Post Graduate Certificate Course on Zero Liquid Discharge (ZLD) Technologies

India has 16% of the world's population and is expected to exceed 1.5 billion by 2050. Water demand will rise from 710 BCM (Billion Cubic Meters) in 2010 to 1180 BCM by 2050, with industrial and domestic usage 2.5-fold higher[1]. The Central Pollution Control Board mandates wastewater treatment for all industries including oil and gas, chemicals, pharmaceuticals, textiles, power and food and beverages industries. Zero Liquid Discharge (ZLD) recovers 90–95% of effluent water, enabling reuse or safe discharge, fostering market growth and business opportunities.

Considering the trained and skilled manpower requirement for the industries for wastewater treatment and management, Jadavpur University has developed an innovative program for the engineering and science graduates to support the industry with ZLD professionals and meet the environmental requirements to achieve the sustainability goals. Through a certificate course comprising of two months classroom and laboratory teaching followed by six months' industry experience, Jadavpur University plans developing "ZLD professionals" -- knowledgeable in ZLD technologies for industries.

Zero Liquid Discharge (ZLD) technology is an advanced water management strategy that eliminates liquid waste discharge by treating, recycling wastewater, and recovering resources. Improved membrane technologies enhance recovery efficiency and lower energy usage, making ZLD increasingly accessible and cost-effective.

The following diagram provides a conceptual understanding of ZLD:

Source: https://www.saltworkstech.com/articles/what-is-zero-liquid-discharge-why-is-it-important/

About the Course

The proposed course is developed considering the following parameters for the five-year program duration including number of students per year, tuition, scholarships and travel allowance for students, and compensation for professors, industrial experts and admin staff.

Course Duration	8 months
Theoretical part at JU	3 months
Duration at the Industrial Facility	4 months+1 month (internal assessment)
Number of Students	10
Course fees	Rs. 6,000 per student per month
Student Scholarship	Rs 8,000 per student per month
Student Travel Allowance	Rs. 2,000 per student per month
Duration of the ZLD Program	3/5 years

Course Curriculum

Subject Area	**Subjects**		**Periods/ week**	**Marks**		**Credit Points**
Courses	**Subject code**	**Subject Name**	**Lecture**	**Examination**	**Sessional**	
Paper - I		Water and Wastewater Treatment and Management	4 (First 3 months)	100		3
Paper - II		Concept of Zero Liquid discharge	4 (First 3 months)	100		3
Paper - III		Process Design of Water and Wastewater Treatment	4 (First 3 months)	100		3
LABORATORY I		Water quality and Wastewater Analysis Laboratory	3 (First 3 months)		100	3
ZLD Professionals at Industrial Facilities		ZLD professionals at industrial facilities	Last 5 Months		400	8
TOTAL			15	300	500	20

***Total periods per week = 15, Total periods in First 3 Months = 195, Total credits = 20, Total marks = 800**

Course Syllabus

- **Water and Wastewater Treatment and Management**

Water resources and its Management, Water quality, Drinking water Specification, Water Supply Engineering, Pollution and contamination of water, Surface and Ground Water Treatment Technologies, Different type of wastewater and its management, Wastewater characteristics, Standards of Discharge and reuse of wastewater, Sewage and Effluent treatment technologies, Advanced Treatment Technologies, Sludge handling and management, Different type of waste management and safe disposal, Case Studies on WTP, STP, ETP, & RWHP,

- **Concept of Zero Liquid discharge**

Definition, Concept and importance of ZLD, Water budget and water balance. Policies from regulatory bodies, Standards of reuse/recycle, Assessment and planning, identifying waste streams in manufacturing operations; Setting goals for ZLD implementation, Technologies and methods for Zero-Discharge: Resource Monitoring and control systems. Design and engineering of ZLD facilities: Integration of technologies into existing operations; Safety and compliance considerations. Implementation and management Project management for ZLD facilities; Stakeholder engagement; Monitoring performance and continuous improvement. Case studies of successful ZLD implementations,

- **Process Design of Water and Wastewater Treatment**

Introduction to Water and Wastewater System, Reaction Engineering in Wastewater Treatment (Reactors, Mass balance analysis and modelling, Reaction & Process kinetics: reaction rates), Physical Unit Operations (Screening, Mixing and flocculation mechanisms Separation processes: sedimentation, filtration, and flotation Aeration systems), Chemical Unit Processes (Coagulation–flocculation mechanisms, Precipitation reactions and pH control), Fundamentals of Biological Treatment (Suspended Growth Processes, Attached Growth and Combined Processes, Anaerobic Treatment Processes), Tertiary and Advanced Treatment (Filtration, adsorption, disinfection, and advanced oxidation, Membrane processes like UF, RO, MEE for ZLD applications) Process Design for ZLD Systems (Integration of biological, chemical, and physical units for ZLD)

Course Eligibility:

Category 1: Bachelors' Degree in Engineering or Technology in Civil/ Electrical/ Mechanical/ Chemical/ Environmental Engineering/ Biotechnology only
or
Category 2: 2-year Master of Science Degree in Chemistry/Environmental Science or Equivalent degrees of the above-mentioned subjects only will be accepted.

Sponsored candidates will be allowed to participate in the course, subject to formal release from their appointing authority. This is a full time day certificate course. They have to produce no objection certificate (NOC) from their appointing authority at the time of admission.

Age: No bar

Intake: Total intake is 10 (Ten)-Maximum

Duration: 8 months (3 months university teaching followed by 4 months industrial training followed by 1 month internal assessment)

Timing and venue: Classes will be held at Jadavpur University Main Campus during day time.

Fees: Fees for the course is Rs. 48,000/- (plus GST) to be paid in one installment at the time of admission. In addition, each student has to pay his/her examination fees as per the university rules.

Scholarship: Rs. 8000/- per month subject to maintaining 70% monthly attendance.

Instructions for filling up the application form: Applicants can fill up the application form online. The application fee is Rs. 100.00 and the same should be paid online through SBI-Collect portal for online applications. **Link for SBI-Collect**

Mode of admission: Seats will be distributed among the two categories (please see eligibility criteria above) of the applicants proportionate to the number of applications received in each category. **No written admission test will be held.** Merit list in each of the two categories will be prepared considering B. Tech./ M.Sc. degree final marks (70% weightage). After that candidates will be called for interview (30% weightage). Provisional merit lists will be displayed on Jadavpur University website and candidates will also be informed through email. Course will be conducted subject to filling up of minimum number of seats. If not filled up entire course fees paid will be refunded.

For any questions/clarifications please email **zld@jadavpuruniversity.in**

Schedule for admission to Course On "Zero Liquid Discharge (ZLD) Technologies", Session 2025-26

Announcement and forms available online: **6/11/2025**

Last date of filling up online admission form: **30/12/2025 (Tuesday, 11.59 pm)**

Last date of receiving application fees online: **31/12/2025**

Date of interview: **6/1/2026 (Tuesday)** Venue: TEQIP Building Room No. 110, Jadavpur University main campus

1st admission list available in Jadavpur University website: **13/1/2026**

Admission: **19/1/2026** and **20/1/2026** (in TEQIP Building Room No. 110)

2nd and subsequent lists (if required): **22/1/2026**

2nd list admission: **27/1/2026** (in TEQIP Building Room No. 110)

Class start: **02/02/2026** (Monday)

Students Selection and Administration

Selection of students: To ensure fair and transparent selection process the applicants (as mentioned in the Eligibility section will be divided in two categories:

Category 1: Bachelor's degree in engineering or technology in Civil/ Electrical/ Mechanical/ Chemical/ Environmental Engineering/ Biotechnology
or
Category 2: Two-year Master of Science Degree in Chemistry/Environmental Science or Equivalent degrees of the above-mentioned are acceptable.

To ensure commitment from the students employed candidates will not be allowed to attend the course. However, industry-sponsored candidates will be allowed to participate in the course, subject to formal release from their appointing authority.

There is no age limit for attending the course. Ten students will be admitted in each session and Government of West Bengal reservation rules may not be applied.

Seats will be distributed among the two categories (please see above) of the applicants proportionate to the number of applications received in each category. No written admission test will be held. Merit list in each of the two categories will be prepared considering B. Tech./ M.Sc. degree final marks (70% weightage). After that candidates will be called for interview (30% weightage).

Teaching

Teachers from the Department of Chemical Engineering, Department of Civil Engineering, School of Water Resources Engineering and the School of Environmental Studies will lecture on the theoretical courses (Papers 1 and 2). Industry experts will also teach these two papers. The laboratory courses will be conducted in the above-mentioned departments and schools. Classes will be held in Jadavpur University main campus.

Non-teaching support

Two persons will be employed, one for maintaining financial records and other administrative work and the other as laboratory attendant.

Students in Industrial Facilities

Students who are successful in the theoretical and practical courses will be allowed to continue their studies in the industry. Unsuccessful students will leave the course and the fees already paid will not be returned. The task allotted to each student will be thoroughly discussed with the participating industry mentor. One teacher mentor will supervise the work through regular meeting with the student and the industry mentor. At the end of the industry stay, the student has to prepare a detailed report and make a presentation before the teachers and industry experts. The university learning and well as industrial professional work will be quantitatively evaluated following the examination rules as detailed below.

Examination rules

The following examination fees are fixed and should be paid before appearing in the theoretical papers:
Examination fee Rs. 500/-
Grade Card Rs. 500/-
Certificate fee Rs. 100/-

The certificate course will be of eight months' duration and student performance will be evaluated through examinations, reports and presentations.

2. A student has to pass each theoretical subject and practical examination in one chance before proceeding to industrial work. **There will no separate repeat examinations.**

3. Pass marks will be 40% in each subject (theoretical, practical and evaluation of industrial work). Absence due to any reason will be considered as failure.

4. Minimum 70% attendance is necessary for appearing in the examination.

5. The certificate will be awarded to the candidate on successful completion of all examinations (theoretical, practical and industry work).
6. Candidates securing 65% or more of aggregate marks in the total number of papers (including practical and industry work) will be declared to have passed in First Class and other successful candidates securing less than 65% marks will be placed in the Second class.

7. All students will have to appear in written examinations conducted by the Controller of Examinations, Jadavpur University and the venue of the theoretical and practical examinations will be decided upon by the Controller of Examinations, Jadavpur University.

8. Controller of Examination on the recommendation from the Course Coordinator will appoint the paper setters as well as examiners of the answer scripts. The paper setters and examiners may be internal or external members.

9. The students' performance will be indicated as grade points and credit hours and Cumulative Grade Point Average (CGPA) in grade cards and the total percentage of marks (converted by formula as per Jadavpur University examination rules) and class will be additionally mentioned in the grade card.
10. Classification of grades

% marks obtained	*Performance*	*Grade*	*Grade Points*
90 and above	Outstanding	S	10
80 – 89	Excellent	A	9
70 – 79	Very good	B	8
60 – 69	Good	C	7
50 – 59	Fair	D	6
40 – 49	Satisfactory	E	5
Less than 40	Fail	X	0