Lesson Plan No. 1	Course Name: Environment Engineering Topic: Scope of Environmental Engineering	Course No.: CE-403

Objectives	At the end of the lesson the student shall be able to: a. Articulate the concept of environmental engineering. b. Learnt about the importance and necessity for planned water supplies. c. Illustrate financing of water supply schemes and their distribution in India. d. Learn about planning and execution of modern water supply systems.
Teaching Aids (if any)	a. Pen and white board. b. Indian standard water codes.
Teaching Development	1. **Introduction** (5 minutes) - Introduce the students about the concept of environmental engineering. - Introduce them about water supply schemes by PHE departments. - Highlight the layout of water supply systems. 2. **Development** (30 minutes) a) Discussed about environmental pollution related to water sources. b) Importance of planned water supply system for households and other areas. c) How Planning, designing and executing a city water supply schemes are done. d) Finance calculation of these water supply schemes. e) Pricing of municipal water supplies. f) Discussed about the water supply patterns for different cities of India. g) Planning and execution of modern water supply schemes like collecting the water from the sources then to intakes by main lines, then water transferred to treatment units, disinfection units, storage reservoirs and by use of gravity pumps supplied to distribution systems. 3. **Exercise** (5 minutes) – Draw the flow diagram of layout of whole water supply system.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Video links https://www.youtube.com/watch?v=EoE_NkF8N8k -

	3. Homework - Read about advanced technique used by irrigation department to calculate or plan a full water supply scheme for a city and submit on Google classroom. Spend 5 minutes to wrap up and consolidate the learning.
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 2	**Course Name: Environment Engineering** **Topic: Surface and ground water sources**	**Course No.: CE-403**

Objectives	At the end of the lesson the student shall be able to: e. Articulate the concept of sources of water. f. Learnt about the important hydrological concepts. g. Illustrate the study of surface and sub surface sources of water. h. Learn about rain gauges and its types.
Teaching Aids (if any)	c. Pen and white board. d. Quizzes.
Teaching Development	4. **Introduction** (5 minutes) - Introduce the students about the concept of sources of water, its hydrological concept. - Introduce them about study of surface and sub surface sources of water. - Highlight the importance of aquifers, aquitard, aquiclude, aquifuge. 5. **Development** (30 minutes) h) Discussed about general introduction about various sources of water that are into two categories: 1) Surface sources- Ponds, lakes, rivers, oceans, storage reservoirs. 2) Subsurface sources- Springs, infiltration galleries, infiltration wells, wells and tube wells. i) Importance of hydrological cycle in ground water recharge. j) Importance of precipitation and its different types. k) Rainfall and its distribution like ground rainfall, infiltrations, and depression storages. l) Types of rain gauges used in India.

	m) Discussed about aquifers – confined and unconfined aquifers. n) Ground water resources, layers of saturation zones, Them's equation for confined aquifers and unconfined aquifers. 6. **Exercise** (5 minutes) – Derive the relations for dupit equation for unconfined aquifers.
Closure	4. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 5. Suggested Reading - Video links https://www.youtube.com/watch?v=LiL0_sfdhQ0&t=1208s - 6. Homework - Read about the surface and subsurface ground water sources of water make a list and submit on Google classroom. Spend 5 minutes to wrap up and consolidate the learning.
Evaluation	2. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 3	**Course Name: Environment Engineering** **Topic: Water supply systems/demands**	**Course No.: CE-403**

Objectives	At the end of the lesson the student shall be able to: i. Articulate the concept of water supply systems. j. Learnt about various types of water demands. k. Illustrate the amount of water available for public. l. Fire demands, Average daily demand, maximum daily demand, and maximum hourly demand.
Teaching Aids (if any)	e. Pen and white board. f. Quizzes. g. IS:1172-1993
Teaching Development	7. **Introduction** (5 minutes) - Introduce the students about the concept of water supply systems. - Introduce them various types of water demands. - Highlight them about various empirical approaches to calculate fire demand. 8. **Development** (30 minutes) o) Discussed about various types of water demands: 3) Domestic water demand.

	4) Industrial water demand. 5) Institutional water demand or commercial. 6) Demand for public uses. 7) Fire demands. p) Average requirements or water demands for low income group and high income group. q) Calculation of per capita demand or LPCD. r) Fire demands and its calculation using empirical approaches like: 1) Kuchling's formula. 2) Buston's formula. 3) Freeman's formula. 4) National board of fire formula. s) Learnt about average daily demand. t) Discussed about maximum daily demand and graphically studying the trend analysis of maximum hourly demand. 9. **Exercise** (5 minutes) – Solve a numerical on designing a distribution system on basis of daily demands of water.
Closure	7. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 8. Suggested Reading - Video links - https://www.youtube.com/watch?v=nluTKmE4lGs 9. Homework - Read about various types of water demands make a list and submit on Google classroom. Spend 5 minutes to wrap up and consolidate the learning.
Evaluation	3. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 4	Course Name: Environment Engineering Topic: Municipal water demand variations.	Course No.: CE-403

Objectives	At the end of the lesson the student shall be able to: m. Articulate the concept of municipal water demands. n. Learnt about various types of water demands. o. Illustrate the amount of water available for public. p. Fire demands, Average daily demand, maximum daily demand, and maximum hourly demand.
Teaching Aids (if any)	h. Pen and white board. i. Quizzes. j. IS:1172-1993
Teaching Development	10. **Introduction** (5 minutes) - Introduce the students about the concept of water supply systems. - Introduce them various types of water demands. - Highlight them about various empirical approaches to calculate fire demand. 11. **Development** (30 minutes) u) Discussed about various types of water demands: 8) Domestic water demand- its consumption. 9) Industrial water demand- its consumption. 10) Institutional water demand or commercial. 11) Demand for public uses. 12) Fire demands calculation. v) Water required compensating losses in thefts and wastes. w) Calculation of total requirement of water for a town or a city. x) Discussed about calculating the future growth of population by various methods by population forecasting. y) Factors affecting per capita demand. z) Policy of metering and method of charging in municipal areas. aa) Studying population growth trends. 12. **Exercise** (5 minutes) – Analyze simple graphical method of population forecasting.
Closure	10. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 11. Suggested Reading - Video links - https://www.youtube.com/watch?v=nluTKmE4lGs 12. Homework - Solve the numerical in the text book mentioned in class, make a

	note and submit on Google classroom. Spend 5 minutes to wrap up and consolidate the learning.
Evaluation	4. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 5	**Course Name: Environment Engineering** **Topic: Population forecasting and water demand estimations.**	**Course No.: CE-403**

Objectives	At the end of the lesson the student shall be able to: q. Articulate the concepts of population forecasting. r. Knowledge about various methods of population forecasting. s. Able to study the population data and population growth of a city and design the distribution for that population. t. Ideal population growth curve.
Teaching Aids (if any)	k. Pen and white board. l. Quizzes.
Teaching Development	13. **Introduction** (5 minutes) - Introduce the students about the concept of Population forecasting. - Introduce them various methods of calculation of population of an area. - Highlight them about logistic curve of population calculation. 14. **Development** (30 minutes) bb) Discussed about forecasting of population and types: 13) Arithmetic increase method. 14) Geometric increase method. 15) Incremental increase method. 16) Decreasing rate of growth method. 17) Simple graphical method. 18) The logistic curve method. cc) Method that is used to calculate the population of already developed city. dd) Method that is used to calculate the population of rapidly growing city. ee) Method that is used to calculate the population of city where rate of growth is not constant. ff) Concept of saturation population, population at any time‘t’.

	15. **Exercise** (5 minutes) – Solving different numerical on different methods.
Closure	13. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 14. Suggested Reading - Video links - https://www.youtube.com/watch?v=5EVvM-TL1WU 15. Homework - Solve the numerical in the text book mentioned in class for respective chapter, make a note and submit on Google classroom. Spend 5 minutes to wrap up and consolidate the learning.
Evaluation	5. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 6	**Course Name: Environment Engineering** **Topic: Intakes and Transmission systems**	**Course No.: CE-403**

Objectives	At the end of the lesson the student shall be able to: u. Articulate the definitions and general introduction of intake conduits. v. Knowledge about factors governing the location of intakes. w. Able to know about different types of intake structures. x. Information about various types of conduits in transmission systems.
Teaching Aids (if any)	m. Pen and white board. n. Quizzes. o. Power point presentations.
Teaching Development	16. **Introduction** (5 minutes) - Introduce the students about simple submerged intakes. - Introduce them about medium sized river intake structure and uses of that structure over canal intakes. - Highlight them about conduits for transporting water in distribution system. 17. **Development** (30 minutes) gg) Discussed about types of intake structures: 19) Simple submerged intakes.

	20) Intake towers. 21) Medium sized river intake structures. 22) Typical twin well type of river intake structures. 23) Single well type of river intake structure 24) Design of inlet well. hh) Factors governing the location of an intake. ii) Design of coarse screen, design of intake conduit, intakes of sluiceway of dams. jj) Requirements of good distribution systems. kk) Layout of distribution networks 1) Dead end system. 2) Grid iron system. 3) Ring system. 4) Radial system. 18. **Exercise** (5 minutes) – Solving different numerical on canal intakes designing coarse screens and intake conduits.
Closure	16. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 17. Suggested Reading - Video links - https://www.youtube.com/watch?v=rKMFga1C-Pk 18. Homework - Solve the numerical in the text book mentioned in class for respective chapter, make a note and submit on Google classroom. Spend 5 minutes to wrap up and consolidate the learning.
Evaluation	6. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 7	Course Name: Environment Engineering Topic: Pipes for transporting water and their designs.	Course No.: CE-403

Objectives	At the end of the lesson the student shall be able to: y. Articulate the designs of different pipes used in transporting of water. z. Knowledge about flumes, aquiducts, canals, pressure conduits. aa. Able to know about gravity conduits and pressure conduits. bb. Information about hydraulic flow and designing of pressure pipes as gravity mains
Teaching Aids (if any)	p. Pen and white board. q. Quizzes.
Teaching Development	19. **Introduction** (5 minutes) - Introduce the students about gravity conduits like flumes, aquiducts, canals, pressure conduits. - Introduce them about hydraulic flow and design of pipes. - Highlight them about conduits for transporting water in distribution system. 20. **Development** (30 minutes) ll) Discussed about various types of conduits: 25) Gravity conduits- canals, flumes, aqueducts. 26) Pressure conduits mm) Designs of pipes by Darcy-Weisbach formula, manning's formula, hazen-william's formula, modifier H-W formula. nn) Study of flow in pipe systems. oo) Requirements of water hammer pressures. pp) Laying of water supply pipes. qq) Gate valves, air valves, pressure relief valves, reflux valves, manholes. rr) Testing of pipelines. ss) Various types of pressure pipes: 1) Cast iron pipes. 2) Galvanised steel pipes and its corrosion control. 3) RCC pipes. 4) Asbestos pipes 5) Vitrified clay pipes 6) Hume steel pipes. 7) Gates and valves in pipe lines. 8) **Exercise** (5 minutes) – Solving different numerical on designing the piping system in transmission of water.

Closure	19. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 20. Suggested Reading - Video links https://www.youtube.com/watch?v=-l7-2KkIRKc&list=PLtqsV4c_a47qPBlLMurACw40fn2djXDFZ&index=2 21. Homework - Solve the numerical in the text book mentioned in class for respective chapter, make a note and submit on Google classroom. Spend 5 minutes to wrap up and consolidate the learning.
Evaluation	7. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents