Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
7.

8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

THEORY COURSE FILE CONTENTS

Check list Course Outcomes Attainment

S. No.	Contents	Available (Y/N/NA)	Date of Submission	Signature of HOD
1.	Authenticated Syllabus Copy	Y	05/04/2021	
2.	Individual Time Table	Y		
3.	Students' Name List (Approved Copy)	Y		
4.	Course Plan, PO, PSO, COs, CO-PO Mapping, COA Plan, Session Plan and Periodic Monitoring	Y		
5.	Previous Year End Semester Question Papers	Y		
6.	Question Bank (All Units - Part A, Part B & C)	Y		
7.	Dissemination of Syllabus and Course Plan to Students	Y		
8.	Lecture Notes - Unit I, II & III	Y		
9.	**Sample Documents and Evaluation Sheet for Internal Assessment** – Tutorials / Assignments / Class Test / Open Book Test / Quiz / Project / Seminar / Role Play if any (Before Mid Term)			
10.	**Mid Term Examination** A. Question Paper / Any Other Assessment Tools Used B. Sample Answer Scripts (Best, Average, Poor) if required C. Evaluation Sheet D. Slow Learners List and Remedial Measures			
11.	Lecture Notes – Unit IV & V			
12.	**Sample Documents and Evaluation Sheet for Internal Assessment** – Tutorials / Assignments / Class Test /Open Book Test / Quiz / Project / Seminar / Role Play if any (After Mid Term)			
13.	Course End Survey (Indirect Assessment) & Consolidation			
14.	**End Term Examination** A. Question Paper & Answer Key B. Sample Answer Scripts (Best, Average, Poor) if			

Year: I

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C: 0

	required C. Evaluation Sheet **D.** Slow Learners List and Remedial Measures.			
15.	Content Beyond the Syllabus (Proof)			
16.	Innovative Teaching Tools Used for TLP			
17.	Details of Visiting Faculty Session / Industry Expert / Guest Lecture / Seminar / Field Visit / Webinars / Flipped Class Room / Blended Learning / Online Resources etc.			
18.	Consolidated Mark Statement	Y		
19.	CO Attainment (Mid Term + Internal Assessment + End Term)	Y		
20.	Gap Analysis & Remedial Measures			
21.	CO - PO Attainment			
22.	Class Record (Faculty Logbook)			

Signature of HOD/ Dean **Signature of Faculty**

Date: **Date: 24/04/2021**

Year: I

Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy **Course Code: ENV21005**

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8. Course : **Process Chemistry for Water & Wastewater Treatment** **L:3**

9. Program : **M. Tech (Environmental Engineering)** **T: 0**

10. Target : **60%** **P: 0**

C: 0

Syllabus Copy

Course Code	Course Name	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Environmental Engineering I (B. Tech Course)				
Co-requisites					

Course Objectives

To educate the student on the working principles, theories and design of various physical and chemical treatment systems for water and wastewater.

Course Content

UNIT I: **10 Lecture Hours**

Basic Concepts from Equilibrium Chemistry, Chemical equilibrium and kinetics fundamentals; Acids and Bases; Buffers; Buffer index; Titrations; Solution to equilibrium problems; pC-pH diagram; Complex formation; Solubility of salts; Oxidation-reduction reaction; pE-pH diagram.

Unit II: **10 Lecture Hours**

Water and Wastewater Analysis, Basic concepts from quantitative chemistry: Gravimetric analysis; Volumetric analysis; Colorimetry; Optical methods of analysis; Chromatographic methods of analysis; Standard solutions.

Acidity; Alkalinity; Chemical coagulation and water softening, hardness; Chemistry ofchlorination, disinfection and breakpoint chlorination; Biological oxygen demand; Chemical oxygen demand.

Unit III: **12 Lecture Hours**

Role of Chemical Unit Processes in Wastewater Treatment, Application of chemical unit processes; Fundamentals of chemical coagulation; nature of particles in wastewater; Development and measurement of surface charge; Particle-particle interaction; Particle destabilization with potential determining ions and electrolytes; Particle.

Unit IV: **13 Lecture Hours**

Chemical precipitation for improved plant performance: Chemical reactions in wastewater; Enhanced

Year: I

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10. Target	**: 60%**	**P: 0**
		C: 0

removal of suspended solids in primary sedimentation; Chemical precipitation for phosphorus removal; Chemical precipitation for removal of heavy metals and dissolved inorganic substances.

Text Books

1. Sawyer, C.N., McCarty, P.L. and Parkin, G.F. Chemistry for Environmental Engineering and Science, 5th Edition, McGraw-Hill, Inc., New York, 2003.
2. Manahan, S.E. Fundamentals of Environmental Chemistry, Lewis Publishers, Inc., Boca Raton, 1993.
3. Stumm, W and Morgan, J.J. Aquatic Chemistry: An Introduction emphasizing chemical equilibrium in natural waters, 2nd Edition, Wiley Intersciences, New York.

Reference Books

1. Metcalf and Eddy, Inc. Wastewater Engineering: Treatment and Reuse, 4th Edition, McGraw-Hill, Inc., New York, 2002

Year: I
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Faculty Individual Time Table

ADAMAS UNIVERSITY, KOLKATA									
SCHOOL OF ENGINEERING & TECHNOLOGY									
DEPARTMENT OF CIVIL ENGINEERING									
Programme: M. Tech (Environmental Engineering)									
Course Code & Course: ECE61109 & Process Chem for Water & Wastewater Treatment Faculty Coordinator: Bidhan Ghosh									
Day & Time	**9:30-10:25**	**10:30-11:25**	**11:30-12:25**	**12:25-13:30**	**13:30-14:25**	**14:30-15:25**	**15:30-16:25**	**16:30-17:25**	**17:30-18:25**
Monday		Process Chem for Water & Wastewater Treatment		**LUNCH BREAK**					
Tuesday									
Wednesday									
Thursday						Process Chem for Water & Wastewater Treatment			
Friday							Process Chem for Water & Wastewater Treatment		
Saturday									

Signature of HOD — **Signature of Class Coordinator**

Date: — **Date: 24/04/2021**

Year: I

Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
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8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

Students Name List

Roll Number	Registration Number	Name of the Student
		Srija SinhaRoy
		Susmita Pandit
		Sumit Kumar Khan
		Snehashis Ghosh

Signature of HOD/Dean

Date:

Signature of Class Coordinator

Date: 24/04/2021

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
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8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

COURSE PLAN

Target	60% (marks)
Level-1	50% (population)
Level-2	60% (population)
Level-3	70% (population)

1. Method of Evaluation

UG	**PG**
Internal Assessment (30%) (Quizzes/Tests, Assignments & Seminars etc.)	Internal Assessment (30%) (Quizzes/Tests, Assignments & Seminars etc.)
Mid Semester Examination (20%)	Mid Semester Examination (20%)
End Semester Examination (50%)	End Semester Examination (50%)

*Keep as per Program (UG/PG)

2. Passing Criteria

Scale	**PG**	**UG**
Out of 10 Point Scale	CGPA – "5.00" Min. Individual Course Grade – "C" Passing Minimum – 40	CGPA – "5.00" Min. Individual Course Grade – "C" Passing Minimum – 35

*Keep as per Program (UG/PG)

3. Pedagogy

- **Direct Instruction**
- Kinesthetic Learning
- **Flipped Classroom**
- Differentiated Instruction
- Expeditionary Learning
- Inquiry Based Learning
- Game Based Learning
- Personalized Learning

4. Topics introduced for the first time in the program through this course

Year: I

Semester: I

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8. Course : Process Chemistry for Water & Wastewater Treatment **L:3**

9. Program : M. Tech (Environmental Engineering) **T: 0**

10. Target : 60% **P: 0**

C: 0

- (New Topics Related to this Course – Syllabus Revision if any/Content Beyond Syllabus)

5. References:

Text Books	Web Resources	Journals	Reference Books
03	----	---	01

Signature of HOD/Dean **Signature of Faculty**

Date: **Date:** 24/04/2021

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy **Course Code: ENV21005**

7.

8. Course	**: Process Chemistry for Water & Wastewater Treatment**	**L:3**
9. Program	**: M. Tech (Environmental Engineering)**	**T: 0**
10. Target	**: 60%**	**P: 0**
		C: 0

GUIDELINES TO STUDY THE SUBJECT

Instructions to Students:

1. Go through the 'Syllabus' in the LMS in order to find out the Reading List.
2. Get your schedule and try to pace your studies as close to the timeline as possible.
3. Get your on-line lecture notes (Content, videos) at Lecture Notes section. These are our lecture notes. Make sure you use them during this course.
4. check your LMS regularly
5. go through study material
6. check mails and announcements on blackboard
7. keep updated with the posts, assignments and examinations which shall be conducted on the blackboard
8. Be regular, so that you do not suffer in any way
9. C**ell Phones and other Electronic Communication Devices:** Cell phones and other electronic communication devices (such as Blackberries/Laptops) are not permitted in classes during Tests or the Mid/Final Examination. Such devices MUST be turned off in the class room.
10. **E-Mail and online learning tool:** Each student in the class should have an e-mail id and a pass word to access the LMS system regularly. Regularly, important information – Date of conducting class tests, guest lectures, via online learning tool. The best way to arrange meetings with us or ask specific questions is by email and prior appointment. All the assignments preferably should be uploaded on online learning tool. Various research papers/reference material will be mailed/uploaded on online learning platform time to time.
11. **Attendance:** Students are required to have minimum attendance of 75% in each subject. Students with less than said percentage shall NOT be allowed to appear in the end semester examination.

This much should be enough to get you organized and on your way to having a great semester! If you need us for anything, send your feedback through e-mail somendranath.roy@adamasuniversity.ac.in Please use an appropriate subject line to indicate your message details.

There will no doubt be many more activities in the coming weeks. So, to keep up to date with all the latest developments, please keep visiting this website regularly.

Year: I
Semester: I

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8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

RELATED OUTCOMES

1. The expected outcomes of the Program are:

PO1	Domain Knowledge: Apply comprehensive knowledge of theories, concepts and principles for effective control and management of construction industry projects.
PO2	Problem Analysis: Identify and analyze the strategic importance of construction projects and its problems in the perspectives of client, context and constraints and obtain solution using mathematics, engineering and management principles.
PO3	Design/Development of Solutions: Planning, scheduling, and control of construction projects by managing resources and constraints with appropriate consideration for the public health and safety, and the cultural, societal, and economical 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 IT prediction and simulation tools for construction projects.
PO6	Project Management, Governance and Finance: Create comprehensive understanding of the techniques associated with the management of resources and finance, assessment and management of risk and subsequent corporate governance as appropriate to a project manager operating in the construction industry.
PO7	Ethics and Environment: Understand the impact of residential, commercial, industrial and infrastructural projects in societal, ethical and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO9	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.
PO10	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.

Year: I
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10. **Target**	**: 60%**	**P: 0**
		C: 0

2. The expected outcomes of the Specific Program are: (up to 3)

PSO1	PG itself is a specific specialization program. Henceforth no PSO is required.
PSO2	
PSO3	

3. **The expected outcomes of the Course are: (minimum 4 and maximum 6)**

CO1	**Explain** fundamental water chemistry and learn about water and wastewater characteristics and fundamentals of water and wastewater treatment.
CO2	**Classify** the common physical, chemical and biological unit operations encountered in treatment processes.
CO3	**Illustrate** the fundamentals of water and wastewater treatment.
CO4	**Discuss** water quality data and characterize water and wastewater.
CO5	**Apply** the knowledge in the process design of water and wastewater treatment.

4. Co-Relationship Matrix

Indicate the relationships by 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)

Program Outcomes / Course Outcomes	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**
CO1	3	3	3	3	-	-	3	3	-	3

Year: I
Semester: I

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9. Program : M. Tech (Environmental Engineering) **T: 0**
10. Target : 60% **P: 0**
C: 0

CO2	3	3	3	3	-	-	3	3	-	3
CO3	3	3	3	3	-	-	3	3	-	3
CO4	3	3	3	3	-	-	3	3	-	3
CO5	3	3	3	3	-	-	3	3	-	3
Average	3	3	3	3	-	-	3	3	-	3

5. Course Outcomes Assessment Plan (COA):

Course Outcomes	Internal Assessment* (30 Marks)		Mid Term Exam (20 Marks)	End Term Exam (50 Marks)	Total (100 Marks)
	Before Mid Term	After Mid Term			
CO1	5	NA	7	8	20
CO2	5	NA	7	8	20
CO3	3	3	6	8	20
CO4	NA	7	NA	13	20
CO5	NA	7	NA	13	20
Total	13	17	20	50	100

* Internal Assessment – Tools Used: Tutorial, Assignment, Seminar, Class Test etc.

Year: I
Semester: I

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10. Target : 60% — P: 0
C: 0

OVERVIEW OF COURSE PLAN OF COURSE COVERAGE

Course Activities:

S. No.	Description	Planned			Actual			Remarks
		From	To	No. of Session	From	TO	No. of Session	
1.	Basic Concepts from Equilibrium Chemistry	01.09.2020	17.09.2020	10	01.09.2020	24.09.2020	16	
2.	Water and Wastewater Analysis	18.09.2020	12.10.2020	10	25.09.2020	02.11.2020	14	
3.	Role of Chemical Unit Processes in Wastewater Treatment	15.10.2020	12.11.2020	12	05.11.2020	14.12.2020	18	
4.	Chemical precipitation for improved plant performance	13.11.2020	17.12.2020	13	17.12.2020	09.02.2021	17	

Total No. of Instructional periods available for the course: 45 Sessions

Signature of HOD/Dean — **Signature of Faculty**

Date: — **Date: 24/04/2021**

Year: I
Semester: I

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10. **Target** : **60%** **P: 0**
C: 0

SESSION PLAN
UNIT-I

Session Plan				Actual Delivery			
Lect.	Date	Topics to be Covered	CO Mapped	Lect.	Date	Topics Covered	CO Achieved
1	01.09.2020	Chemical equilibrium and kinetics fundamentals	CO1	2	01.09.2020	Chemical equilibrium and kinetics fundamentals	CO1
2	04.09.2020	Chemical equilibrium and kinetics fundamentals	CO1	2	04.09.2020	Chemical equilibrium and kinetics fundamentals	CO1
3	07.09.2020	Acids and Bases	CO1	2	07.09.2020	Acids and Bases	CO1
4	14.09.2020	Acids and Bases	CO1	2	14.09.2020	Acids and Bases	CO1
5	17.09.2020 – 18.09.2020	Buffers	CO1	2	17.09.2020 – 18.09.2020	Buffers	CO1
6	21.09.2020	Buffer index	CO1	1	21.09.2020	Buffer index	CO1
7	24.09.2020 – 25.09.2020	Titrations	CO1	2	24.09.2020 – 25.09.2020	Titrations	CO1
8	28.09.2020	Solution to equilibrium problems	CO1	1	28.09.2020	Solution to equilibrium problems	CO1

Year: I

Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy **Course Code: ENV21005**

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9. Program : **M. Tech (Environmental Engineering)** **T: 0**

10. Target : **60%** **P: 0**

C: 0

9	01.10.2020	Solubility of salts	CO1	1	01.10.2020	Solubility of salts	CO1
10	05.10.2020	Oxidation-reduction reaction	CO1	1	05.10.2020	Oxidation-reduction reaction	CO1

Remarks:

Signature of Faculty

Date: 24/04/2021

Year: I
Semester: I

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8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

SESSION PLAN
UNIT-II

Session Plan				Actual Delivery			
Lect.	Date	Topics to be Covered	CO Mapped	Lect.	Date	Topics Covered	CO Achieved
1	08.10.2020	Water and Wastewater Analysis	CO2	1	08.10.2020	Water and Wastewater Analysis	CO2
2	09.10.2020	Water and Wastewater Analysis	CO2	1	09.10.2020	Water and Wastewater Analysis	CO2
3	12-15.10.2020	Gravimetric analysis	CO2	2	12-15.10.2020	Gravimetric analysis	CO2
4	16.10.2020	Gravimetric analysis	CO2	1	16.10.2020	Gravimetric analysis	CO2
5	19 &29.10.2020	Volumetric analysis	CO2	2	19 &29.10.2020	Volumetric analysis	CO2
6	02 &05.11.2020	Volumetric analysis	CO2	2	02 &05.11.2020	Volumetric analysis	CO2
7	06.11.2020	Colorimetry	CO2	1	06.11.2020	Colorimetry	CO2
8	09 & 12.11.2020	Chromatographic methods of analysis	CO2	2	09 & 12.11.2020	Chromatographic methods of analysis	CO2
9	13.11.2020	Chromatographic methods of analysis	CO2	1	13.11.2020	Chromatographic methods of analysis	CO2
10	16.11.2020	Standard solutions	CO2	1	16.11.2020	Standard solutions	CO2

Year: I

Semester: I

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9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

Remarks:

Signature of Faculty

Date: 24/04/2021

Year: I
Semester: I

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9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

SESSION PLAN
UNIT-III

Session Plan				Actual Delivery			
Lect.	Date	Topics to be Covered	CO Mapped	Lect.	Date	Topics Covered	CO Achieved
1	19 & 20.11.2020	Role of Chemical Unit Processes in Wastewater Treatment	CO3	2	19 & 20.11.2020	Role of Chemical Unit Processes in Wastewater Treatment	CO3
2	03 & 04.12.2020	Role of Chemical Unit Processes in Wastewater Treatment	CO3	2	03 & 04.12.2020	Role of Chemical Unit Processes in Wastewater Treatment	CO3
3	07 & 10.12.2020	Application of chemical unit processes	CO3	2	07 & 10.12.2020	Application of chemical unit processes	CO3
4	11.12.2020	Fundamentals of chemical coagulation	CO3	1	11.12.2020	Fundamentals of chemical coagulation	CO3
5	14.12.2020	Fundamentals of chemical flocculation	CO3	1	14.12.2020	Fundamentals of chemical flocculation	CO3
6	17.12.2020	Fundamentals of chemically particles binding	CO3	1	17.12.2020	Fundamentals of chemically particles binding	CO3
7	21.12.2020	Nature of particles in wastewater	CO3	1	21.12.2020	Nature of particles in wastewater	CO3
8	24.12.2020	Development and measurement	CO3	1	24.12.2020	Development and measurement of	CO3

Year: I

Semester: I

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10. **Target** : **60%** **P: 0**
C: 0

		of surface charge				surface charge	
9	24.12.2020	Particle-particle interaction	CO3	2	24.12.2020	Particle-particle interaction	CO3
10	04.01.2021	Particle-particle interaction	CO3	1	04.01.2021	Particle-particle interaction	CO3
11	07.01.2021	Particle destabilization with potential determining ions	CO3	2	07.01.2021	Particle destabilization with potential determining ions	CO3
12	08.01.2021	Electrolytes	CO3	2	08.01.2021	Electrolytes	CO3

Remarks:

Signature of Faculty

Date: 24/04/2021

Year: I
Semester: I

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8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

SESSION PLAN
UNIT-IV

Session Plan				Actual Delivery			
Lect.	Date	Topics to be Covered	CO Mapped	Lect.	Date	Topics Covered	CO Achieved
1	09.01.2021	Chemical reactions in wastewater	CO4	1	09.01.2021	Chemical reactions in wastewater	CO4
2	21.01.2021	Chemical reactions in wastewater	CO4	2	21.01.2021	Chemical reactions in wastewater	CO4
3	22.01.2021	Chemical reactions in wastewater	CO4	1	22.01.2021	Chemical reactions in wastewater	CO4
4	29.01.2021	Enhanced removal of suspended solids in primary sedimentation	CO4	1	29.01.2021	Enhanced removal of suspended solids in primary sedimentation	CO4
5	02.02.2021	Enhanced removal of suspended solids in primary sedimentation	CO4	2	02.02.2021	Enhanced removal of suspended solids in primary sedimentation	CO4
6	03.02.2021	Enhanced removal of suspended solids in primary sedimentation	CO4	1	03.02.2021	Enhanced removal of suspended solids in primary sedimentation	CO4
7	05.02.2021	Chemical precipitation for	CO4	2	05.02.2021	Chemical precipitation for	CO4

Year: I

Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy **Course Code: ENV21005**

7.

8. Course : Process Chemistry for Water & Wastewater Treatment **L:3**

9. Program : M. Tech (Environmental Engineering) **T: 0**

10. Target : 60% **P: 0**

C: 0

		phosphorus removal				phosphorus removal	
8	08.02.2021	Chemical precipitation for phosphorus removal	CO4	2	08.02.2021	Chemical precipitation for phosphorus removal	CO4
9	09.02.2021	Chemical precipitation for nitrogen removal	CO4	1	09.02.2021	Chemical precipitation for nitrogen removal	CO4
10	10.02.2021	Chemical precipitation for removal of heavy metals and dissolved inorganic substances	CO5	2	10.02.2021	Chemical precipitation for removal of heavy metals and dissolved inorganic substances	CO5
11	N	Chemical precipitation for removal of heavy metals and dissolved inorganic substances	CO5	N			N
12	N	Chemical precipitation for removal of heavy metals and dissolved inorganic substances	CO5	N			N
13	N	Chemical precipitation for removal of heavy metals and dissolved inorganic substances	CO5	N			N

Remarks:

Signature of Faculty

Date: 24/04/2021

Year: I

Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
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Year: I
Semester: I

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8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

PERIODIC MONITORING

Actual date of completion and remarks, if any

Components		From	To	From	To
Duration (Mention from and to Dates)		01.09.2020	12.10.2020	05.11.2020	09.02.2021
Percentage of Syllabus covered		50%		50%	
Lectures	Planned	1	20	21	45
	Taken	1	30	31	65
Tutorials	Planned	NA			
	Taken				
Test/Quizzes/ Mid Semester/ End Semester	Planned	1	1 (MID)	1	1 (END)
	Taken				
	CO's Addressed	CO1 & CO2	CO1, CO2 & CO3	CO4 & CO5	CO1, CO2, CO3, CO4 & CO5
	CO's Achieved				
Assignments	Planned	1	1		1
	Taken				
	CO's Addressed	CO1 & CO2	CO3	CO3	CO4 & CO5
	CO's Achieved				
Signature of Faculty					
Head of the Department					
OBE Coordinator					

Signature of HOD/ Dean — Signature of Faculty

Date — Date: 24/04/2021

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
7.

8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

PERIODIC MONITORING

Attainment of the Course (Learning) Outcomes:

Components	Attainment level	Action Plan	Remarks
Assignment	CO1:	Submission Target 12.10.2020	Assignment Questions covered the Basic Concepts from Equilibrium Chemistry, Acids & base and Basic concepts from quantitative chemistry
	CO2:		
	CO3:	Submission Target 05.11.2020	Assignment Questions covered the Role of Chemical Unit Processes in Wastewater Treatment
	CO4:	Submission Target 09.02.2021	Assignment Questions covered the Enhanced removal of suspended solids in primary sedimentation
	CO5:		
Quiz/Test etc.	CO1:	Conducted on 12.10.2020	
	CO2:		
	CO3:	----	
	CO4:	Conducted on 05.02.2021	
	CO5:		
Mid Semester	CO1:	Scheduled on	Question bank given to understand pattern
	CO2:		
	CO3:		
	CO4:	-----	
	CO5:	----	
End Semester	CO1:	Scheduled on	Question bank given to understand pattern
	CO2:		
	CO3:		
	CO4:		
	CO5:		
Any Other	CO1:	NA	
	CO2:		
	CO3:		
	CO4:		
	CO5:		

Year: I

Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8.	Course	: Process Chemistry for Water & Wastewater Treatment	L:3
9.	Program	: M. Tech (Environmental Engineering)	T: 0
10.	Target	: 60%	P: 0
			C: 0

Signature of HOD/ Dean **Signature of Faculty**

Date **Date: 24/04/2021**

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
7.

8. Course	: Process Chemistry for Water & Wastewater Treatment	L:3
9. Program	: M. Tech (Environmental Engineering)	T: 0
10. Target	: 60%	P: 0
		C: 0

Previous Year Question Papers – Set 1

ADAMAS UNIVERSITY

END SEMESTER EXAMINATION (DECEMBER 2019)

(Academic Session: 2019 – 20 Semester Terms: Aug 2019 – Dec 2019)

Name of the Program: M. Tech. — **Semester: I**

Paper Title: Process Chemistry for Water & Waste Water Treatment — **Paper Code: ECE-61109**

Maximum Marks: 40 — **Time Duration: 3 hrs**

No. of Pages = 02 — **No. of Questions = 11**

Note:

1. Please follow all the Instructions given on the cover page of the Answer Booklet Strictly.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.
4. No Mobile Phones will be permitted in the Examination Hall.

Answer all the Groups

PART– A

ANSWER ALL THE QUESTIONS — **5 x 1= 5**

1. One word/sentence answer type question

i) The objectives of sewage treatment will always include the reduction of the concentration of at least one of the below constituents

ii) The activated sludge process consists of returning a portion of the clarifier

iii) The most serious environmental effect posed by hazardous wastes is

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy **Course Code: ENV21005**

7.

8. Course	**: Process Chemistry for Water & Wastewater Treatment**	**L:3**
9. Program	**: M. Tech (Environmental Engineering)**	**T: 0**
10. Target	**: 60%**	**P: 0**
		C: 0

iv) The chemical oxygen demand (COD) measures the

v) For the survival of fish in a river stream, the minimum dissolved oxygen is prescribed as

vi) According to IS guideline, what should be the lowest Turbidity limit to be present in drinking water supplies.

PART– B

ANSWER QUESTION (any Three) **3 x 5 = 15**

2. Draw a schematic diagram for the characteristics of industrial waste. Write in tabular form the difference between ground water and surface water.

3. Define environmental indicator. Draw in a tabular form for the five key global environmental indicators.

4. What is Biodiversity? How many types of biodiversity exist in the environment? Describe the individual scale of biodiversity in details?

5. The contaminants in wastewater are removed by different unit processes. What are these processes?

6. Describe typical composition of solids in raw waste water as the total solids are divided. What are the reasons why DO depend on temperature and flow?

7. Write the Procedure for calculating original sample turbidity after dilution.

PART– C

ANSWER QUESTION (any Two) **2 x 10 = 20**

8. A BOD test was conducted at 20^0C in which 15 mL of waste sample was diluted with dilution water to 300 mL. Calculate 5-day BOD at 20^0C.

[Given :

Initial DO of the diluted sample D_1 = 8.8 mg/L

Final Do after 5 days D_2 = 1.9 mg/L

Initial DO of seeded dilution water B_1 = 9.1 mg/L

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy **Course Code: ENV21005**

7.

8. Course	**: Process Chemistry for Water & Wastewater Treatment**	**L:3**
9. Program	**: M. Tech (Environmental Engineering)**	**T: 0**
10. Target	**: 60%**	**P: 0**
		C: 0

Final DO of seeded dilution water B_2 = 7.9 mg/L]

9. Define Beer-Lambert Law / Beer's law. What is the Main use of Beer's Law? Explain along with the formula of statement "**Transmittance is Related to Absorbance"**.

10. What is colorimetry principle? What is the purpose of colorimetry? What are the parts of colorimeter? Draw and explain a simple schematic diagram to show a spectrophotometer.

11. Being an environmental engineer, what would be your approach for setting-up a waste water treatment system? Discuss briefly with a schematic diagram.

----------x----------x----------

Previous Year Question Papers - Set 2

ADAMAS UNIVERSITY

END SEMESTER EXAMINATION (DECEMBER 2019)

(Academic Session: 2019 – 20 Semester Terms: Aug 2019 – Dec 2019)

Name of the Program: M. Tech. **Semester: I**

Paper Title: Process Chemistry for Water & Waste Water Treatment **Paper Code: ECE-61109**

Maximum Marks: 40 **Time Duration: 3 hrs**

No. of Pages = 02 **No. of Questions = 10**

Note:

5. Please follow all the Instructions given on the cover page of the Answer Booklet Strictly.
6. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
7. Assumptions made if any, should be stated clearly at the beginning of your answer.
8. No Mobile Phones will be permitted in the Examination Hall.

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy **Course Code: ENV21005**

7.

8. Course	**: Process Chemistry for Water & Wastewater Treatment**	**L:3**
9. Program	**: M. Tech (Environmental Engineering)**	**T: 0**
10. Target	**: 60%**	**P: 0**
		C: 0

Answer all the Groups

PART– A

ANSWER ALL THE QUESTIONS **5 x 1= 5**

12. One word answer type question

i) Problem of solid waste disposal can be reduced through

ii) Which element is considered the main element triggering eutrophication in saltwater?

iii) The chemical oxygen demand (COD) measures the

iv) Conventional tertiary treatment is

v) When would you expect the lowest concentration of dissolved oxygen (DO) in a facultative pond?

PART– B

ANSWER QUESTION (any Three) **5 x 3 = 15**

13. Draw a cubical diagram for the characteristics of industrial waste.
14. What do you mean by activated sludge? Draw a schematic diagram of the conventional activated sludge process.
15. What is Membrane Bio-Reactor (MBR)? Write in tabular form the advantages & disadvantages of MBR.
16. Write the dilution factor with formula. What would be the diluted concentration if the standard/original concentration is 6.88 ppm?
17. State and explicit with examples the different types of chemical reactions. Classify and explain the organic matter depending on their degradability.

PART– C

ANSWER QUESTION (any Two) **10 x 2 = 20**

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
7.

8. Course	: Process Chemistry for Water & Wastewater Treatment	L:3
9. Program	: M. Tech (Environmental Engineering)	T: 0
10. Target	: 60%	P: 0
		C: 0

18. Describe schematically in details of sewage treatment plant which you have visited recently.

19. Being an environmental engineer, what would be your approach for setting-up a waste water treatment system? Discuss briefly with a schematic diagram.

20. Write in a tabular form the differences between gravimetric and volumetric analysis.
A 10.0 ml solution containing Cl^- was treated with excess $AgNO_3$ to precipitate 0.4368 gm of AgCl. What was the concentration of Cl^- in the unknown? [AgCl = 143.321 gm/mol].

21. Draw a schematic diagram of treatment methodologies for waste water treatment. Why Zero Liquid Discharge (ZLD) is so important now a day for the industries? What is the main aim of ZLD? Name the major ZLD technologies.

----------x----------x----------

Question Bank Sample

ADAMAS UNIVERSITY
PURSUE EXCELLENCE

School: SOET — **Department: CE**
Course Code: ECE61109 — **Course Name: Process Chem for Water & Wastewater Treatment**
Program: M. Tech. (Env. Engg.) — **Semester: I**

Sl. No.	Question	Level of Difficulty (Easy/ Medium/ Difficult)	Knowledge Level (Bloom's Taxonomy)	Course Outcome (CO)
	UNIT-I			
	Part A (Multiple Choice Questions) (1 mark each)			

Year: I

Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy **Course Code: ENV21005**

7.

8. Course : Process Chemistry for Water & Wastewater Treatment **L:3**

9. Program : M. Tech (Environmental Engineering) **T: 0**

10. Target : 60% **P: 0**

C: 0

1.	The objectives of sewage treatment will always include the reduction of the concentration of at least one of the below constituents a) Pathogenic organisms (eg. E.Coli) b) Heavy metals c) Ammonia d) None of these	**Easy**	R	CO1
2.	In municipal waste water, phosphorous should be controlled between a) 4-16 mg/L b) 1-5 mg/L c) 10-20 mg/L d) None of these	**Medium**	**R**	**CO1**
3.	Turbidity of drinking water must less than a) 10 NTU b) 5 NTU c) 1 NTU d) 3 NTU	**Difficult**	U, Ap	**CO1**
	Part B (Definition/Naming Questions) (2 marks each)			
1.	The activated sludge process consists of returning a portion of the clarifier	**Easy**	R	**CO1**
2.	**The most serious environmental effect posed by hazardous wastes is**	**Medium**	U	**CO1**
3.	**According to IS** guideline, what should be the lowest Turbidity limit to be present in drinking water supplies.	**Difficult**	U	**CO1**
	Part C (Short Questions) (3-4 marks each)			
1.	Draw a schematic diagram for the characteristics of industrial waste. Write in tabular form the difference between ground water and surface water.	**Easy**	R	**CO1**
2.	If the statement "Chemical reactions are associated with chemical change" is true, explain to justify the statement.	**Medium**	U	**CO1**
3.	How do you identify the water quality depending on the basis of BOD level in gm/litre?	**Difficult**	U	**CO1**
	Part D (Explanation Based Questions) (5 marks each)			
1.	Define environmental indicator. Draw in a tabular form for the five key global environmental indicators.	**Easy**	R	**CO1**
2.	How many types of biodiversity exist in the environment?	**Medium**	U	**CO1**

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

3.	Describe the individual scale of biodiversity in details?	**Difficult**	U	**CO1**
Part E (Questions Based on Reasoning) (5 marks each)				
1.	The contaminants in wastewater are removed by different unit processes. What are these processes?	**Easy**	R	**CO1**
2.	How do you identify the water quality depending on the basis of BOD level in gm/litre?	**Medium**	U	**CO1**
3.	Write the Procedure for calculating original sample turbidity after dilution.	**Difficult**	U, R	**CO1**
Part F (Application Based Questions) (5-10 marks each)				
1.	With surface aerators the oxygen transfer is regulated in different ways. Give the possible control systems with: a) Aerators with vertical wave b) Aerators with horizontal wave	**Easy**	R	**CO1**
2.	*Which element is considered one of the most corrosive components in water chemistry when found dissolved in water? Explain.*	**Medium**	U	**CO1**
3.	The inspection of sewers is an important prerequisite for the timely recognition of whether the sewer has to be cleaned or damage has to be repaired. a) Name the normal inspection methods. b) Which damage to the sewer can be discovered as a result of an inspection?	**Difficult**	U	**CO1**
Part G (Short Notes) (5 marks each)				
1.	What do you understand by “secondary pollution of a body of water”?	**Easy**	U	**CO1**
2.	With increasing duration of use of compressed air aerators without plastic membrane the required blower output increases continuously in order to guarantee the necessary oxygen transfer. Give possible causes for this.	**Medium**	Ap	**CO1**
3.	The metabolism of the micro-organisms, in particular of the bacteria, is relevant for the self-cleaning of the body of water. Explain how and why, below a discharge of wastewater into a body of water the number of bacteria and protozoa changes as well as the oxygen content.	**Difficult**	U, R	**CO1**

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
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8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

UNIT-II

	Part A (Multiple Choice Questions) (1 mark each)			
1.	Coliform bacteria in water is an indication of the presence of 1. radioactive wastes 2. excess fertilizer 3. decaying animals and plants 4. human feces	**Easy**	U	**CO2**
2.	Both temporary and permanent hardness of water can be removed by 1. Boiling 2. Distillation 3. Filtration 4. Decantation.	**Easy**	U	**CO2**
3.	When temporary hard water is boiled, one of the substances formed is 1. calcium bicarbonate 2. calcium sulfate 3. hydrogen chloride 4. carbon dioxide	**Medium**	U	**CO2**
	Part B (Definition/Naming Questions) (2 marks each)			
1.	Why wastewater should be treated before disposal?	**Easy**	**U**	**CO2**
2.	Define wastewater.	**Medium**	**R**	**CO2**
3.	Why ground water monitoring is important in control of water pollution?	**Difficult**	**U**	**CO2**
	Part C (Short Questions) (3-4 marks each)			
1.	State and explicit with examples the different types of chemical reactions.	**Easy**	R	**CO2**
2.	Classify and explain the organic matter depending on their degradability.	**Medium**	**R**	**CO2**

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

3.	Describe in tabular form the difference between Molarity & Molality.	**Difficult**	**U**	**CO2**
Part D (Explanation Based Questions) (5 marks each)				
1.	When would you expect the lowest concentration of dissolved oxygen (DO) in a facultative pond?	**Easy**	**U**	**CO2**
2.	Draw the symbiosis of the oxidation pond.	**Medium**	**U**	**CO2**
3.	Why more than one lagoon is recommended for wastewater treatment?	**Difficult**	**Ap, U**	**CO2**
Part E (Questions Based on Reasoning) (5 marks each)				
1.	The self-cleaning capacity of a body of water depends on the biology of the water and on the nutrients available. List the relevant individual factors for the self-cleaning capacity.	**Easy**	**Ap**	**CO2**
2.	The metabolism of the micro-organisms, in particular of the bacteria, is relevant for the self-cleaning of the body of water. Explain how and why, below a discharge of wastewater into a body of water the number of bacteria and protozoa changes as well as the oxygen content.	**Medium**	**U**	**CO2**
3.	In the biological wastewater treatment there are two basic processes: the activated sludge and the fixed-bed processes. Explain the differences with regard to the important characteristics of the bacteria.	**Difficult**	**Ap**	**CO2**
Part F (Application Based Questions) (5-10 marks each)				
1.	A sewer film forms in a sewer. a) Explain the term “sewer film”.	**Easy**	**U**	**CO2**

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
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8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

	b) Name the characteristics of the sewer film advantageous for the sewer.			
2.	What are the purposes of a septic tank?	**Medium**	**Ap**	**CO2**
3.	How do you estimate the size of a septic tank for a home of 5 members? [Note: Total water consumption = 500 litres/day (approx.), Detention period = 3 days Sludge removal 2 years once Consider length:breadth = 4:1 (consider breadth of the tank should min 750 mm) Min depth of septic tank should not be less than 1.8 m]	**Difficult**	**U, R**	**CO2**
Part G (Short Notes) (5 marks each)				
1.	Oxidation ponds	**Easy**	**Cr, U, Ap**	**CO2**
2.	Facultative ponds	**Medium**	**R, U**	**CO2**
3.	Lagoon design	**Difficult**	**U**	**CO2**
UNIT-III				
Part A (Multiple Choice Questions) (1 mark each)				
1.	Which element is considered the main element triggering eutrophication in saltwater? (a) Nitrogen (b) oxygen (c) calcium	**Easy**	**R**	**CO3**
2.	The activated sludge process consists of returning a portion of the clarifier a) effluent water entering the reactor b) influent water coming out of the reactor c) c) influent water entering the reactor d) effluent water coming out of the reactor	**Medium**	**U**	**CO3**
3.	Anaerobic wastewater releases a) Chlorine gas b) H_2S c) Ammonia d) None of these	**Difficult**	**U**	**CO3**

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

	Part B (Definition/Naming Questions) (2 marks each)			
1.	Name the different forms of phosphorous.	**Easy**	**U**	**CO3**
2.	Explain with cite examples the types of displacement reactions	**Medium**	**U**	**CO3**
3.	What is Biodiversity?	**Difficult**	**U**	**CO3**
	Part C (Short Questions) (3-4 marks each)			
1.	What is MBR? Name the two different configurations of MBR.	**Easy**	R	**CO3**
2.	Why is the BOD:COD ratio of a sewage sample increasing as the wastewater sample progresses through the treatment plant?	**Medium**	U	**CO3**
3.	How does biological nutrient removal work?	**Difficult**	U	**CO3**
	Part D (Explanation Based Questions) (5 marks each)			
1.	Draw a cubical diagram for the characteristics of industrial waste.	**Easy**	**U, R**	**CO3**
2.	Write in tabular form the difference between ground water and surface water.	**Medium**	U	**CO3**
3.	Nitrogen removal takes place in wastewater treatment plants through the biological-chemical processes of nitrification and denitrification. Describe both processes briefly.	**Difficult**	U	**CO3**
	Part E (Questions Based on Reasoning) (5 marks each)			
1.	Classify and explain the organic matter depending on their degradability.	**Easy**	U, Ap	**CO3**
2.	Draw a schematic diagram of the conventional activated sludge process.	**Medium**	**U**	**CO3**
3.	State the common treatment processes for biological nutrient r	**Difficult**	**U**	**CO3**
	Part F (Application Based Questions) (5-10 marks each)			
1.	A BOD test was conducted at 20^0C in which 15 mL of waste sample was diluted with dilution water to 300 mL. Calculate 5-day BOD at 20^0C.	**Easy**	U	

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
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8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

	[Given : Initial DO of the diluted sample D_1 = 8.8 mg/L Final Do after 5 days D_2 = 1.9 mg/L Initial DO of seeded dilution water B_1 = 9.1 mg/L Final DO of seeded dilution water B_2 = 7.9 mg/L]			**CO3**
2.	A 10 ml solution containing Cl^- was treated with excess $AgNO_3$ to precipitate 0.4368 gm of AgCl. What was the concentration of Cl^- in the unknown? (AgCl = 143.321 g/mol).	**Medium**	U	**CO3**
3.	Being an environmental engineer, what would be your approach for setting-up a waste water treatment system? Discuss briefly with a schematic diagram.	**Difficult**	**U, Ap**	**CO3**
	Part G (Short Notes) (5 marks each)			
1.	Imhoff tank	**Easy**	U	**CO3**
2.	Nitrification and Denitrification	**Medium**	U, Ap	**CO3**
3.	Fixed-bed processes	**Difficult**	Ap	**CO3**
	UNIT-IV			
	Part A (Multiple Choice Questions) (1 mark each)			
1.	BOD stands for 1. biochemical oxygen demand 2. british oxygen demand 3. british oxygen depletion 4. biological oxygen depletion	**Easy**	**U**	**CO4**
2.	Facultative bacteria are able to work in a) Presence of oxygen only b) Absence of oxygen only c) Presence as well as in absence of oxygen d) Presence of water	**Medium**	**U**	**CO4**
3.	The polluted water is one which a) Contains pathogenic bacteria	**Difficult**	**U**	**CO4**

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
7.

8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

	b) Consists of undesirable substances rendering it unfit for drinking and domestic use c) Is safe and suitable for drinking and domestic use d) Is contaminated			
	Part B (Definition/Naming Questions) (2 marks each)			
1.	Define the oxidation ponds.	**Easy**	**U**	**CO4**
2.	Define the anaerobic ponds.	**Medium**	**U**	**CO4**
3.	What is IFAS process?	**Difficult**	U	**CO4**
	Part C (Short Questions) (3-4 marks each)			
1.	What is colorimetry principle?	**Easy**	R	**CO4**
2.	What is the purpose of colorimetry?	**Medium**	**R**	**CO4**
3.	State and explicit with examples the different types of chemical reactions.	**Difficult**	**U**	**CO4**
	Part D (Explanation Based Questions) (5 marks each)			
1.	What are the parts of colorimeter?	**Easy**	**U, Ap**	**CO4**
2.	Draw and explain a simple schematic diagram to show a spectrophotometer.	**Medium**	**U**	**CO4**
3.	What do you mean by activated sludge? What is Membrane Bio-Reactor (MBR)?	**Difficult**	**U**	**CO4**
	Part E (Questions Based on Reasoning) (5 marks each)			
1.	What is the Main use of Beer's Law?	**Easy**	**U**	**CO4**
2.	Describe typical composition of solids in raw waste water as the total solids are divided. What are the reasons why DO depend on temperature and flow?	**Medium**	**Ap, U**	**CO4**
3.	Write the dilution factor with formula. What would be the diluted concentration if the standard/original concentration is 6.88 ppm?	**Difficult**	**R**	**CO4**

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
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9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

Part F (Application Based Questions) (5-10 marks each)				
1.	Define Beer-Lambert Law / Beer's law.	**Easy**	**U**	**CO4**
2.	Explain along with the formula of statement "**Transmittance is Related to Absorbance"**.	**Medium**	**R**	**CO4**
3.	How does the type of wastewater affect the performance of an anaerobic bioreactor?	**Difficult**	**U, Ap**	**CO4**
Part G (Short Notes) (5 marks each)				
1.	Beer's law.	**Easy**	**Cr, U**	**CO4**
2.	MBBR	**Medium**	**U**	**CO4**
3.	Activated sludge	**Difficult**	**R, Ap**	**CO4**

Lecture Notes

https://riceindia.sharepoint.com/:f:/s/ADAMAS_SOET/ErZBFhnkNuxCqnnIims9H3EB9EcEumNGpiPWaQ54I7HCZA?e=sraQEi

https://drive.google.com/drive/folders/1Qcwolx2nBJvLnwNk1A0-Kwxwog6ScU90?usp=sharing

Internal Assessment/ Class Test

Group A **Answer All the Questions (5 x 2 = 10)**		**Knowledge Level**	
1	What is the rate of a chemical reaction not dependent on?	**U**	**CO1, CO2**

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
7.

8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

	a) Stoichiometry b) Surface area of reactants c) Temperature d) Pressure		
2	In case of Moving Bed Bioreactor and Activated Sludge process which is the factor that limits the rate of the reaction? a) temperature b) pressure c) pH d) ionic composition	R	CO1, CO4
3	In water treatment which factor which has a major control over reaction selectivity and product distribution? a) pH b) temperature c) pressure d) ionic concentration	U	CO3
4	The degradation of BOD is classified as what type of reaction? a) First Order Reaction b) Zero Order Reaction c) Second Order Reaction d) Third Order Reaction	Ap	CO4
5	_____ tend to resist conventional methods of wastewater treatment. a) Suspended solids b) Nutrients c) Refractory organics d) Priority pollutants	U	CO4, CO5

Group B

Answer Four Questions (5 x 4 = 20)

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy **Course Code: ENV21005**

7.

8. Course : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. Program : **M. Tech (Environmental Engineering)** **T: 0**
10. Target : **60%** **P: 0**
C: 0

6.	i) Which of these is the used as the indicator when the titration is carried out to determine the amount of COD present in a sample? ii) How is TSS calculated?	**R**	**CO1, CO2**
7.	i) What is the ratio of BOD/COD in the final effluent? ii) What is the ratio of BOD/COD in untreated waste?	**U**	**CO1, CO2**
8.	i) How is COD calculated?	**U**	**CO3**
9.	i) The BOD test is carried out for how many days? ii) Turbidity in water is caused by which materials.	**R**	**CO3,** **CO4**
10.	i) What is the role of chlorine in water treatment? ii) What is the phosphorus available for a biological process called?	**U**	**CO3,** **CO4,** **CO5**

Class Test Answer Script

ADAMAS UNIVERSITY
PURSUE EXCELLENCE

SCHOOL OF ENGINEERING AND TECHNOLOGY

MID-SEMESTER EXAMINATION (THEORETICAL)

(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Subject Code : **ECE-61109**
Subject Title : **Process Chemistry for Water**

No. of Pages	= 02
No. of Questions	= 08

Year: I

Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy **Course Code: ENV21005**

7.

8. Course	**: Process Chemistry for Water & Wastewater Treatment**	**L:3**
9. Program	**: M. Tech (Environmental Engineering)**	**T: 0**
10. Target	**: 60%**	**P: 0**
		C: 0

& Wastewater Treatment

Full Marks : **20**

Duration : **2 Hours**

Note:

9. Please follow all the Instructions given on the cover page of the Answer Booklet Strictly.
10. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
11. Assumptions made if any, should be stated clearly at the beginning of your answer.
12. No Mobile Phones will be permitted in the Examination Hall.

Answer all the Groups

PART– A

ANSWER ALL THE QUESTIONS **5 x 1= 5**

1. Multiple Choice Questions

i) The solution of known concentration which is usually taken in a burette is called

a) Titrand b) Titrant c) Titration d) *End point*

ii) In municipal waste water, phosphorous should be controlled between

a) 4-16 mg/L b) 1-5 mg/L c) 10-20 mg/L d) None of these

iii) Turbidity of drinking water must less than

b) 10 NTU b) 5 NTU c) 1 NTU d) 3 NTU

iv) Anaerobic wastewater releases

a) Chlorine gas b) H_2S c) Ammonia d) None of these

v) Which light source is used for measuring turbidity in FNU (Formazin Nephelometric Unit)

a) an infrared light

b) an ordinary light

c) a florescent light

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy **Course Code: ENV21005**

7.

8.	**Course**	**: Process Chemistry for Water & Wastewater Treatment**	**L:3**
9.	**Program**	**: M. Tech (Environmental Engineering)**	**T: 0**
10.	**Target**	**: 60%**	**P: 0**
			C: 0

d) scattered light

PART– B

ANSWER QUESTION (any Three) **5 x 3 = 15**

2. If the statement "Chemical reactions are associated with chemical change" is true, explain to justify the statement. How do you identify the water quality depending on the basis of BOD level in gm/litre?

3. State and explicit with examples the different types of chemical reactions. Classify and explain the organic matter depending on their degradability.

4. (i) A 10 ml solution containing Cl^- was treated with excess $AgNO_3$ to precipitate 0.4368 gm of AgCl. What was the concentration of Cl^- in the unknown? (AgCl = 143.321 g/mol).

   (ii) How do you identify the water quality depending on the basis of BOD level in gm/litre?

5. Describe in tabular form the difference between Molarity & Molality. Name the different forms of phosphorous. Explain with cite examples the types of displacement reactions.

6. Draw a cubical diagram for the characteristics of industrial waste. Write in tabular form the difference between ground water and surface water.

7. Define wastewater. Write the types of wastewater in our environment. why wastewater should be treated before disposal?

8. A BOD test was conducted at 20^0C in which 15 mL of waste sample was diluted with dilution water to 300 mL. Calculate 5-day BOD at 20^0C.
   [Given :
   Initial DO of the diluted sample D_1 = 8.8 mg/L
   Final Do after 5 days D_2 = 1.9 mg/L
   Initial DO of seeded dilution water B_1 = 9.1 mg/L

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
7.

8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

Final DO of seeded dilution water B_2 = 7.9 mg/L]

----------x----------x----------

Answer Key

Answer Script Sample

Evaluation Sheet – Internal Assessment

Roll Number	Registration Number	Name of the Student	Internal Assessment (30)				
			Assignment	Class Test	Case Study	etc.	Total
PG/02/MTEVE/2020/002	AU/2020/0004450	Srija SinhaRoy		29			29
PG/02/MTEVE/2020/004	AU/2020/0004460	Susmita Pandit		29			29
PG/02/MTEVE/2020/003	AU/2020/0004454	Sumit Kumar Khan		29			29
PG/02/MTEVE/2020/001	AU/2020/0004291	Snehashis Ghosh		28			28

Signature of HOD/Dean — Signature of Faculty

Date: — Date: 24/04/2021

Evaluation Sheet – Mid Semester

Roll Number	Registration Number	Name of the Student	Marks (20)
PG/02/MTEVE/2020/002	AU/2020/0004450	Srija SinhaRoy	17

Year: I

Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

PG/02/MTEVE/2020/004	AU/2020/0004460	**Susmita Pandit**	18
PG/02/MTEVE/2020/003	AU/2020/0004454	**Sumit Kumar Khan**	17
PG/02/MTEVE/2020/001	AU/2020/0004291	**Snehashis Ghosh**	17

Signature of HOD/Dean **Signature of Faculty**

Date: **Date: 24/04/2021**

Year: I

Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
7.

8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

Planning for Remedial Classes – Mid Semester

Sl. No.	Name of Student	Roll No.	Reg. No.	Mid Sem Marks	Remedial Classes Held							Class test on the basis of Remedial Classes	End Sem Marks	Improvement (Y/N)
					Date									
					Venue									
					Time									
1.	Srija SinhaRoy	PG/02/MTEVE/2020/002	AU/2020/0004450	17										
2.	Susmita Pandit	PG/02/MTEVE/2020/004	AU/2020/0004460	18										
3.	Sumit Kumar Khan	PG/02/MTEV	AU/2020/0004454	17										

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

		E/2020/003												
4.	**Snehashis Ghosh**	PG/02/MTEV E/2020/001	AU/2020/0004291	17										

Signature of HOD/ Dean **Signature of Faculty**

Date: **Date: 24/04/2021**

End Semester Question Papers – Set A

ADAMAS UNIVERSITY PURSUE EXCELLENCE	**ADAMAS UNIVERSITY** **END SEMESTER EXAMINATION** (Academic Session: 2020 – 21)		
Name of the Program:	M. Tech. (Env. Engg) (CE)	**Semester:**	1st
Paper Title:	Process Chemistry for Water & Wastewater Treatment	**Paper Code:**	ECE61109
Maximum Marks:	50	**Time Duration:**	3 Hrs
Total No. of Questions:	17	**Total No of Pages:**	02
(Any other information for the student may be mentioned here)	**1.** At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code and Date of Exam. **2.** All parts of a Question should be answered consecutively. Each Answer should start from a fresh page. **3.** Assumptions made if any, should be stated clearly at the beginning of your answer.		

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
7.

8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

	Group A Answer All the Questions (5 x 1 = 5)	Knowledge Level	
1	What is the rate of a chemical reaction not dependent on? a) Stoichiometry b) Surface area of reactants c) Temperature d) Pressure	U	CO1, CO2
2	In case of Moving Bed Bioreactor and Activated Sludge process which is the factor that limits the rate of the reaction? a) temperature b) pressure c) pH d) ionic composition	R	CO1, CO4
3	In water treatment which factor which has a major control over reaction selectivity and product distribution? a) pH b) temperature c) pressure d) ionic concentration	U	CO3
4	The degradation of BOD is classified as what type of reaction? a) First Order Reaction b) Zero Order Reaction c) Second Order Reaction d) Third Order Reaction	Ap	CO4
5	_____ tend to resist conventional methods of wastewater treatment. a) Suspended solids b) Nutrients	U	CO4, CO5

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

	c) Refractory organics d) Priority pollutants		
	Group B **Answer All the Questions (5 x 2 = 10)**		
6.	i) Which of these is the used as the indicator when the titration is carried out to determine the amount of COD present in a sample? ii) How is TSS calculated?	**R**	**CO1, CO2**
7.	i) What is the ratio of BOD/COD in the final effluent? ii) What is the ratio of BOD/COD in untreated waste?	**U**	**CO1, CO2**
8.	i) How is COD calculated?	**U**	**CO3**
9.	i) The BOD test is carried out for how many days? ii) Turbidity in water is caused by which materials.	**R**	**CO3,** **CO4**
10.	i) What is the role of chlorine in water treatment? ii) What is the phosphorus available for a biological process called?	**U**	**CO3,** **CO4,** **CO5**
	Group C **Answer All the Questions (7 x 5 = 35)**		
11.	a) State the purpose of aeration. b) What is the method adopted for removing organic matter from water? c) How the soil may be polluted due to urbanization effect? Explain.	**U, R**	**CO1**

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

12.	Discuss briefly the various methods which adopted collectively for treating public water supplies drawn from a river? Show a layout of treatment units.	**U, Ap**	**CO2**
13.	Write short note on "Iimhoff Tank" and explain its design procedure.		**CO3**
14.	Calculate the ultimate BOD for a sewage whose 5 day BOD at 20^0C is 250 mg/l. What will be the BOD after 2 days. [Assume K = 0.23 per day].	**U**	**CO4**
15.	a) What is MBR? b) Name the two different configurations of MBR. c) What are the advantages & disadvantages of this process? – State in a tabular format.	**U**	**CO5**
16.	a) What is secondary treatment of wastewater? Describe in details. b) How does the type of wastewater affect the performance of an anaerobic bioreactor?	**U, R**	**CO4,** **CO5**
17.	a) State the common treatment processes for biological nutrient removal. b) Describe any one of the process with hand sketch diagram in details.	**U, Ap**	**CO4,** **CO5**

End Semester Question Papers – Set B

ADAMAS UNIVERSITY PURSUE EXCELLENCE	**ADAMAS UNIVERSITY** **END SEMESTER EXAMINATION** (Academic Session: 2020 – 21)		
Name of the Program:	M. Tech. (Env. Engg) (CE)	**Semester:**	1st
Paper Title:	Process Chemistry for Water & Wastewater Treatment	**Paper Code:**	ECE61109
Maximum Marks:	50	**Time Duration:**	3 Hrs

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

Total No. of Questions:	17	**Total No of Pages:**	02
(Any other information for the student may be mentioned here)	**4.** At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code and Date of Exam. **5.** All parts of a Question should be answered consecutively. Each Answer should start from a fresh page. **6.** Assumptions made if any, should be stated clearly at the beginning of your answer.		

Answer Key (Sample)

Answer Script (Sample)

Evaluation Sheet (End Semester)

Roll Number	**Registration Number**	**Name of the Student**	**Marks (50)**
PG/02/MTEVE/2020/002	AU/2020/0004450	**Srija SinhaRoy**	44
PG/02/MTEVE/2020/004	AU/2020/0004460	**Susmita Pandit**	44
PG/02/MTEVE/2020/003	AU/2020/0004454	**Sumit Kumar Khan**	44
PG/02/MTEVE/2020/001	AU/2020/0004291	**Snehashis Ghosh**	45

Planning for Remedial Classes – End Semester

Year: I

Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005

7.

8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

Sl. No.	Name of Student	Roll No.	Reg. No.	End Sem Marks	Remedial Classes Held							Class test on the basis of Remedial Classes	Supple Exam Marks	Improvement (Y/N)
					Date									
					Venue									
					Time									
1.	Srija SinhaRoy	PG/02/MTEVE/2020/002	AU/2020/0004450	44										
2.	Susmita Pandit	PG/02/MTEVE/2020/004	AU/2020/0004460	44										
3.	Sumit Kumar Khan	PG/02/MTEVE/2020/003	AU/2020/0004454	44										

Year: I

Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
7.

8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

4.	Snehashis Ghosh	PG/02/MTEVE/2020/001	AU/2020/0004291	45										

Consolidated Mark Statement

Roll Number	Registration Number	Name of the Student	Total Marks			
			Mid Semester (20)	Internal Assessment (30)	End Semester (50)	Total (100)
PG/02/MTEVE/2020/002	AU/2020/0004450	Srija SinhaRoy	17	29	44	90
PG/02/MTEVE/2020/004	AU/2020/0004460	Susmita Pandit	18	29	44	91
PG/02/MTEVE/2020/003	AU/2020/0004454	Sumit Kumar Khan	17	29	44	90
PG/02/MTEVE/2020/001	AU/2020/0004291	Snehashis Ghosh	17	28	45	90

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

COURSE END SURVEY

INDIRECT ASSESSMENT

Sample format for Indirect Assessment of Course outcomes:

NAME: **Srija SinhaRoy**
ROLL NO.: PG/02/MTEVE/2020/002
REG. NO..: AU/2020/0004450
COURSE & COURSE: ECE61109 &Process Chemistry for Water & Wastewater Treatment
PROGRAM: M. Tech. (Environment Engineering)

Please rate the following aspects of course outcomes of **Process Chemistry for Water & Wastewater Treatment**

Use the scale 1-5 (Poor – Excellent)

Course Outcomes	Statement	1	2	3	4	5
CO1	Can you able to Discuss the Elements, Tools & Methods of Construction Management?					5
CO2	Are you able to Recognize the Fundamentals of Network Analysis to Schedule a Project with Constraints?					5
CO3	Do you Understand Different Approaches of Time and Cost Control of Construction Projects?					5
CO4	Will you Demonstrate Different Types of Project Information, it's Accuracy and Uses in an Organization?					5
CO5	Are you able to Select a Data Base Model to Control Project Information Flow of a Construction Project?					5

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

NAME: **Susmita Pandit**
ROLL NO.: PG/02/MTEVE/2020/004
REG. NO..: AU/2020/0004460
COURSE & COURSE: ECE61109 &Process Chemistry for Water & Wastewater Treatment
PROGRAM: M. Tech. (Environment Engineering)

Please rate the following aspects of course outcomes of **Process Chemistry for Water & Wastewater Treatment**
Use the scale 1-5 (Poor – Excellent)

Course Outcomes	Statement	1	2	3	4	5
CO1	Can you able to Discuss the Elements, Tools & Methods of Construction Management?					5
CO2	Are you able to Recognize the Fundamentals of Network Analysis to Schedule a Project with Constraints?					5
CO3	Do you Understand Different Approaches of Time and Cost Control of Construction Projects?					5
CO4	Will you Demonstrate Different Types of Project Information, it's Accuracy and Uses in an Organization?					5
CO5	Are you able to Select a Data Base Model to Control Project Information Flow of a Construction Project?					5

NAME: **Sumit Kumar Khan**
ROLL NO.: PG/02/MTEVE/2020/003
REG. NO..: AU/2020/0004454
COURSE & COURSE: ECE61109 &Process Chemistry for Water & Wastewater Treatment

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

PROGRAM: M. Tech. (Environment Engineering)

Please rate the following aspects of course outcomes of **Process Chemistry for Water & Wastewater Treatment**
Use the scale 1-5 (Poor – Excellent)

Course Outcomes	Statement	1	2	3	4	5
CO1	Can you able to Discuss the Elements, Tools & Methods of Construction Management?					5
CO2	Are you able to Recognize the Fundamentals of Network Analysis to Schedule a Project with Constraints?					5
CO3	Do you Understand Different Approaches of Time and Cost Control of Construction Projects?					5
CO4	Will you Demonstrate Different Types of Project Information, it's Accuracy and Uses in an Organization?					5
CO5	Are you able to Select a Data Base Model to Control Project Information Flow of a Construction Project?					5

NAME: **Snehashis Ghosh**
ROLL NO.: PG/02/MTEVE/2020/001
REG. NO..: AU/2020/0004291
COURSE & COURSE: ECE61109 &Process Chemistry for Water & Wastewater Treatment
PROGRAM: M. Tech. (Environment Engineering)

Please rate the following aspects of course outcomes of **Process Chemistry for Water & Wastewater Treatment**
Use the scale 1-5 (Poor – Excellent)

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy — Course Code: ENV21005
7.

8. Course : Process Chemistry for Water & Wastewater Treatment — L:3
9. Program : M. Tech (Environmental Engineering) — T: 0
10. Target : 60% — P: 0
C: 0

Course Outcomes	Statement	1	2	3	4	5
CO1	Can you able to Discuss the Elements, Tools & Methods of Construction Management?					5
CO2	Are you able to Recognize the Fundamentals of Network Analysis to Schedule a Project with Constraints?					5
CO3	Do you Understand Different Approaches of Time and Cost Control of Construction Projects?					5
CO4	Will you Demonstrate Different Types of Project Information, it's Accuracy and Uses in an Organization?					5
CO5	Are you able to Select a Data Base Model to Control Project Information Flow of a Construction Project?					5

INDIRECT ASSESSMENT CONSOLIDATION

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF
DEPARTMENT OF
CO Indirect Assessment

Programme: M. Tech [Env. Engg.] **Academic Year:2020-21**
Batch: 2020-22

Course Code:ECE61
Course Name: Proc Chemistry for Water & Wastew

Course Outcome	Students Feed Back (5)	Attainment (100)
CO1	5	100
CO2	5	100
CO3	5	100
CO4	5	100
CO5	5	100
etc.		

Year: I

Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. Course	: Process Chemistry for Water & Wastewater Treatment	L:3
9. Program	: M. Tech (Environmental Engineering)	T: 0
10. Target	: 60%	P: 0
		C: 0

Signature of HOD/Dean **Date:**	**Signature of Faculty** **Date: 24/04/2021**

Year: I

Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8.	Course	: Process Chemistry for Water & Wastewater Treatment	L:3
9.	Program	: M. Tech (Environmental Engineering)	T: 0
10.	Target	: 60%	P: 0
			C: 0

Year: I
Semester: I

6. Name of the Faculty: Dr. Somendra Nath Roy Course Code: ENV21005
7.

8. Course : Process Chemistry for Water & Wastewater Treatment L:3
9. Program : M. Tech (Environmental Engineering) T: 0
10. Target : 60% P: 0
C: 0

CO ATTAINMENT – GAP ANALYSIS & REMEDIAL MEASURES

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF
DEPARTMENT OF
CO ATTAINMENT - GAP ANALYSIS & REMEDIAL MEASURES

Batch :	2020-22		Academic Year: 2020-21
Course Code & Name		Name of the Coordinator	Year & Semester
ECE61109 Process Chemistry for Water & Wastewater Treatment		Dr. Somendra Nath Roy	I & I

CO	Direct Assessment	Indirect Assessment	CO Attainment	Target	CO Attainment Gaps	Action for Bridge the Gap	Target Modification
CO1	100	100	100	**80**	-20		**90**
CO2	100	100	100	**80**	-20		**90**
CO3	100	100	100	**80**	-20		**90**
CO4	100	100	100	**80**	-20		**90**
CO5	100	100	100	**80**	-20		**90**

Signature of HOD/Dean **Signature of Faculty**

Date: **Date: 24/04.2021**

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

CO-PO ATTAINMENT

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF
DEPARTMENT OF
CO-PO ATTAINMENT

Programme :	**Year & Sem: I & I**	**Academic Year: 2020-21**	**Batch:2020-22**

Course Code	**Course Name**	**CO-PO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO 7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
		Relationship	CO1, CO2, CO3, CO4, CO5	CO1, CO2, CO3, CO4, CO5	CO1, CO2, CO3, CO4, CO5	CO2, CO3, CO4, CO5	NA	NA	NA	NA	CO1, CO2, CO4, CO5	NA	NA	NA	NA	NA	NA

Year: I

Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0

		Mapping Value	3	3	3	3	NA	NA	NA	NA	3	NA	NA	NA	NA	NA	NA
		Attainment	**3**	**3**	**3**	**3**	**NA**	**NA**	**NA**	**NA**	**3**	**NA**	NA	NA	NA	NA	NA

Signature of HOD/Dean **Signature of Faculty**

Date: **Date:24/04/2021**

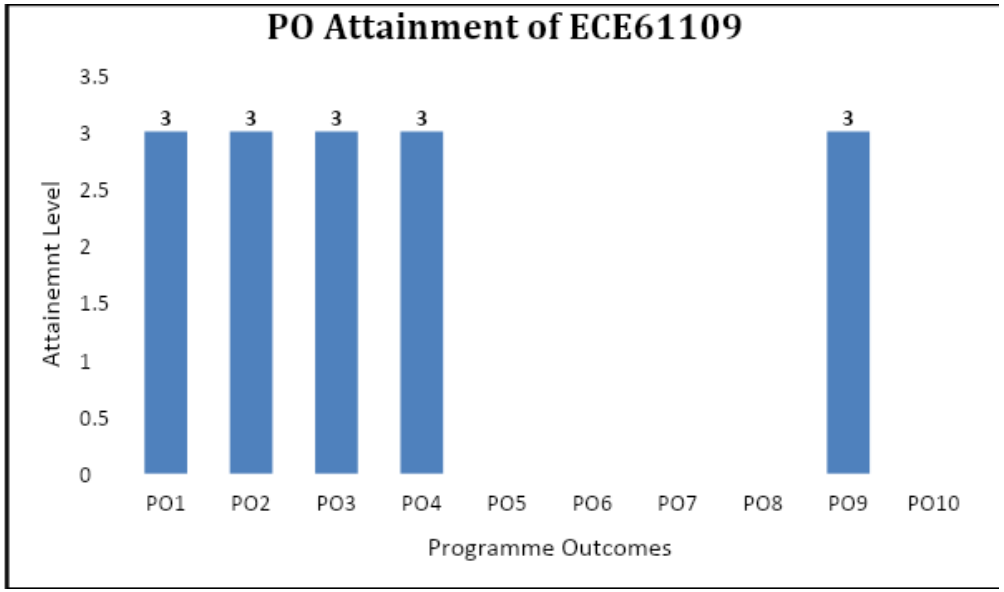
PO ATTAINMENT OF THE COURSE

Year: I

Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8. **Course** : **Process Chemistry for Water & Wastewater Treatment** **L:3**
9. **Program** : **M. Tech (Environmental Engineering)** **T: 0**
10. **Target** : **60%** **P: 0**
C: 0



Signature of HOD/Dean

Date:

Signature of Faculty

Date:

Year: I
Semester: I

6. **Name of the Faculty: Dr. Somendra Nath Roy** **Course Code: ENV21005**
7.

8.	**Course**	**: Process Chemistry for Water & Wastewater Treatment**	**L:3**
9.	**Program**	**: M. Tech (Environmental Engineering)**	**T: 0**
10.	**Target**	**: 60%**	**P: 0**
			C: 0

INSTRUCTIONS FOR FACULTY

Instructions for Faculty

- Faculty should keep track of the students with low attendance and counsel them regularly.
- Course coordinator will arrange to communicate the short attendance (as per University policy) cases to the students and their parents monthly.
- Topics covered in each class should be recorded in the table of RECORD OF CLASS TEACHING (Suggested Format).
- Internal assessment marks should be communicated to the students twice in a semester.
- The file will be audited by respective Academic Monitoring and Review Committee (AMRC) members for theory as well as for lab as per AMRC schedule.
- The faculty is required to maintain these files for a period of at least three years.
- This register should be handed over to the head of department, whenever the faculty member goes on long leave or leaves the Colleges/University.
- For labs, continuous evaluation format (break-up given in the guidelines for result preparation in the same file) should be followed.
- Department should monitor the actual execution of the components of continuous lab evaluation regularly.
- Instructor should maintain record of experiments conducted by the students in the lab weekly.
- Instructor should promote students for self-study and to make concept diary, due weightage in the internal should be given under faculty assessment for the same.
- Course outcome assessment: To assess the fulfilment of course outcomes two different approaches have been decided. Degree of fulfillment of course outcomes will be assessed in different ways through direct assessment and indirect assessment. In Direct Assessment, it is measured through quizzes, tests, assignment, Mid-term and/or End-term examinations. It is suggested that each examination is designed in such a way that it can address one or two outcomes (depending upon the course completion). Indirect assessment is done through the student survey which needs to be designed by the faculty (sample format is given below) and it shall be conducted towards the end of course completion. The evaluation of the achievement of the Course Outcomes shall be done by analyzing the inputs received through Direct and Indirect Assessments and then corrective actions suggested for further improvement.
- **Submission Targets of Course Contents:**
  - **S. No. 1 to 8 : Before Starting the Course**
  - **S. No. 9 & 10 : After Mid Semester Examination**
  - **S. No. 11 to 18 : Immediately After End Semester Examination**
  - **S. No. 19 to 22 : After Declaration of Result of the Course**