3	Student will be able to test small samples using-r, chi-square & f-distribution.	3	3	1	3	3	2	1	0	2	2	0	1
CO4	Student will be able to test large samples based on normal distribution.	3	3	1	3	3	2	1	0	2	2	0	1
CO5	Student will be able to do problems using graphical, sine pleas, Big M method and also can solve transportation & assignment problem.	1	2	1	3	3	1	0	2	1	0	0	1
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE OBJECTIVES:**

- To impart the knowledge of elementary physical chemistry.
- To inculcate the basic concept of aquatic chemistry and biochemistry.
- To enhance the fundamentals of environmental chemicals their existence and impact.
- To impart the knowledge of atmospheric chemistry.
- To develop the knowledge of fundamentals of analytical principles applied in experimental analysis.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learner will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learners will be able to understand various types of reactions, kinetic equations of different orders, determine equilibrium constant by applying Le-Chatelier principle and theory of catalysis and adsorption and can analyze physico-chemical processes involved in different environmental problems (air, water & soil)
CO2	Learners will be able to understand the fundamental of aquatic chemistry and can determine aquatic chemical reactions occurring in water resources along with the microbial redox reactions, enzyme mechanism and basic principles of degradation of bimolecular and colloidal chemistry.
CO3	Learners will be able to recognize different types of toxic substances (lead, mercury, arsenic and chromium) & responses by applying chemical speciation, analyze their toxicological information and predict the fate of pesticides in the environment by assessing their presence, projected risks and biochemical effects.
CO4	Learners will be able to understand the basic concepts of atmosphere chemistry, discuss local and global environmental issues such as ozone depletion, green house gases, acid rain, global warming their causes, consequences and remedial measures.
CO5	Learners will be able to analyze physico-chemical properties of water and wastewater sample according to IS 10500:2012 Code, and will be able to perform various advance spectral methods used in determination of toxic and heavy metals present in air water and soil.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learners will be able to understand various types of reactions, kinetic equations of different orders, determine equilibrium constant by applying Le-Chatelier principle and theory of catalysis and adsorption and can analyze physico-chemical processes involved in different environmental problems (air, water & soil)	3	3	2	0	0	0	0	0	0	0	0	1
CO2	Learners will be able to understand the fundamental of aquatic chemistry and can determine aquatic chemical reactions occurring in water resources along with the microbial redox reactions, enzyme mechanism and basic principles of degradation of bimolecular and colloidal chemistry.	3	3	0	0	1	0	0	0	0	0	0	0
CO3	Learners will be able to recognize different types of toxic substances (lead, mercury, arsenic and chromium) & responses by applying chemical speciation, analyze their toxicological information and predict the fate of pesticides in the environment by assessing their presence, projected risks and biochemical effects.	3	3	2	2	2	1	0	0	0	0	1	2
CO4	Learners will be able to understand the basic concepts of atmosphere chemistry, discuss local and global environmental issues viz ozone depletion, green house gases, acid rain, global warming their causes, consequences and remedial measures.	3	3	3	0	3	1	0	2	1	0	1	2

CO5	Able to analyze physico-chemical properties of water and wastewater sample according to IS 10500:2012 Code, and will be able to perform various advance spectral methods used in determination of toxic and heavy metals present in air water and soil.	3	3	3	0	3	3	0	2	1	0	2	2
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: ENVIRONMENTAL MICROBIOLOGY****COURSE CODE: CE523/CEE523****COURSE OBJECTIVES:**

- Student will be able to understand the basic of microbial, structural and functional characteristics of prokaryotes and eukaryotes cells.
- Student will be able to understand the basics of metabolism and other essential requirements for the growth of microorganism.
- Student will learn about different micro organism present in water and M.F techniques to control the problems caused by microorganism and algae.
- Student will be able to understand the basic microbiology to treat waste water.
- Student will be able to understand about ecotoxicity and removal of toxicity in waste water.

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Student will be able to identify the prokaryotic and eukaryotic cells depending upon the DNA.
<b>CO2</b>	Student will be able to explain the growth of micro organism.
<b>CO3</b>	Student will be able to identify the contaminated water after testing the water for micro organism and control the problems.
<b>CO4</b>	Student will be able to treat waste water biologically.
<b>CO5</b>	Student will be able to remove toxicity in waste water biologically.

**CO-PO MAPPING:**

<b>CO</b>	<b>DESCRIPTION</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	Student will be able to identify the prokaryotic and eukaryotic cells depending upon the DNA.	0	1	0	0	1	1	1	0	0	0	0	0
<b>CO2</b>	Student will be able to explain the growth of micro organism.	0	0	0	1	0	1	1	0	1	0	0	0
<b>CO3</b>	Student will be able to identify the contaminated water after testing the water for micro organism and control the problems.	1	1	0	0	0	1	1	0	0	0	0	1
<b>CO4</b>	Student will be able to treat waste water biologically.	1	2	1	0	0	1	1	0	0	0	1	1
<b>CO5</b>	Student will be able to remove toxicity in waste water biologically	1	1	1	1	0	0	1	0	0	0	0	0

3: Strong contribution, 2: average contribution, 1: Low contribution

**COURSE: TRANSPORT OF WATER AND WASTEWATER**  
**COURSE CODE: CE524/CEE524**

**COURSE OBJECTIVES:**

- Student will be able to understand about the fluid properties.
- Student will be able to understand the various types of material used in the lying of water and waste pipes.
- Student will be able to learn basic principle of water and waste water transportation system.
- Student will be able to understand the design of water and waste transmission lines.
- Student will be able to learn the different software for water distribution.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Student will be able to demonstrate about the properties of fluid
CO2	Student will be able to select best material and method used in the lying of water and waste pipes.
CO3	Student will be able to adopt the best methods of collection and conveyance of waste water in sewers.
CO4	Student will be able to analyses the water distribution and sewer design.
CO5	Student will be able to understand the application of various software's used in the design of water and waste water transport system.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Student will be able to demonstrate about the properties of fluid.	2	1	1	1	0	0	0	0	0	0	1	1
CO2	Student will be able to select best material and method used in the lying of water and waste pipes.	2	2	1	1	0	1	1	0	1	0	1	1
CO3	Student will be able to adopt the best methods of collection and conveyance of waste water in sewers.	1	1	1	0	0	0	0	0	0	0	1	1
CO4	Student will be able to analyses the water distribution and sewer design.	1	1	1	1	2	0	0	0	0	0	1	1
CO5	Student will be able to understand the application of various software's used in the design of water and waste water transport system.	2	1	1	0	0	0	0	0	0	0	0	0
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: INDUSTRIAL WASTEWATER MANAGEMENT**  
**COURSE CODE: CE525/CEE525**

**COURSE OBJECTIVES:**

- To give the knowledge of various industrial waste water sources, and their permissible levels.
- To give the knowledge about the various treatment procedures of industrial wastewater treatment.
- To give the knowledge about the advance methods of treatment of industrial wastewater and its reuse.
- To give the knowledge of characteristics industrial wastewater with the help of case studies.
- To develop the knowledge of treatment process of waste water from different industries.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To enable the student about the sources and their permissible levels as per Indian standard.
CO2	To enable the to learn the methods of treatment of industrial wastewater treatment
CO3	To enable the student to learn the various advance methods of wastewater treatment and its reuse
CO4	To enable the student to understand various characteristics of industrial wastewater by taking case studies
CO5	To enable the student to learn the process of designing of treatment plant for treating the waste form different industries

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	To enable the student about the sources and their permissible levels as per Indian standard.	1	2	3	1	2	1	2	3	0	0	0	0
CO2	To enable the to learn the methods of treatment of industrial wastewater treatment	1	2	1	2	1	2	1	2	0	0	0	0
CO3	To enable the student to learn the various advance methods of wastewater treatment and its reuse	1	2	1	3	1	1	1	1	0	0	0	0
CO4	To enable the student to understand various characteristics of industrial wastewater by taking case studies	1	1	2	3	2	1	2	2	0	0	0	0
CO5	To enable the student to learn the process of designing of treatment plant for treating the waste form different industries	3	3	3	2	1	1	1	1	1	1	1	2
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: AIR POLLUTION CONTROL**

**COURSE CODE: CE526/CEE526**

**COURSE OBJECTIVES:**

- Introduction about air pollution sources, meteorology and air pollution.
- To study about various devices used for particulate matters.
- To study about gaseous pollutant control.
- To know about air pollution control measures at different industries projects.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students are able to understand about air pollutants, meteorological effect on air pollution.
CO2	Students understand about various devices used for control of particulate matters.
CO3	Students are able to understand about various techniques to control gaseous pollutants.
CO4	Students learn about automobile and noise pollution and their controlling techniques.
CO5	Students know about various air pollution control measures at different industries.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Students are able to understand about air pollutants, meteorological effect on air pollution.	3	2	2	3	2	2	3	1	2	2	1	2
CO2	Students understand about various devices used for control of particulate matters.	3	2	2	2	3	3	3	2	1	2	0	2
CO3	Students are able to understand about various techniques to control gaseous pollutants.	3	3	2	3	2	2	3	2	2	2	1	2
CO4	Students learn about automobile and noise pollution and their controlling techniques.	3	3	1	2	2	2	3	2	2	2	1	2
CO5	Students know about various air pollution control measures at different industries.	3	1	2	2	3	2	2	2	1	1	2	2
3: Strong contribution, 2: average contribution, 1: Low contribution													



**COURSE: LABORATORY AND FIELD TESTING****COURSE CODE: CE530/CEE530****COURSE OBJECTIVES:**

- Student will be able to learn how to take sample of water and waste water and to analysis the water and waste water chemically and physically.
- Student will be able to learn to take air sample and analysis them for ambient air and noise pollution.
- Student will be able to learn to analysis the water for microbiology test.

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Student will be able to analysis the different physical and chemical characteristics of water and waste water.
<b>CO2</b>	Student will be able to analysis the different air and noise quality parameter.
<b>CO3</b>	Student will be able to analysis the water for microbiology test.

**CO-PO MAPPING:**

<b>CO</b>	<b>DESCRIPTION</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	Student will be able to analysis the different physical and chemical characteristics of water and waste water.	2	1	0	1	2	2	2	1	2	1	0	2
<b>CO2</b>	Student will be able to analysis the different air and noise quality parameter.	2	1	1	0	2	2	2	1	2	1	0	2
<b>CO3</b>	Student will be able to analysis the water for microbiology test.	2	1	0	1	2	2	2	1	2	1	0	1
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE OBJECTIVES:**

- Student will be able to understand about soil waste, its generation, legislation and its monitoring responsibilities.
- Student will be able to analyse the waste collection systems and its transportation.
- Student will learn about identification of hazardous wastes and its characteristics.
- Student will be able to learn the different Hazardous waste treatment technologies.
- Student will be able to learn the method of laboratory tests on solid waste.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Student will be able to characterize the solid waste.
CO2	Student will be able to analyse the best transportation system which may be used for solid waste collection.
CO3	Student will be able to identify the hazardous waste, its proper handling and storage.
CO4	Student will be able to treat the hazardous waste.
CO5	Student will be able to do the various laboratory tests on solid waste.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Student will be able to characterize the solid waste.	0	0	0	0	0	1	1	1	1	0	0	0
CO2	Student will be able to analyse the best transportation system which may be used for solid waste collection.	1	1	1	0	1	1	1	0	0	1	2	1
CO3	Student will be able to identify the hazardous waste, its proper handling and storage.	0	0	0	0	2	1	2	1	1	0	0	0
CO4	Student will be able to treat the hazardous waste.	2	1	0	0	1	1	1	1	0	0	1	1
CO5	Student will be able to do the various laboratory tests on solid waste.	1	0	0	0	0	0	0	0	1	0	0	1
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: DESIGN AND OPERATIONS OF WATER AND WASTEWATER TREATMENT PLANTS**  
**COURSE CODE: CE532/CEE532**

**COURSE OBJECTIVES:**

- To develop the knowledge of designing of different operating, systems in a water treatment plant.
- To develop the knowledge of designing of different operating, systems in a water treatment plant.
- To develop the knowledge of designing of different operating, systems in an industrial water treatment plant.
- To develop the knowledge of operation, management and maintenance of treatment plant.
- To enhance the knowledge of different treatment plants through visiting different existing treatment plant sites.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Student will be able to design different operational units of a water treatment plant.
CO2	Student will be able to design different operational units of a water treatment plant.
CO3	Student will be able to design different operational units of an industrial water treatment plant.
CO4	Student will be well versed in operation, maintenance, management of different treatment plants.
CO5	Student will be able to explain about different process of treatment plants.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Student will be able to design different operational units of a water treatment plant.	3	2	3	2	3	3	2	2	2	2	2	1
CO2	Student will be able to design different operational units of a water treatment plant.	3	2	3	2	3	3	2	2	2	2	2	1
CO3	Student will be able to design different operational units of an industrial water treatment plant.	3	2	3	2	3	3	2	2	2	2	2	1
CO4	Student will be well versed in operation, maintenance, management of different treatment plants.	1	1	2	3	2	2	2	1	2	2	1	1
CO5	Student will be able to explain about different process of treatment plants.	1	1	0	0	2	1	1	0	1	1	0	2
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: ENVIRONMENTAL IMPACT ASSESSMENT****COURSE CODE: CE533/CEE533****COURSE OBJECTIVES:**

- To inculcate the basic concept of Environmental Impact Assessment (EIA).
- To impart the knowledge of components and Methods of EIA.
- To enhance the fundamentals of quality control in EIA practice and evaluation.
- To impart the knowledge of documentation and monitoring of developmental projects.
- To edify some case studies of EIA of developmental projects at national & international level.

**COURSE OUTCOMES (CO):***After the successful course completion, learner will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learners will be able to understand the concept of Environmental Impact Assessment (EIA) along with its standard operating procedures as per Indian legal and regulatory aspects.
CO2	Learners will be able to be aware of the essential mechanism of EIA and can perform cost benefit analysis and predict the impacts on air, water, soil, noise, biological, cultural, social and economic environments.
CO3	Learners will be able to identify the crucial aspects of quality control and can evaluate various trends in EIA practice and evaluation criteria along with capacity building for quality assurance at national & global level.
CO4	Learners will be able to prepare the detailed project report (DPR) for any proposed developmental project and can imply proper Environmental Management Plan for proposed project.
CO5	Learners will be able to understand the pros and cons of some case studies of EIA of developmental projects.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learners will be able to understand the concept of Environmental Impact Assessment (EIA) along with its standard operating procedures as per Indian legal and regulatory aspects.	3	3	3	2	0	3	1	2	0	1	3	0
CO2	Learners will be able to be aware of the essential mechanism of EIA and can perform cost benefit analysis and predict the impacts on air, water, soil, noise, biological, cultural, social and economic environments.	3	3	3	2	2	3	3	2	0	1	3	1
CO3	Learners will be able to identify the crucial aspects of quality control and can evaluate various trends in EIA practice and evaluation criteria along with capacity building for quality assurance at national & global level.	3	3	3	2	2	3	3	2	0	1	3	1
CO4	Learners will be able to prepare the detailed project report (DPR) for any proposed developmental project and can imply proper Environmental Management Plan for proposed project.	3	3	3	2	2	3	3	3	0	1	3	1
CO5	Learners will be able to understand the pros and cons of some case studies of EIA of developmental projects.	3	3	3	2	2	3	2	1	0	1	3	0
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: UNIT OPERATIONS AND PROCESSES IN WATER AND WASTEWATER TREATMENT**  
**COURSE CODE: CE534/CEE534**

**COURSE OBJECTIVES:**

- To inculcate the basic concept of Unit Operations and Unit Processes.
- To impart the knowledge of water Treatment.
- To enhance the knowledge of wastewater treatment.
- To impart the knowledge of basis designing of water and wastewater treatment system.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learner will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learners will be able to comprehend about selection criteria of unit operations and processes, types of Reactors, Mixing, Coagulation and Flocculation and their importance in primary treatment of water and wastewater treatment process.
CO2	Learners will be able to understand the fundamental of Sedimentation, theory of settling, Flootation and its mechanism and can design rectangular and circular shape sedimentation tank for water and wastewater treatment process.
CO3	Learners will have in-depth knowledge of two film theory of mass transfer, Filtration process and can determine head loss through filters by using Carmen Kozeny equation leading to designing of filters for water and wastewater treatment.
CO4	Learners will be able to have comprehensive understanding of Chemical precipitation, mechanism of Adsorption, various theories of Isotherm and Disinfection process involved in chemical unit processes involved in water and wastewater treatment.
CO5	Learners will be able to analyse the kinetic principles of Biological growth, categories of growth processes and determination of kinetic coefficients during biological unit processes involved in water and wastewater treatment.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learners will be able to comprehend about selection criteria of unit operations and processes, types of Reactors, Mixing, Coagulation and Flocculation and their importance in primary treatment of water and wastewater treatment process.	3	3	2	0	0	0	0	0	0	0	0	1
CO2	Learners will be able to understand the fundamental of Sedimentation, theory of settling, Flootation and its mechanism and can design rectangular and circular shape sedimentation tank for water and wastewater treatment process.	3	3	0	0	1	0	0	0	0	0	0	0
CO3	Learners will have in-depth knowledge of two film theory of mass transfer, Filtration process and can determine head loss through filters by using Carmen Kozeny equation leading to designing of filters for water and wastewater treatment.	3	3	2	2	2	1	0	0	0	0	1	2
CO4	Learners will be able to have comprehensive understanding of Chemical precipitation, mechanism of Adsorption, various theories of Isotherm and Disinfection process involved in chemical unit processes involved in water and wastewater treatment.	3	3	3	0	2	1	0	2	1	0	1	2
CO5	Learners will be able to analyse the kinetic principles of Biological growth, categories of growth processes and determination of kinetic coefficients during biological unit processes involved in water and wastewater treatment.	3	3	3	0	2	3	0	2	1	0	2	2

3: Strong contribution, 2: average contribution, 1: Low contribution

**COURSE OBJECTIVES:**

- Think critically and understand the concept of gap identification for research
- Identify appropriate research methods for a specific research problem
- Write a professional research report.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Develop the student's understanding of research methods and applying those methodology to solve complex research problems.
CO2	Develop student's understanding of sampling techniques for research.
CO3	Develop student's understanding of different data collection methods and their suitability.
CO4	Students will gain understanding of analysing the quantitative data.
CO5	Students will gain understanding of analysing the qualitative data and will learn how to write a professional research report.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Develop the student's understanding of research methods and applying those methodology to solve complex research problems.	2	2	3	1	3	3	3	3	1	2	3	3
CO2	Develop student's understanding of sampling techniques for research.	3	3	2	3	2	2	2	3	1	3	2	3
CO3	Develop student's understanding of different data collection methods and their suitability.	3	3	2	3	2	2	2	3	1	3	2	3
CO4	Students will gain understanding of analysing the quantitative data.	3	3	2	3	3	2	3	3	1	3	2	3
CO5	Students will gain understanding of analysing the qualitative data and will learn how to write a professional research report.	2	2	3	1	3	3	3	3	1	2	3	3
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: SEMINAR**  
**COURSE CODE: CE535/CEE535**

**COURSE OBJECTIVES:**

- To understand organization of topic for presentation and research.  
 To learn the skill set required to perform research.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Skill to search on any topic to extract the information.
<b>CO2</b>	Ability to organize – deliver presentation and report on any topic.

**CO-PO MAPPING:**

	<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	Skill to search on any topic to extract the information.	0	0	0	3	3	1	2	1	3	3	0	3
<b>CO2</b>	Ability to organize – deliver presentation and report on any topic.	0	0	0	0	3	1	2	1	3	3	0	3
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: AIR AND WATER QUALITY MODELLING**  
**COURSE CODE: CE621/CEE621**

**COURSE OBJECTIVES:**

- To impart the knowledge of types and development of mathematical models for air quality modelling.
- To educate the learner about the various parameters related to flow of river and develop the model for river water quality.
- To impart the knowledge of development of model for estuaries and lakes and assess the performance of the model.
- To impart the knowledge of air pollutants dispersion and developing models for predicting its concentration.
- Impart the knowledge of computer based models for air and water quality.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learner will have the knowledge of types of models and will be able to develop mathematical models for air quality.
CO2	Learner will have the knowledge of various parameters related to flow of river water and will be able to develop models for river water
CO3	Learner will be able to develop the models for estuaries and lakes and assess the performance of the models.
CO4	Learner will have the knowledge of air pollutants dispersion and develop models for predicting its concentration.
CO5	Learner will be able to develop the computer based models for air and water quality standards.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learner will have the knowledge of types of models and will be able to develop mathematical models for air quality.	3	2	2	1	0	1	1	0	0	0	0	1
CO2	Learner will have the knowledge of various parameters related to flow of river water and will be able to develop models for river water	3	2	2	1	0	1	1	0	0	0	0	1
CO3	Learner will be able to develop the models for estuaries and lakes and assess the performance of the models.	2	2	2	1	0	1	1	0	0	0	0	1
CO4	Learner will have the knowledge of air pollutants dispersion and develop models for predicting its concentration.	3	2	2	1	0	1	1	0	0	0	0	1
CO5	Learner will be able to develop the computer based models for air and water quality standards.	3	2	2	1	2	1	1	0	0	0	0	1
3: Strong contribution, 2: average contribution, 1: Low contribution													



**COURSE: ECOLOGICAL ENGINEERING****COURSE CODE: CE622/CEE622****COURSE OBJECTIVES:**

- To impart the knowledge of fundamental of ecology & Environment
- To inculcate the basic concept of Principles of Ecological Engineering.
- To enhance the Concept Of Ecosystem and its components.
- To impart the application Of Ecological Engineering
- To develop the knowledge of Eco-Modelling and Case Studies In Ecological Engineering

**COURSE OUTCOMES (CO):***After the successful course completion, learner will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learners will be able to comprehend about aim, scope and applications of ecology, Development and evolution, energy flow, productivity, material cycling in ecosystems and classification of ecotechnology.
CO2	Learners will be able to understand the principles, components and characteristics of ecosystem, Structural and functional interactions of environmental systems, and environmental systems as energy systems.
CO3	Learners will have in-depth knowledge of Self-organizing design and processes in any ecosystem, interface coupling, concept of energy and determination of sustainable loading of ecosystems.
CO4	Learners will be able to have in-depth understanding of Ecosanitation, Principles and operation of soil infiltration systems, aquacultural systems and applications of ecological engineering for marine systems.
CO5	Learners will be able to have a comprehensive knowledge about ecological modelling and its application in ecotechnology, Ecological economics, case studies of Integrated Ecological Engineering Systems and their commercial prospects.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learners will be able to comprehend about aim, scope and applications of ecology, Development and evolution, energy flow, productivity, material cycling in ecosystems and classification of ecotechnology.	3	3	2	0	0	0	0	0	0	0	0	0
CO2	Learners will be able to understand the principles, components and characteristics of ecosystem, Structural and functional interactions of environmental systems, and environmental systems as energy systems.	3	2	2	0	0	0	0	0	0	0	0	0
CO3	Learners will have in-depth knowledge of Self-organizing design and processes in any ecosystem, interface coupling, concept of energy and determination of sustainable loading of ecosystems.	3	3	2	2	0	0	0	0	0	0	0	0
CO4	Learners will be able to have in-depth understanding of Ecosanitation, Principles and operation of soil infiltration systems, aquacultural systems and applications of ecological engineering for marine systems.	3	2	3	0	0	2	0	2	1	0	0	0
CO5	Learners will be able to have a comprehensive knowledge about ecological modelling and its application in ecotechnology, Ecological economics, case studies of Integrated Ecological Engineering Systems and their commercial prospects.	3	3	2	0	0	2	0	1	1	0	0	0
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE OBJECTIVES:**

- Student will be able to learn the basics of environmental science
- Student will be able to understand the concept of biological systems
- Student will acquire the concept of microbiology of environment
- Student will be able to grasp the basics of chemistry of aquatics
- Student will be able to comprehend about the structure of the atmosphere.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Student will be able to explain the structure of environment along with the interaction between biological and chemical components. basics of hydrosphere, atmosphere, lithosphere and biosphere.
CO2	Student will be able to explain the interaction between different species of the environment.
CO3	Student will be able to identify different microorganism present in the contaminated water after testing the water for microorganism and control the problems.
CO4	Student will be able to explain the basic organic reactions, Enzymes and factors influencing enzymatic reactions, and the effects of pesticides on environment.
	Student will be able to identify the structure of the atmosphere, photochemistry of the atmosphere, ozone layer depletion, acid rain, greenhouse gases and global warming.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Student will be able to explain the structure of environment along with the interaction between biological and chemical components. basics of hydrosphere, atmosphere, lithosphere and biosphere	1	1	0	0	0	1	1	1	0	0	1	1
CO2	Student will be able to explain the interaction between different species of the environment.	0	0	0	0	0	1	1	0	0	0	0	0
CO3	Student will be able to identify different microorganism present in the contaminated water after testing the water for microorganism and control the problems	1	1	0	0	1	2	1	0	1	1	0	1
CO4	Student will be able to explain the basic organic reactions and the effects of pesticides on environment.	0	0	0	1	1	1	0	0	0	0	0	1
CO5	Student will be able to identify the structure of the atmosphere, photochemistry of the atmosphere, ozone layer depletion, acid rain, greenhouse gases and global warming.	1	1	1	0	0	1	0	0	0	0	0	1
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: FUNDAMENTALS OF SUSTAINABLE DEVELOPMENT**  
**COURSE CODE: CE626/CEE626**

**COURSE OBJECTIVES:**

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

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learners will be able to understand the background & emergence of the concept of Sustainable Development, Environmental issues and crisis, resource degradation, green house gases, desertification, social insecurity, Industrialization, Globalization and Environment.
CO2	Learners will be able to be aware of the Sustainable development in Indian scenario, Judicial System in India Induction of sustainability concepts through legal systems concepts principles doctrines case laws.
CO3	Learners will be able to identify the crucial aspects of key factors of sustainability, interrelationship of growth and equity, International Summits, Conventions Agreements, Trans boundary issues, Action plan for implementing sustainable development, Moral obligations and Operational guidelines.
CO4	Learners will have in depth understanding of the Socio-economic policies, eco & trade strategies for sustainable development role of public participation.
CO5	Learners will be able to understand the relationship between demographic dynamics and sustainability in context with developed & developing countries along with Integrated resource management.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learners will be able to understand the background & emergence of the concept of Sustainable Development, Environmental issues and crisis, resource degradation, green house gases, desertification, social insecurity, Industrialization, Globalization and Environment.	3	3	3	0	0	3	3	0	0	0	0	0
CO2	Learners will be able to be aware of the Sustainable development in Indian scenario, Judicial System in India Induction of sustainability concepts through legal systems concepts principles doctrines case laws.	3	3	3	0	0	3	3	0	0	0	0	0
CO3	Learners will be able to identify the crucial aspects of key factors of sustainability, interrelationship of growth and equity, International Summits, Conventions Agreements, Trans boundary issues, Action plan for implementing sustainable development, Moral obligations and Operational guidelines.	3	2	3	0	0	3	3	2	0	0	0	0
CO4	Learners will have in depth understanding of the Socio-economic policies, eco & trade strategies for sustainable development role of public participation.	3	2	3	0	0	3	3	0	0	0	0	0
CO5	Learners will be able to understand the relationship between demographic dynamics and sustainability in context with developed & developing countries along with Integrated resource management.	3	2	3	0	0	3	3	0	0	0	0	0
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: CLEANER PRODUCTION****COURSE CODE: CE627/CEE627****COURSE OBJECTIVES:**

- To impart the knowledge of prevention and control of industrial pollution for sustainable development and cleaner production.
- To impart the knowledge of role of industry and government in the management of pollution and its reduction and equipment optimization using internet information.
- To educate the students about cleaner production assessment steps and skills
- To educate the students about life cycle assessment and environmental audit
- To educate the students about various case studies done on dairy, leather, paper and pulp industry.

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Learner will have the knowledge of prevention and control of industrial pollution for sustainable development and cleaner production.
<b>CO2</b>	Learner will have the knowledge of role of industry and government in the management of pollution and its reduction and can do equipment optimization using internet information.
<b>CO3</b>	Learner will have the knowledge of cleaner production assessment steps and skills
<b>CO4</b>	Learner will have the knowledge of life cycle assessment and environmental audit
<b>CO5</b>	Learner will have the knowledge of various case studies done on dairy, leather, paper and pulp industry, etc.

**CO-PO MAPPING:**

<b>CO</b>	<b>DESCRIPTION</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	Learner will have the knowledge of prevention and control of industrial pollution for sustainable development and cleaner production.	1	1	2	1	0	1	1	0	0	0	0	1
<b>CO2</b>	Learner will have the knowledge of role of industry and government in the management of pollution and its reduction and can do equipment optimization using internet information.	2	1	2	1	2	1	1	0	0	0	0	1
<b>CO3</b>	Learner will have the knowledge of cleaner production assessment steps and skills	1	1	2	1	1	1	1	0	0	0	0	1
<b>CO4</b>	Learner will have the knowledge of life cycle assessment and environmental audit	2	2	2	1	1	1	1	0	0	0	0	1
<b>CO5</b>	Learner will have the knowledge of various case studies done on dairy, leather, paper and pulp industry, etc.	0	0	0	3	1	2	2	0	0	0	0	0
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE OBJECTIVES:**

- To learn about various types of wastes, pollutants and their effect on foundation.
- To learn about landfills in details and methods of managing waste at landfill site.
- To learn about mechanism and effect of transfer of contaminants to ground sub surface and their impact on ground water.
- To learn about various methods of testing soil polluted due to various chemicals and pollutants.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To understand about the waste and its impact on soil and ground water
CO2	To understand about ground water pollution due to landfills and their subsequent impact.
CO3	To understand remedial measures on curbing the after effects caused due to pollution.
CO4	Student will understand the methods and techniques to test the soil sample.
CO5	Student will understand the methods of soil stabilization.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	To understand about the waste and its impact on soil and ground water	2	1	0	2	2	2	2	0	0	0	0	0
CO2	To understand about ground water pollution due to landfills and their subsequent impact.	2	2	0	1	1	1	1	0	0	0	0	0
CO3	To understand remedial measures on curbing the after effects caused due to pollution.	3	2	0	1	0	2	2	0	0	0	0	0
CO4	Student will understand the methods and techniques to test the soil sample.	1	1	0	0	0	0	0	0	0	0	0	1
CO5	Student will understand the methods of soil stabilization.	1	1	0	0	0	1	0	0	0	0	0	0
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: ENVIRONMENTAL ENGINEERING STRUCTURE****COURSE CODE: CE631/CEE631****COURSE OBJECTIVES:**

- To develop the knowledge about the concept of Environmental Engineering structures and their analysis.
- To design the concrete structures of environmental engineering structures.
- To design the water retaining structures.
- To design the underground reservoirs and swimming pools.
- To identify the different types of Environmental and Non Environmental cracks.

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	To enable the student to understand the historical aspects of Architecture planning
<b>CO2</b>	To enable the student the various types of town planning in the past
<b>CO3</b>	To enable the student , the effect of materials and techniques in the development of township
<b>CO4</b>	To enable the student in understanding the various elements of Architectural design and its effect on town planning
<b>CO5</b>	To make the student to understand the function of planning of building

**CO-PO MAPPING:**

<b>CO</b>	<b>DESCRIPTION</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	To Enable the student to know the basic formulas in pipe and open channel flows.	1	1	2	1	2	3	1	2	3	0	0	0
<b>CO2</b>	To impart the knowledge of design of concrete structures for Environmental structures	1	2	1	2	2	1	3	2	1	0	0	0
<b>CO3</b>	To impart the knowledge of design of environmental structures (Water retaining Structures)	2	2	3	1	2	1	2	2	1	0	0	0
<b>CO4</b>	To impart the knowledge of design of environmental structures (underground Structures)	1	1	2	3	2	3	2	1	1	0	0	0
<b>CO5</b>	To enable the students to methods of identification of cracks in environmental structures	2	1	2	3	1	2	1	2	3	0	0	0
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: SURFACE AND GROUND WATER MODELLING****COURSE CODE: CE632/CEE632****COURSE OBJECTIVES:**

- To develop basic knowledge of precipitation, infiltration, evaporation, transpiration and models.
- To impart the knowledge of various types of hydrographs and hydrological characteristics of rivers and lakes
- To impart the basic knowledge of ground water movement, aquifers, filtration wells and galleries
- To impart the knowledge of tests on aquifers and design of wells
- To impart the knowledge of ground water and hydrological cycles and various parameters associated with flow through porous media

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learner will have the knowledge of precipitation, infiltration, evaporation, transpiration and models.
CO2	Learner will have the knowledge of various types of hydrographs and hydrological characteristics of rivers and lakes
CO3	Learner will have the basic knowledge of ground water movement, aquifers, infiltration wells and galleries
CO4	Learner will have the knowledge of tests on aquifers and can design infiltration wells
CO5	Learner will have the knowledge of ground water and hydrological cycles and various parameters associated with flow through porous media

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learner will have the knowledge of precipitation, infiltration, evaporation, transpiration and models.	2	2	2	1	0	1	1	0	0	0	0	1
CO2	Learner will have the knowledge of various types of hydrographs and hydrological characteristics of rivers and lakes	2	2	2	1	0	1	1	0	0	0	0	1
CO3	Learner will have the basic knowledge of ground water movement, aquifers, infiltration wells and galleries	1	1	1	1	0	1	1	0	0	0	0	1
CO4	Learner will have the knowledge of tests on aquifers and can design infiltration wells	2	2	1	1	0	1	1	0	0	0	0	1
CO5	Learner will have the knowledge of ground water and hydrological cycles and various parameters associated with flow through porous media	1	2	2	1	0	1	1	0	0	0	0	1

3: Strong contribution, 2: average contribution, 1: Low contribution

**COURSE: WATER RESOURCES SYSTEMS MANAGEMENT**  
**COURSE CODE: CE633/CEE633**

**COURSE OBJECTIVES:**

- Student will be able to understand about the planning of reservoir.
- Student will be able understand about the quality of water required by various crops and rain water harvesting method.
- Student will learn about droughts and its managements.
- Student will be able to learn the different software used in reservoir operation.
- Student will be able to learn different optimization and modeling in water recourse system.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

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

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Student will be able to characterize different types of reservoir and dams.	1	0	0	0	0	1	1	0	0	1	1	0
CO2	Student will be able to explain about the quality of water used for various crops production and rain water harvesting methods.	1	0	0	0	1	1	1	0	0	0	0	1
CO3	Student will be able to explain the classification of drought.	1	0	0	0	0	0	0	0	0	0	0	0
CO4	Student will be able to use different software used in water recourse system.	1	1	1	0	1	0	0	0	1	1	1	1
CO5	Student will be able to explain different optimization method in water resource system.	1	0	0	0	0	0	0	0	0	0	0	0
3: Strong contribution, 2: average contribution, 1: Low contribution													



**COURSE: DIRECTED STUDY**  
**COURSE CODE: CE636/CEE636**

**COURSE OBJECTIVES:**

- To make learner aware about the latest technology and engineering practices in industries.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Awareness regarding the latest technology, engineering methodology and practices being used in industries.

**CO-PO MAPPING:**

	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Awareness regarding the latest technology, engineering methodology and practices being used in industries.	3	0	0	2	3	3	0	0	3	3		3
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: M TECH DISSERTATION**  
**COURSE CODE: CE699/CEE699**

**COURSE OBJECTIVES:**

- To develop individuality and problem analysis skill.
- To nurture ability to perform literature review.
- To improve critical thinking ability for formulation of plan.
- To develop skill to use various engineering and technological tools.
- To develop skill to think critically on research results.
- To enhance the writing skill for research paper and dissertation.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

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

**CO-PO MAPPING:**

	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Capability to work independently on a research-based problem.	0	0	0	3	3	0	0	3	3	3	0	3
CO2	Skill to perform review of available literature effectively to present research gap.	0	0	0	3	3	0	0	3	3	3	0	3
CO3	Aptitude to plan methodology for the attainment of various research objectives.	0	0	0	0	3	0	0	0	3	3	0	3
CO4	Competency to apply of various engineering and technological tools to carry research.	0	0	0	3	3	0	0	0	3	0	0	3
CO5	Ability to conclude work using critical thinking.	0	0	0	3	3	0	0	3	3	3	0	3
CO6	Proficiency in preparing presentation and report.	0	0	0	0	3	0	0	3	3	3	0	3
3: Strong contribution, 2: average contribution, 1: Low contribution													