

WATER SUPPLY AND WASTEWATER ENGINEERING		Semester	III
Course Code	BCV304	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3+0+0+0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	
Examination type (SEE)	Theory		

**Course Learning objectives:** This Course will enable the students to

1. Analyze the variation of water demand and to estimate water requirement for a community.
2. Study drinking water quality standards and to illustrate qualitative analysis of water.
3. Analysis of physical and chemical characteristics of water and wastewater.
4. Understand and design of different unit operations and unit process involved in water and wastewater treatment process
5. Design various oxidation processes.

#### Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
2. Arrange field visits to give brief information about the water and wastewater treatment plant.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking and enhance the knowledge of treatment processes.
5. Adopt Problem Based Learning (PBL), which fosters students, Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Seminars, surprise tests and Quizzes may be arranged for students in respective subjects to develop skills

#### Module-1

**Introduction:** Water: Need for protected water supply, Demand of Water: Types of water demands - domestic demand, industrial, institutional and commercial demand, public use and fire demand estimation, factors affecting per capita demand, Variations in demand of water, Peak factor.

Design period and factors governing design period. Methods of population forecasting and numerical problems. Physico chemical characteristics of water Sampling. **L1, L2, L3**

#### Module-2

**Water Treatment:** Objectives, Unit flow diagrams – Significance of each unit, Aeration process Limitations and types.

**Sedimentation** - Theory, settling tanks, types and design with numerical, Coagulation and flocculation, types of coagulants.

**Filtration:** Mechanism, theory of filtration, types of filters: slow sand, rapid sand and pressure filters. Operation and cleaning. Design of slow and rapid sand filter without under drainage system, Numerical. **L1, L2,**

#### Module-3



the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

#### **CIE for the theory component of the IPCC (maximum marks 50)**

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

#### **CIE for the practical component of the IPCC**

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test (**duration 02/03 hours**) after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks**.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

#### **SEE for IPCC**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

**The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.**

**Note: Subject to be taught by Geologist with qualification M. Sc Geology/MPhil/ Ph. D in Geology**

**Earth Surface process and Resources**

Weathering, type, causes, soil insitu, drifted soil, soil profile, soil mineralogy, structure, types of soil, Black cotton soil v/s Lateritic soil; effects of weathering on monumental rocks. Soil Horizon, Soil Classification by Grain Size.

**MODULE-4 7 hrs****Surface and sub investigation for deep foundation**

Dip and strike, and outcrop problems(numerical problem geometrical/ simple trigonometry based), Borehole data(and problems), Faults, folds, unconformity, joints, types, recognition and their significance in Civil engineering projects like tunnel project, dam project, Reservoir site,.

**MODULE-5 5 hrs****Modern Tools and geophysical methods**

Rocks as aquifers, water-bearing properties igneous, sedimentary and metamorphic rocks , coefficient of permeability, factors affecting permeability, Electrical Resistivity meter, depth of water table, (numerical problems), seismic studies.

**PRACTICAL COMPONENT OF IPCC (May cover all / major modules)**

Sl.NO	Experiments 8 hrs
1	Identification of common minerals based on Physical Properties
2	Identification of rocks used in building construction based on Physical properties
3	Solving Geological maps for suitability for aqua duct
4	Geological maps with inclined beds, suitability for tunnels/ Dams
5	Geological maps with folds, in tunnels/ Dams
6	Geological maps with unconformity , in tunnel/dam project
7	Geological maps with faults in Dams/tunnels project
8	One Day Nearest Field Visit Investigation.

**Course outcomes (Course Skill Set):**

At the end of the course the student will be able to:

- Apply geological knowledge in different civil engineering practice.
- Acquire knowledge on durability and competence of foundation rocks, and will be able to use the best building materials.
- Students will become competent enough for the safety, stability, economy and life of the structures that they construct
- Able to solve various issues related to ground water exploration, build up dams, bridges, tunnels which are often confronted with ground water problems
- Students will become Intelligent enough to apply GIS, GPS and remote sensing as a latest tool in different civil engineering for safe and solid construction.

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for



Lecture 25 : Water Treatment Units Screening and Aeration

[https://youtu.be/QsWp\\_HIZqPs](https://youtu.be/QsWp_HIZqPs)

Lecture 26 : Water Treatment Units Sedimentation <https://youtu.be/T1M4Eciwq7Q>

Lecture 27 : Practice Problems On Sedimentation <https://youtu.be/Zlh2mpOjIMU>

Lecture 28: Coagulation and Flocculation: Theory <https://youtu.be/aAo2bBaF0yU>

Lecture 29: Coagulation and Flocculation: Selection and Application <https://youtu.be/44p0IN31ogo>

Lecture 30: Coagulation and Flocculation: Design Operation and Process Control [https://youtu.be/v0TDfCz\\_iLU](https://youtu.be/v0TDfCz_iLU)

Lecture 31: Filtration Theory and Slow Sand Filters [https://youtu.be/nuJQe9F\\_2zI](https://youtu.be/nuJQe9F_2zI)

Lecture 32: Rapid Sand Filter: Filter Media and Components <https://youtu.be/3qw3sKcuQIY>

Lecture 33: Rapid Sand Filters and Pressure Filters [https://youtu.be/PEX\\_0DebrSQ](https://youtu.be/PEX_0DebrSQ)

Lecture 34: Practice Problems Coagulation Flocculation and Filtration <https://youtu.be/73jxsBCDuq4>

Lecture 35: Disinfection Basic <https://youtu.be/d4UG9Xivulk>

Lecture 36: Chlorination <https://youtu.be/L3eSkeOU3iY>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

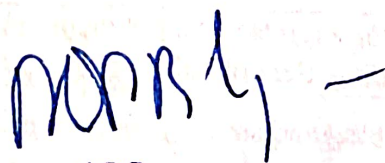
- Activity Based Learning (Suggested Activities in Class)/ Practical Based learning <http://nptel.ac.in>
- <https://swayam.gov.in>
- <https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham>

### CO & PSO - PO Mapping (Individual Teacher has to fill)

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes																
Course outcomes	Program outcomes												Program Specific Outcomes			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1																
CO2																
CO3																
CO4																
CO5																
Total																
Average																

Level 0: Not Mapped, 1: Low Mapped, 2: Moderately Mapped 3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.



H.O.D.

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