



# Indra Ganesan

## COLLEGE OF ENGINEERING

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai  
Accredited by NAAC with 'B+' Grade, 2(f) & 12B Status Institution by UGC

IG Valley, Madurai Main Road, Manikandam, Tiruchirappalli - 620012

# NAAC DOCUMENTS

## QUALITY INDICATOR FRAME WORK

### CRITERION – 1

## CURRICULAR ASPECTS

SUBMITTED BY

**IQAC**

INTERNAL QUALITY ASSURANCE CELL

**INDRA GANESAN COLLEGE OF ENGINEERING**





# Indra Ganesan

**COLLEGE OF ENGINEERING**

Madurai Main Road (NH-45B), Manikandam, Tiruchirappalli - 620 012

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai  
NAAC Accredited, 2(F) Status Institution by UGC



**Criteria1**

**CurricularAspects**

**100**

## 1.1 CurricularPlanningandImplementation(20)

**1.1.1 TheInstitutionensureseffectivecurriculumplanninganddeliverythroughawell-plannedanddocumentedprocessincludingAcademiccalendarandconductofcontinuousinternalAssessment**

### TableofContent

S.No	Description
1.	PrefaceoftheCourseFile
2.	ReviewofCourseFile
3.	FacultyWorkload
4.	CoursePlan
5.	CourseCommitteeMeeting
6.	ContentBeyondSyllabus
7.	RubricsBaseEvaluation
8.	StudentFeed BackonFaculty
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10.	QuestionPaper
11.	Answer Key
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17.	RootCauseAnalysis
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# INDRA GANESAN COLLEGE OF ENGINEERING

(Approved by AICTE, New Delhi and affiliated to Anna University, Chennai)

## DEPARTMENT OF SCIENCE AND HUMANITIES

### REVIEW OF COURSE FILE

(to be pasted on the inner side of the file-backside). (#-State Yes/No.)

S.No	Details	R-I-*	R-II- *&	R-III- *&	R-IV- *&\$	R-V- *&\$ @
1	Preface of the course file	Y				
2	Vision, mission, PEOs,POs,PSO, Blooms taxonomy	Y				
3	Subject handlers of yesteryears	Y				
4	Time table/workload of the staff- Distribution of teaching load- Roles and Responsibilities	Y				
5	Syllabus signed by staff & HOD	Y				
6	Lecture schedule signed by staff & HOD	Y				
7	Course committee meeting circular and minutes	Y				
8	Identification of curricular gap and content beyond the syllabus	Y				
9	Self-study topics	Y				
10	Previous AU question papers	Y				
11	Unit wise Q&A and Objective type questions	Y				
12	Unit wise course material		Y	Y	Y	
13	Assignment question paper with sample answer sheet and mark entry		Y	Y	Y	
14	Tutorial question paper with key and mark entry		Y	Y	Y	
15	Class test/IA test Q Paper with Key and mark entry		Y	Y	Y	
16	IA Test- result analysis- CAP- evidence-root cause analysis		Y	Y	Y	
17	Retest - Q paper - attendance mark		Y	Y	Y	
18	AU web portal entry		Y	Y	Y	
19	Very poor performance in fast two tests-action taken.- communication to parents-evidence.			Y	Y	
20	Absence of two test-action taken-communication to parents.			Y	Y	
21	Indiscipline of student reported, if any			Y	Y	
22	Special class/coaching class/remedial class/attendance-CAP		Y	Y	Y	
23	Conduct of seminar, Quizzes-Proof					
24	Conduct beyond the syllabus-Proof					Y
25	Student feedback on faculty					Y
26	Course end survey					Y
27	Internal Assessment sheet					Y
28	AU question paper with students feedback					Y
29	Discrepancy of the question paper and correspondence, if any					Y
30	AU result analysis- details of arrear students					Y
31	AU grade sheen					Y
32	CO-PO & PSO attainment sheet					Y
	<b>Signature of Course handling faculty</b>	<i>S. Balan</i>	<i>S. Balan</i>	<i>S. Balan</i>	<i>S. Balan</i>	<i>S. Balan</i>
	<b>Signature of HOD</b>	<i>S. Balan</i>	<i>S. Balan</i>	<i>S. Balan</i>	<i>S. Balan</i>	<i>S. Balan</i>

# INDRA GANESAN COLLEGE OF ENGINEERING

IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 620 012, India  
(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)

## DEPARTMENT OF SCIENCE AND HUMANITIES PREFACE OF THE COURSEFILE

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Batch :2021-25

AcademicYear :2021-2022/ODD


Program :CHEMISTRY

Year&Semester :1Year/ 1Semester/ 'A' Section


CourseCode :CY3151

NameoftheCourse :ENGINEERING CHEMISTRY

Facultyin-charge :Dr.S.BOOBALAN

  
Signatureofthe Facultyin-charge

  
HoD/S & H

  
Dr. G. Balakrishnan, M.E., Ph.D.,  
Principal  
Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.



# Indra Ganesan College of Engineering

Madurai Main Road (NH-45B), Manikandam, Tiruchirappalli-620012

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Department of Science and Humanities

WorkLoad-ODDSemester2021-22

S. NO.	Teacher'sName	CourseCode	CourseName	Semester	Lecture/week	Total
1	Dr.S.BOOBALAN	CY3151	Engineering Chemistry	I Sem – A-Section CSE, EEE, MECH	5	18
2	Dr.S.BOOBALAN	CY3151	Engineering Chemistry	I Sem – B-Section IT, AGRI, AIDS, ECE	5	
3	Dr.S.BOOBALAN	BS3171	Physics & Chemistry Laboratory	I Sem – I Sem,-A-Section CSE, , EEE, MECH	4	
4	Dr.S.BOOBALAN	BS3171	Physics & Chemistry Laboratory	I Sem – B-Section IT, AGRI, AIDS, ECE	4	

  
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## COURSE OUTCOMES

At the end of the course, the students will be able:

- CO1 To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water
- CO2 To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
- CO3 To apply the knowledge of phase rule and composites for material selection requirements.
- CO4 To recommend suitable fuels for engineering processes and applications.
- CO5 To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

## TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17<sup>th</sup> Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12<sup>th</sup> Edition, 2018.


## REFERENCES:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2<sup>nd</sup> Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media New York 2nd Edition 2013

## CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1	-	1	1	-	-	-	-	1	-	-	-
2	2	-	-	1	-	2	2	-	-	-	-	-	-	-	-
3	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
4	3	1	1	-	-	1	2	-	-	-	-	-	-	-	-
5	3	1	2	1	-	2	2	-	-	-	-	2	-	-	-
CO	2.8	1.3	1.6	1	-	1.5	1.8	-	-	-	-	1.5	-	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

  
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**DEPARTMENT OF SCIENCE AND HUMANITIES**

**Lecture Schedule**

Degree/Program: **B.Tech/CSE** Course code & Name: **CY3151 & ENGINEERING CHEMISTRY**

Duration: **2021-22 (ODD)** Semester: **I** Section: **A** Faculty Name: **Dr.S.BOOBALAN**

**COURSE OBJECTIVES:**

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

After the course, the students should be able to:

CO	Course Outcomes	POs	PSOs
C104.1	To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.	1, 2,3,4, 6,7,12	1,2,3
C104.2	To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.	1,4, 6,7	1,2,3
C104.3	To apply the knowledge of phase rule and composites for material selection requirements.	1, 2	1,2,3
C104.4	To recommend suitable fuels for engineering processes and applications.	1, 2,3, 6,7	1,2,3
C104.5	To recognize different forms of energy resources	1, 2,3,4,6,7,12	1,2,3
C104.6	To apply energy resources applications in energy sectors.	1, 2,3,4,6,7,12	1,2,3

  
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S.NO	Period	Topic to be covered	Reference/Teaching aids and methods	Planned date
<b>Unit I WATER AND ITS TREATMENT</b>				
1	3	Types of impurities in water	T1,R3/BB	22.11.21
2	1	Water quality parameter	T1,R3/BB	23.11.21
3	2,8	Treatments of water	T1,R3/BB	25.11.21
4	5	Desalination of brackish water	T1,R3/BB	26.11.21
5		Troubles of boiler: scale, sludge, priming, foaming,	T1,R3/BB	29.11.21
6	3	boiler corrosion and caustic embrittlement	T1, R3/BB	30.11.21
7	1	Internal treatment- Phosphate condition, colloidal condition, sodium aluminate condition, calgon condition.	T1, R3/BB	02.12.21
8	2,8	External Treatment Demineralisation and	T1, R3/BB	05.21.21
9	5	Zeolite methods.	T1, R3/BB	06.12.21
<b>Unit II NANO CHEMISTRY</b>				
11	3	Basics of Nanochemistry	T2,R3/BB	13.12.21
12	1	Distinction between nano particles and bulk materials	T2,R3/BB	14.12.21
13	2,8	Properties of Nanomaterials	T2,R3/BB	16.12.21
14	5	Types of nanomaterials, Particle, clusters, rods, wires	T2,R3/BB	17.12.21
15	3	Tube, CNT, SWNT, MWNT	T2,R3/BB	20.12.21
16		Preparations of nano materials, Top down, Bottom-up, SOL GEL, solvothermal, laser ablation	T2,R3/BB	21.12.21
17	2	Cvd, electro deposition, electro spinning	T2,R3/BB	23.12.21
18	8	Application in medicine, agri, energy	T2,R3/BB	23.12.21
19	5	Electronics, catalysis	T2,R3/BB	24.12.21
21	2	Phase rule introduction, definition of terms	T2,R3/BB	06.01.22
22	8	One component- water system	T2,R3/BB	06.01.22



23	5	Reduced phase rule, simple eutectic phase diagram, thermal analysis	T2,R3/BB	07.01.22
24	3	Two component - lead - silver system, pattinson process	T2,R3/BB	10.01.22
25	1	Composite introduction, definition, need for composites	T2,R3/BB	11.01.22
26	2	Types of composites, Polymer composites properties and uses	T2,R3/BB	17.01.22
27	1	Metal matrices composites properties and uses	T2,R3/BB	18.01.22
28	2	Ceramic composites properties and uses	T2,R3/BB	20.01.22
29	8	Hybrid composites properties and uses	T2,R3/BB	20.01.22

#### Unit IV FUELS AND COMBUSTION

31	1	Introduction, characteristics of fuels, classification of fuels, Solid fuels, Coal classification,	T2,R3/BB	01.02.22
32	2	analysis of coal- proximate analysis and significance, Ultimate analysis and significance.	T2,R3/BB	03.02.22
33	8	Carbonization, types of carbonizations, Preparation of metallurgical coke by Otto-Hoffman's method	T2,R3/BB	03.02.22
34	5	Liquid fuel, refining of petroleum and synthetic petrol preparation by Bergius process method	T2,R3/BB	04.02.22
35	2	Knocking, anti-knocking, octane number, diesel oil, cetane number,	T2,R3/BB	05.02.22
36	8	Preparation and properties of Power alcohol, bio diesel. Applications of power alcohol, bio diesel	T2,R3/BB	05.02.22
37	3	Low Calorific value and Higher Calorific value calculations	T2,R3/BB	07.02.22
38	2	Ignition temperature, spontaneous temperature, explosive temperature	T2,R3/BB	08.02.22
39	8	Flue gas analysis by ORSAT method, CO <sub>2</sub> emission, carbon foot print	T2,R3/BB	08.02.22

#### Unit V ENERGY RESOURCES AND STORAGE DEVICES

41	3	Introduction, Stability of nucleus: mass defect (problems), binding energy;	T2,R3/BB	14.02.22
42	1	Nuclear energy: light water nuclear power plant, breeder reactor.	T2,R3/BB	15.02.22
43	2	Solar energy conversion: Principle, working and applications of solar cells;	T2,R3/BB	17.02.22
44	8	Recent developments in solar cell materials. Wind energy; Geothermal energy	T2,R3/BB	17.02.22
45	5	Batteries: Types of batteries, Primary battery - dry cell,	T2,R3/BB	18.02.22
46	2	Secondary battery - lead acid battery and lithium-ion battery;	T2,R3/BB	19.02.22
47	8	Electric vehicles - working principles	T2,R3/BB	19.02.22
48	3	Fuel cells: H <sub>2</sub> -O <sub>2</sub> fuel cell, micro fuel cell	T2,R3/BB	21.02.22

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49	1	Super capacitors: Storage principle, types and examples	T2,R3/BB	22.02.22
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**Book Reference-TextBooks**

Sl.	Title of the Book	Author	Publisher	Year
1.	Engineering Chemistry	P. C. Jain and Monica Jain	17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi.	2018
2.	A Text book of Engineering Chemistry	S.S. Dara	12th Edition S. Chand Publishing,	2018
3.	Engineering Chemistry	Sivasankar B	Tata McGraw-Hill Publishing Company Ltd, New Delhi	2008

Book Reference-Reference

S.No	Title of the Book	Author	Publisher	Year
1.	Text book of nanoscience and nanotechnology	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday	Universities Press-IIM Series in Metallurgy and Materials Science	2018
2.	Engineering Chemistry	O.G. Palann	2 <sup>nd</sup> Edition McGraw Hill Education (India) Private Limited,.	2017
3.	Engineering Chemistry	Friedrich Emich,	Scientific International PVT, LTD, New Delhi	2014
4	Engineering Chemistry- Fundamentals and Applications	Shikha Agarwal	Second Edition Cambridge University Press, Delhi.	2019

*S. Boobalan*

Signature of the Faculty in-charge

*S. Boobalan*

HoD/H&S

*(Signature)*  
Dr. G. Balakrishnan, M.E., Ph.D.,

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## DEPARTMENT OF SCIENCE AND HUMANITIES

### Identification of Curricular Gap & Content Beyond Syllabus(CBS)

Name of the Faculty :Dr.S.BOOBALAN

Course Code & Name: Engineering Chemistry

Degree & Program:B.E. /CSE Semester & Section: I / A Academic Year: 2021 -2022 /ODD

#### I.Mapping of Course Outcomes with POs & PSOs.( before CBS)

Table.1 Mapping of COs, C, PSOs with POs - before CBS.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C210.1	3	2	1	1	-	-	-	-	-	2	1	1	2	2
C210.2	3	2	1	1	-	-	-	-	-	2	1	1	2	2
C210.3	3	2	1	1	-	-	-	-	-	2	1	1	2	2
C210.4	3	2	1	1	-	-	-	-	-	2	1	1	2	2
C210.5	3	2	1	1	-	-	-	-	-	2	1	1	2	2
C210.6	3	2	1	1	-	-	-	-	-	2	1	1	2	2

#### II. Identification of content beyond syllabus.

Table.2 Identification of content beyond syllabus

Details of Content Beyond Syllabus(CBS) added	POs strengthened/ vacant filled	CO/Unit
Polymer Chemistry	PO5(2) Vacant filled	CO1 & CO2/ I & II

#### III. Mapping of Course Outcomes with POs & PSOs. (After CBS)

Table.3 Mapping of COs, C, PSOs with POs- after CBS.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C210.1	3	2	1	1	-	-	-	-	-	2	1	1	2	2
C210.2	3	2	1	1	-	-	-	-	-	2	1	1	2	2
C210.3	3	2	1	1	-	-	-	-	-	2	1	1	2	2
C210.4	3	2	1	1	-	-	-	-	-	2	1	1	2	2
C210.5	3	2	1	1	2	-	-	-	-	2	1	1	2	2
C210.6	3	2	1	1	2	-	-	-	-	2	1	1	2	2
C210	3	2	1	1	2	-	-	-	-	2	1	1	2	2

*S. Boobalan*  
Signature of the Faculty

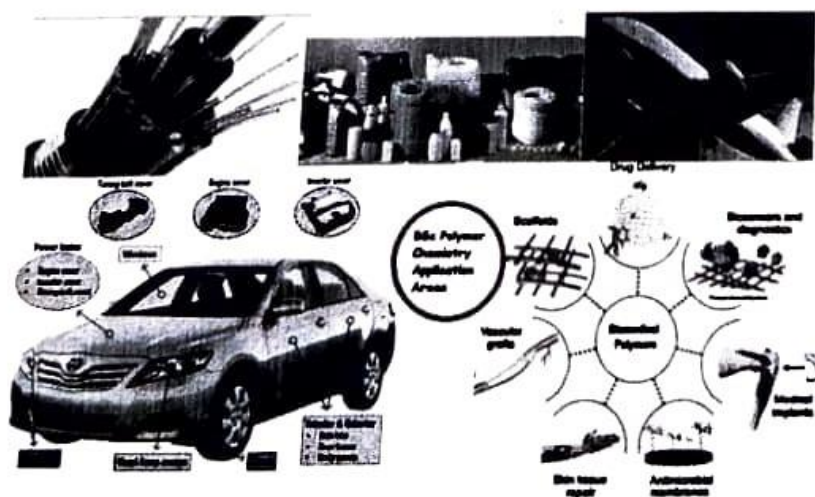
*(Signature)*  
Dr. G. Balakrishnan, M.E., Ph.D.,  
Principal

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HoD/S & H

# WHAT IS A POLYMER

- A word polymer is a combination of two Greek words, "Poly" means "many" and "Meros" meaning "parts or units".
- A polymer is a large molecule of which is formed by repeated linking of the small molecules called "monomers".



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(Approved by AICTE, New Delhi and affiliated to Anna University, Chennai)

DEPARTMENT OF SCIENCE AND

HUMANITIES CBS-PROOF

ACADEMIC YEAR: 2021-2022 (ODD)

SEM: 01

REGULATION:

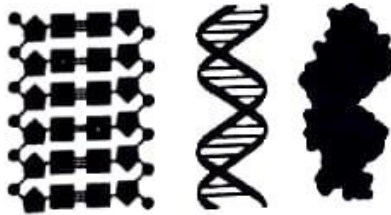
2021 PROGRAM: CSE

NAME OF THE FACULTY: Mr. S. BOOBALAN

(AP) TOPIC: ENGINEERING CHEMISTRY

MATERIALS (PROOF)

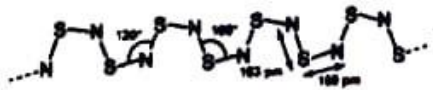
## DIFFERENT TYPES OF POLYMERS



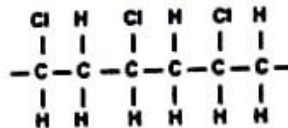
NATURAL POLYMERS



SYNTHETIC POLYMERS



INORGANIC POLYMERS



ORGANIC POLYMERS

  
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India (Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-  
25)

**DEPARTMENT OF SCIENCE AND HUMANITIES**

**Assignment Question Paper**

Assignment-01			Date of Issue:	15.12.2021	Marks	10
Course code	CY3151	Course Title	ENGINEERING CHEMISTRY			
Year	I	Semester/Section	I/A	Date of Submission:	23.12.2021	

Q.No	Questions	CO
1	Explain the water quality parameter and its properties?	CO01
2	What are nanomaterial and its properties?	CO02

S. BOOBALAN S. Boobalan

Name and Signature of the Faculty in charge

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Register Number: 

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IA Exam - I			Date/Session	29/12/2021/AN	Marks	50
Course code	CY3151	Course Title	ENGINEERING CHEMISTRY			
Regulation	2021	Duration	90 min	Academic Year	2021-2022	
Year	1	Semester	1	Department	ALL Department	

## COURSE OUTCOMES

C104.1	To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
C104.2	To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
C104.3	To apply the knowledge of phase rule and composites for material selection requirements.
C104.4	To recommend suitable fuels for engineering processes and applications.
C104.5	To recognize different forms of energy resources
C104.6	To apply energy resources applications in energy sectors.

Q.No.	Question	CO	BTS
<b>PART A</b>			
(Answer all the Questions 9 x 2 = 18 Marks)			
1	What is sterilization?	CO1	1
2	Explain the term COD & BOD?	CO1	1
3	What is meant by break point chlorination?	CO1	1
4	Distinguish between internal conditioning and external conditioning?	CO1	1
5	Mention any two compounds that cause caustic embrittlement in boiler?	CO2	2
6	Define nano particles?	CO2	2
7	List any four nano materials?	CO2	2
8	Write the difference between bulk particles and nano particles?	CO2	2
9	What are properties of nanorodes?	CO2	2
<b>PART B</b>			
(Answer all the Questions 2 x 16 = 32 Marks)			
10a	Explain with neat sketch the various steps in the treatment of water for municipal water supply?	CO1	1
OR			
10b	(i) Discuss the process of desalination of the Brackish water by Reverse Osmosis method? (ii) What are boiler troubles and explain about the notes on scale and sludge?	CO1	1
11a	Write briefly on the size dependence properties of nanomaterials?	CO2	2
11b	(i) Write the properties and uses of Nano wires? (ii) Write a brief notes on properties and uses of nano clusters?	CO2	2

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Course Faculty  
Name/Sign/Date)

S. Boobalan

HoD

(Name/Sign/Date)

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IA Exam-I			Date/Session	27/01/2022/AN	Marks	50
Coursecode	CY3151	Course Title	ENGINEERING CHEMISTRY			
Regulation	2021	Duration	90min	Academic Year	2021-22	
Year	I	Semester	I	Department	ALL Department	

**COURSE OUTCOMES**

C104.1	To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
C104.2	To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
C104.3	To apply the knowledge of phase rule and composites for material selection requirements.
C104.4	To recommend suitable fuels for engineering processes and applications.
C104.5	To recognize different forms of energy resources
C104.6	To apply energy resources applications in energy sectors.

Q.No.	Question	CO	BTS
<b>PART A</b> (Answer all the Questions 9 x 2 = 18 Marks)			
1	What is sterilization?  <i>Destroying bacteria, process method titles. Ozone, UV, chlorine</i>	CO1	1
2	Explain the term COD & BOD?  <i>COD: amount of O<sub>2</sub> required - oxidisable impurities K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> BOD: amount of O<sub>2</sub> required by bacteria, period 5 days</i>	CO1	1
3	What is meant by break point chlorination?  <i>1. Combined residual chlorine decrease. 2. Graph </i>	CO1	1
4	Distinguish between internal conditioning and external conditioning?  <i>Internal 1. adding chemicals directly into the boiler 2. Types Hardening: Phosphate Sodium AlO<sub>2</sub></i> <i>External Adding before feeding to boiler. Types Hardening: Ion exchange resins</i>	CO1	1
5	Mention any two compounds that cause caustic embrittlement in boiler?  <i>1. Na<sub>2</sub>CO<sub>3</sub> 2. NaOH</i>	CO1	1

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Define nano particles?

CO2

2

size range 1-50 nm, colloids.

7 List any four nano materials?

1. Nano particle, 2. Nano wire, 3. Nano rode, 4. Nano clusters

CO2

2

8 Write the difference between bulk particles and nano particles?

CO2

2

9 What are properties of nanorods?

1. Adsorb near IR, 2. Unique mechanical, electrical, optical activity
3. Generate heat when executed with IR light.
4. Isotropic arrangements.

CO2

2

### PART B

(Answer all the Questions 2 x 16 = 32 Marks)

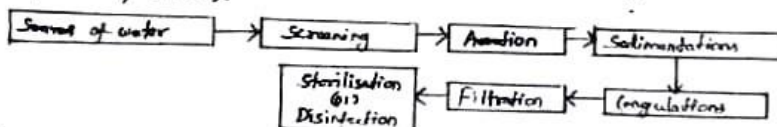
10a Explain with neat sketch the various steps in the treatment of water for municipal water supply?

CO1

1

Municipal Water Treatment: (or) (Domestic Supply) (or) (Potable water Treatment).

Rivers and lakes are the most common sources of water used by municipalities. These water should be free from colloidal impurities, domestic sewage, industrial effluents and disease producing bacteria. Hence domestic supply of water involves the following stages in the purification processes.



Primary Treatment:

Screening: It is a process of removing the floating materials like leaves, wood pieces, etc., from water. The raw water is allowed to pass through a screen, having large number of holes, which retains the floating material and allows the water to pass.

Aeration: The process of mixing water with air is known as aeration. The main purpose of aeration is

- i) to remove gases like  $CO_2$ ,  $H_2S$  and other volatile impurities causing bad taste and odour to water.
- ii) to remove ferrous and manganese salts as insoluble ferric and manganic salts.

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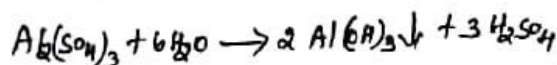
### Sedimentation:

It is a process of removing suspended impurities by allowing the water to stand undisturbed for 2-6 hours in a big tank. Most of the suspended particles settle down at the bottom due to forces of gravity, and they are removed.

### Congulation:

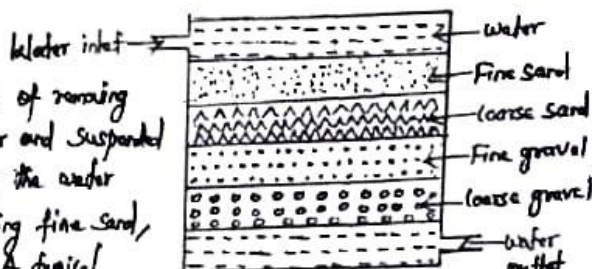
Finely divided clay, silica, etc. do not settle down easily and hence cannot be removed by sedimentation. Such impurities are removed by Congulation method.

In this method certain chemicals called Congulants like alum  $Al_2(SO_4)_3$  etc., are added to water. When the  $Al_2(SO_4)_3$  is added to water, it gets hydrolysed to form a gelatinous precipitate of  $Al(OH)_3$ . The gelatinous precipitate of  $Al(OH)_3$  entraps the finely divided and colloidal impurities, settles to the bottom and can be removed easily.



### Filtration:

It is the process of removing bacteria, colour, taste, odour and suspended particles, etc., by passing the water through filter beds containing fine sand, coarse sand and gravel. A typical




Sand filter consists of a tank containing a thick top layer of fine sand followed by coarse sand, fine gravel and coarse gravel. When the water passes through the filtering medium, it flows through the various beds slowly. The rate of filtration decreases slowly due to the clogging of impurities in the pores of the sand bed. When the rate of filtration becomes very slow, the filtration is stopped and thick top layer of fine sand is scrapped off and replaced with clean sand. Bacteria are also partly removed by this process.

OR

10b (i) Discuss the process of desalination of the Brackish water by Reverse Osmosis method?

CO1

1

  
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## Desalination of Brackish water:

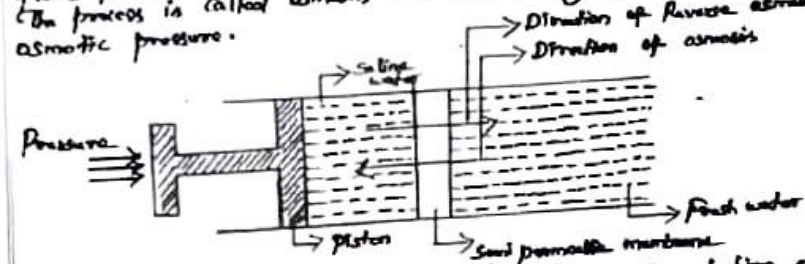
Definition: The process of removing common salt (NaCl) from the water is known as desalination. The water containing dissolved salts with a peculiar salty taste is called brackish water. Depending upon the amount of dissolved solids there are three types.

1. Fresh water - Contains  $< 1000$  ppm of dissolved solids.
2. Brackish water - Contains  $1000 - 35,000$  ppm
3. Sea water - Contains  $> 35,000$  ppm.

Brackish and sea water can be converted into drinking water by desalination. It is carried out by reverse osmosis process.

## Reverse osmosis (RO) Process:

When two solutions of different concentrations are separated by a semi-permeable membrane, water flows from lower concentration side to higher concentration side. The process is called osmosis and driving force is called osmotic pressure.



If hydrostatic pressure is applied on higher concentration side, solvent flows from higher to lower concentration. This is called reverse osmosis.

This pure water can be separated from salt water. This process is also known as super filtration.

## Advantage:

- 1) Life time of membrane is high and can be easily replaced.
- 2) Capital cost is low.

(ii) What are boiler troubles and explain about the notes on scale and sludge?

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Boiler Troubles:

The water fed into the boiler for the production of steam is called boiler feed water. If feed water is not directly into the boiler the following troubles may arise.

1. Formation of scales and sludges in boiler
2. Priming and foaming (carry over)
3. Caustic Embrittlement
4. Boiler Corrosion

Formation of scales and sludges in boiler:

When water is continuously converted into steam in boiler, the concentration of dissolved salts in water increases. When the concentration of the salts reaches their saturation point, they are formed as precipitate at the inner walls of the boiler.

Sludge: The precipitate which is present as loose and slimy with non-adherent is called sludge. The following substances are responsible for sludge formation like  $MgCO_3$ ,  $MgCl_2$ ,  $MgSO_4$  etc.

Methods to remove sludges:

Sludges are removed by "Blow down operation". The Blow down operation is a process of removing concentrated water by fresh water from the boiler during steam production.

Disadvantages of sludge:

- (i) Sludges are poor conductors of heat
- (ii) They decrease the efficiency of boiler.

Prevention: Sludge formation can be prevented by using softened water.

Scale: The precipitate which is formed as hard and adherent coating on the inner walls of the boiler. The following substances are responsible for scale formation like  $Ca(HCO_3)_2$ ,  $CaSO_4$  and  $Mg(OH)_2$ .

Methods to remove scale:

- Scale formation can be removed by (i) External treatment, (ii) Internal treatment. It can be also removed by applying thermal shock, scrapers, wire brush.

Disadvantages of scale:

- (i) Scale decreases the efficiency of boiler.
- (ii) Scale act as thermal insulator
- (iii) Any crack developed on the scale leads to explosion.

Prevention:

Scale formation can be prevented by descaling using acids like HCl, HNO<sub>3</sub>.

11a Write briefly on the size dependence properties of nanomaterials?

CO1

1

Size dependent PROPERTIES:

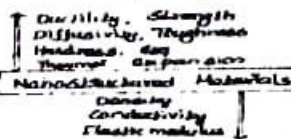
All properties like hardness, strength, ductility, elastic modulus, melting point, density, thermal conductivity, thermal expansion coefficient, diffusivity and so on, change for nanomaterials. The material behavior varies significantly by a mere reduction in grain size. Nano-structured materials are composed of grains and grain boundaries. Nanometer sized grains contain only a few thousands of atoms within each grain. A large number of atoms reside at the grain boundaries. As the grain size decreases, there is a significant increase in the volume of grain boundaries or interfaces.

The properties of materials are found to be governed to a large extent by defect configurations, dynamics and interactions. Hence the mechanical and chemical properties of nanomaterials are significantly altered due to defect dynamics.

The elastic modulus of nanomaterials can be significantly different from that of bulk alloys, due to the presence of increased fraction of defects.

Grain boundaries = nanocrystalline materials are lighter and stronger than those with coarse grains.

= Nano-sized metals exhibit significant increase in yield strength and the toughness decreases.



Property	Change in property in comparison to bulk
Hardness	3 times increase
Strength	3-10 times increase
Wear Resistance	170 times increase
Thermal Coefficients	Reduced to half
Creep resistance	Reduced or localized creep is stopped
Magnetic Properties	Lower conductivity, saturation magnetization reduced by 25.
Electrical Properties	Reactivity increased by 3 times
Hydrogen diffusion	Higher
Electrocatalytic Properties	Improved electrocatalytic activities for hydrogen evolution

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Nanowires

Nanowire is two dimensional cylindrical solid material having an aspect ratio i.e. length to width ratio greater than the diameter of the nanowire ranges from 10-100 nm.

Examples:

Metallic nanowires - Au, Ni, Pt      Nanowires of Insulators -  $SiO_2, TiO_2$   
 Molecular nanowires - DNA      Nanowires of Semiconductors - InP, Si, Ge

Synthesis of nanowires

- 1. Template-assisted synthesis - This is a simple way to fabricate nanowires. These templates contain very small cylindrical pores or voids within the host material and the empty spaces are filled with the chosen material to form nanowires.
- 2. Vapor-liquid-solid (VLS) method - It involves the adsorption of the source material from the gas phase into a liquid phase of catalyst upon supersaturation of the liquid alloy, a nucleation event generates a solid precipitate of the source material. This seed serves as a preferred site for further deposition of material at the interface of the liquid droplet, promoting the elongation of the seed into a nanowire.

Properties of nanowires:

- + Nanowires are two dimensional material.
- + Conductivity of a nanowire less than that of bulk material.
- + It exhibits distinct optical, chemical, thermal and electrical properties due to this large surface area.
- + Silicon nanowire shows strong photoluminescence characteristics.

Uses of nanowires:

- + Nanowires are used for enhancing mechanical properties of composites.
- + Nanowires replace conventional copper wires used in computers, televisions.
- + It is also used to prepare active electronic components such as P-n junction and logic gates.
- + Semiconductor nanowire crossings are expected to play a important role in future of digital computing.
- + Nanowires find applications in high density data storage either as magnetic read heads or as patterned storage media.
- + It is also used to link tiny components into very small circuits.

ii) Write a brief notes on properties and uses of nano clusters?

Nanoclusters:

Nanoclusters are fine aggregates of atoms or molecules. The size of which ranges from 0.1 to 10 nm. Of all the nanomaterials, nanoclusters are the smallest sized nanomaterials due to their close packing arrangement.

Example: CdS, ZnO.

In nanocluster, all the atoms are bound by forces like metallic, covalent, ionic, hydrogen bond or Van der Waals force of attraction.

Clusters of certain critical size are more stable than others. Nanoclusters consisting of up to a couple of hundred atoms, but larger aggregates, containing  $10^3$  or more atoms are called nanoparticles.

Magic number - The number of atoms present in the clusters of critical sizes with higher stability.

Nanoclusters can be distinguished from the value of forces present between atoms. The property of clusters can vary with the number of constituent atoms, the type of elements and the net charge of cluster.

Properties of nanoclusters:

- + Atomic or molecular clusters are formed by the nucleation of atoms or molecules respectively.
- + Reactivity of nanoclusters are decreased due to their decrease in size.
- + Melting point of nanoclusters are lower than the bulk due to high surface to volume ratio.
- + Electronic structure of the nanocluster is more confined than the bulk materials.

Applications of nanoclusters:

- > Nanoclusters are used as catalyst in many reactions.
- > It is used in nano based chemical sensors.
- > It is used as a LED in quantum computers.

Course Faculty \* S. Boobalan  
 (Name/Sign/Date)

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S. Boobalan  
 HoD  
 (Name/Sign/Date)

S. Boobalan

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(Approved by AICTE, New Delhi and affiliated to Anna University, Chennai)

## Internal Assessment Test Answer Book

Name	A. Nithya		Year/ Semester/Section	5, I Sem	
Roll No.	PH201104034	Date/Session	29-12-21	Department	CSE
Course code	CY3151	Course Title	Engineering Chemistry		
Internal Assessment Test	IAT1 <input type="checkbox"/>	IAT2 <input type="checkbox"/>	IAT3 <input type="checkbox"/>	Model	<input checked="" type="checkbox"/>
Name and Signature of the Invigilator with date			S. Manthandan 29/12/2021		

Instruction to the Student: Put tick mark to the question attempted in the column against question.

Q. No.	Part A		Part B / Part C				Total Marks
	✓	Marks	Q. NO.	a		b	
				✓	Marks		
1	✓	02	10	✓	15		15
2	✓	02	11	✓	14		14
3	✓	02	12				
4	✓	02	13				
5	✓	02	14				
6	✓	02	15				
7	✓	02	Total				29
8	✓	02	45		S. Basilan 30/12/21		
9							
Total		16	Grand Total		Name and Signature of the Examiner with date		

Course Outcomes	To be filled by the examiner						Total
	1	2	3	4	5	6	
Marks allotted	26	24					50
Marks Obtained	25	20					45
IQAC Audit - Remarks							
							Name and Signature of the IQAC member

  
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IG VALLEY, MANIDANDAM, TIRUCHIRAPPALLI - 620  
012 DEPARTMENT OF AGRICULTURAL  
ENGINEERING ACADEMIC YEAR 2022 -2023  
(ODD SEMESTER)

STUDENT MARK STATEMENT-CO BASED

AIE-I

SUBJECT CODE & TITLE: CE3351- ENGINEERING CHEMISTRY

YEAR/SEM: I/I

MONTH & YEAR: SEP/2021

S.NO	REGNO	STUDENT NAME	CO1	CO2	TOTAL (50)	TOTAL (100)
1	811221104001	AKSHAY K	16	10	26	52
2	811221104002	BHARATH KUMAR S M	AB	AB	AB	AB
3	811221104003	BHUVANESHWARI M	11	32	43	86
4	811221104004	DHINESH C	10	19	29	58
5	811221104005	EYARKAI KAMALI R	17	28	45	90
6	811221104006	GOKULNATH P R	14	25	39	78
7	811221104007	HARIHARASWAMY M	15	20	35	70
8	811221104008	HARISH R	40	20	36	72
9	811221104009	HARRISH M	10	18	28	56
10	811221104010	HARUN RASHEETH S	08	08	16	32
11	811221104011	HEMA T	16	26	42	84
12	811221104012	JACOP ANTONY L	08	10	18	36
13	811221104013	JEEVANANTHAM S	16	26	42	84
14	811221104014	KATHIRVEL K	12	23	25	50
15	811221104015	KEERTHANA J	12	18	30	60
16	811221104016	KOWSHIK G	14	10	24	48
17	811221104017	MADHAN KUMAR P	12	20	32	64
18	811221104018	MANIKANDAN N	08	15	23	46
19	811221104019	MOHAMED GANI A	16	20	36	72
20	811221104020	MOHAMED THOUFIK U	10	10	20	40
21	811221104021	MOHAMED YUNUZ R	14	29	43	86
22	811221104022	MOHAMMED RISWAAN M	AB	AB	AB	AB
23	811221104023	NAVEENKUMAR S	06	05	11	22
24	811221104024	NITHYA A	16	29	45	90
25	811221104025	POORNIMA C	14	28	42	84
26	811221104026	PRASANNA BALAJI C	12	09	21	42
27	811221104027	PRAVEEN JAYASEELAN B	10	15	25	50
28	811221104028	RAJAPUSHPAM V	12	25	37	74
29	811221104029	REETHIKA R	16	22	37	74
30	811221104030	RESIKA A V R	18	29	47	94
31	811221104031	SANTHOSH P	09	16	25	50
32	811221104032	SARAVANAPERUMAL S	16	28	44	88
33	811221104034	SELVALAKSHMI G	15	20	35	70

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(Approved by AICTE, New Delhi and affiliated to Anna University, Chennai)

**RETEST- I**


Course code	CY3151	Course Title	Engineering Chemistry	Date/Session	04.01.22/AN	Marks	50
Regulation	2021	Duration	90 minutes	Academic Year	2021-22		
Year	I	Semester	I	Department	ALL Department		

**COURSE OUTCOMES**


C104.1	To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
C104.2	To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
C104.3	To apply the knowledge of phase rule and composites for material selection requirements.
C104.4	To recommend suitable fuels for engineering processes and applications.
C104.5	To recognize different forms of energy resources
C104.6	To apply energy resources applications in energy sectors.

Q.No.	Question	CO	BTS
<b>PART A</b> (Answer all the Questions 9x2 = 18 Marks)			
1	Differentiate hard water and soft water?	CO1	1
2	Define hardness.	CO1	1
3	What are the types of hardness? Differentiate them.	CO1	1
4	Give any four requirements for potable water?	CO1	1
5	What is boiler feed water? What are the basic requirements?	CO1	1
6	What are boiler problems? Name any 4 boiler problems?	CO1	1
7	Differentiate scales and sludge.	CO1	1
8	Define Nano Chemistry	CO2	2
9	What are the types of Nano materials?	CO2	2
<b>PART B</b> (Answer all the Questions 2x16 = 32 Marks)			
10a	What is reverse osmosis? Bring out the methodology behind it. OR	1	1
10b	How will you treat the water for drinking purpose?	1	1
11a	i) Write the properties and uses of Nano wires? (ii) Write a brief notes on properties and uses of nano clusters? OR	2	2
11b	Discuss any four salient properties of nanomaterials	2	2

S. Boobalan

Course Faculty  
(Name/Sign/Date) 

S. Boobalan

HoD   
(Name/Sign/Date)  
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## Internal Assessment Test Answer Book

Name	S. Navaneeth Kumar		Year/Semester/Division	1/2/B	
Batch No.	17121104013	Date/Session	04-01-21	Department	CSE
Course code	CY3151	Course Title	Engineering Chemistry		
Internal Assessment Test	LAT1 <input checked="" type="checkbox"/> Re-test <input type="checkbox"/>	LAT2 <input type="checkbox"/>	LAT3 <input type="checkbox"/>	Model <input type="checkbox"/>	
Name and Signature of the Investigator with date	A. Marimuthu 04/01/2021				

Instruction to the Student: Put tick mark to the question attempted in the column against question.

Part A			Part B / Part C				Total Marks
Q. No.	✓	Marks	Q. NO.	a		b	
				✓	Marks		
1	✓	02	10	✓	12		12
2	✓	01	11	✓	11		11
3	✓	01	12				
4	-	-	13				
5	✓	01	14				
6	✓	01	15				
7	✓	02	Total				23
8	✓	02	35 Grand Total				S. Boobalan S. Boobalan 04/01/21 Name and Signature of the Examiner with date
9	✓	02					
Total		12					

To be filled by the examiner							
Course Outcomes	1	2	3	4	5	6	Total
Marks allotted	30	20					50
Marks Obtained	20	15					35
IQAC Audit - Remarks							
Name and Signature of the IQAC member							

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012 DEPARTMENT OF AGRICULTURAL  
ENGINEERING ACADEMIC YEAR 2022 -2023

Total No. of Candidates Present	7
Total No. of Candidates Absent	0
Total No. of Students Pass	7
Total No. of Students Fail	0

(ODD SEMESTER)

STUDENTS MARK STATEMENT-CO BASED

RETEST

SUBJECT CODE & TITLE: CE3151- Engineering Chemistry

YEAR/SEM: I/I

MONTH & YEAR: SEP/2021

S.NO	REGNO	STUDENT NAME	CO1	CO2	TOTAL (50)	TOTAL (100)
1.	811221104002	BHARATHKUMAR S M	10	13	23	46
2.	811221104002	HARUN RASHEETH S	14	16	30	60
3.	811221104002	JACOP ANTONY L	13	23	36	72
4.	811221104002	MOHAMED THOUFIK U	14	20	33	66
5.	811221104002	NAVEENKUMAR S	08	16	24	48
6.	811221104002	PRASANNA BALAJI C	10	18	28	56
7.	811221104002	SURIYA R	15	28	43	86

MARKS RANGE:

<20	20-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
0	0	0	02	2	1	1	1	0

S. Babalan

STAFF IN CHARGE ✓

S. Babalan

HoD ✓

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PRINCIPAL

**DEPARTMENT OF SCIENCE AND HUMANITIES**

**ROOT CAUSE ANALYSIS**

Name of the Faculty: **Dr. S. Balakrishnan**  
 Degree & Program: **B.E. - CSE**  
 LA Ten: **14/08/2009**  
 Target: **QC 2**

Course Code & Name: **CS9309 - Probability and Statistics**  
 Semester & Section: **3 - 200-2**  
 University Examination & Year: **Dec - 2008**  
 Addressed: **100-00%**

S.NO	BATCH NO	NAME OF THE STUDENT	CAUSED FOR FAILURE	SIGNATURE OF THE STUDENT WITH DATE	CORRECTIVE ACTION TAKEN	PREVENTIVE ACTION TAKEN	FOLLOWUP STATUS	REMARKS OF THE ROB
1	2008100101	Ashanth Kumar P	Health Issues	<i>[Signature]</i> 01/11/09	Re-test	Advised to take care health	Attended Re-Test	Advised to take care health
2	2008100102	Ashwin Kumar S	Not understanding English	<i>[Signature]</i> 01/11/09	Re-test	Advised to improve English	Attended Re-Test	Improvement in English
3	2008100103	Jacob Anthony L	Irregular	<i>[Signature]</i> 01/11/09	Re-test	Advised to improve attendance	Attended Re-Test	Improved attendance
4	2008100104	Mohamed Shoukib U	Lack of Knowledge	<i>[Signature]</i> 01/11/09	Re-Test	Read more study of more questions	Attended Re-Test	Improved marks
5	2008100105	Nandan Kumar S	Irregular	<i>[Signature]</i> 01/11/09	Re-Test	Advised to take better attendance	Attended Re-Test	Improved conduct

S.NO	ROLL NO	NAME OF THE STUDENT	CAUSED FOR FAILURE	SIGNATURE OF THE STUDENT WITH DATE	CORRECTIVE ACTION TAKEN	PREVENTIVE ACTION TAKEN	FOLLOWUP STATUS	REMARKS OF THE ROB
6	2008100106	Prasanna Aravind C	Irregular	<i>[Signature]</i> 01/11/09	Re-Test	Advised to improve attendance	Attended Re-Test	Improved attendance
7	2008100107	Sarvya R	Family Friction	<i>[Signature]</i> 01/11/09	Re-Test	Advised to take care health	Attended Re-Test	Improved attendance
8								
9								
10								

*[Signature]*  
 01/11/2009  
 Signature of the Faculty Member

*[Signature]*  
 01/11/2009  
 Signature of the ROB

**Dr. G. Balakrishnan, M.E., Ph.D.,**  
 Principal  
 Indra Ganesan College of Engineering  
 IG Valley, Madurai Main Road  
 Manikandam, Trichy-620 012.

INDRA GANESAN COLLEGE OF ENGINEERING  
 100 Valley, Maduraimain Road, Madurai, Tamil Nadu - 625 012, India  
 Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai, TN  
**IQAC Academic Audit Form**

ACADEMIC YEAR: 2021-2022 **1001 / 1002 / 1003 / 1004 / 1005**  
 Department: **CHEMISTRY** Year / Sem / Rev: **1 / 1 / A** No. of Students Registered: **47**

Sl. No.	Course Code	Course Name	1001			1002			1003			1004			1005		
			Y	N	A	Y	N	A	Y	N	A	Y	N	A	Y	N	A
1	CY201	PHYSICS 001	Y			Y											
2	CY201	PHYSICS 002	Y			Y											
3	CY201	PHYSICS 003	Y			Y											
4	CY201	PHYSICS 004	Y			Y											
5	CY201	PHYSICS 005	Y			Y											
6	CY201	PHYSICS 006	Y			Y											
7	CY201	PHYSICS 007	Y			Y											
8	CY201	PHYSICS 008	Y			Y											
9	CY201	PHYSICS 009	Y			Y											
10	CY201	PHYSICS 010	Y			Y											

11	CY201	PHYSICS 011	Y			Y										
12	CY201	PHYSICS 012	Y			Y										
13	CY201	PHYSICS 013	Y			Y										
14	CY201	PHYSICS 014	Y			Y										
15	CY201	PHYSICS 015	Y			Y										
16	CY201	PHYSICS 016	Y			Y										
17	CY201	PHYSICS 017	Y			Y										
18	CY201	PHYSICS 018	Y			Y										
19	CY201	PHYSICS 019	Y			Y										
20	CY201	PHYSICS 020	Y			Y										
21	CY201	PHYSICS 021	Y			Y										
22	CY201	PHYSICS 022	Y			Y										
23	CY201	PHYSICS 023	Y			Y										
24	CY201	PHYSICS 024	Y			Y										
25	CY201	PHYSICS 025	Y			Y										
26	CY201	PHYSICS 026	Y			Y										
27	CY201	PHYSICS 027	Y			Y										
28	CY201	PHYSICS 028	Y			Y										
29	CY201	PHYSICS 029	Y			Y										

30	CY201	PHYSICS 030	Y			Y										
31	CY201	PHYSICS 031	Y			Y										
32	CY201	PHYSICS 032	Y			Y										
33	CY201	PHYSICS 033	Y			Y										
34	CY201	PHYSICS 034	Y			Y										
35	CY201	PHYSICS 035	Y			Y										
36	CY201	PHYSICS 036	Y			Y										
37	CY201	PHYSICS 037	Y			Y										
38	CY201	PHYSICS 038	Y			Y										
39	CY201	PHYSICS 039	Y			Y										
40	CY201	PHYSICS 040	Y			Y										
41	CY201	PHYSICS 041	Y			Y										
42	CY201	PHYSICS 042	Y			Y										
43	CY201	PHYSICS 043	Y			Y										
44	CY201	PHYSICS 044	Y			Y										
45	CY201	PHYSICS 045	Y			Y										
46	CY201	PHYSICS 046	Y			Y										

Internal Monitor Form for Monitoring  
 Internal Monitor Form and Signature  
 Internal Monitor  
 Dr. G. Balakrishnan  
 IQAC Coordinator

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**INDRA GANESAN COLLEGE OF ENGINEERING**  
 620 012, India  
 Affiliated to Anna University, Chennai-60.  
**IGAC Academic Audit Form**

ACADEMIC YEAR: 2021-2022  
 SEMESTER: I / II / A  
 No. of Students Registered: 47

Sl. No.	Reg. No.	Name of the Student	1	2	3	4	5	6	7	8	9	10	11	12
1	CV501	...												
2	CV501	...	Y											
3	CV501	...	Y	Y										
4	CV501	...	Y	Y										
5	CV501	...	Y	Y										
6	CV501	...	Y	Y										
7	CV501	...	Y	Y										
8	CV501	...	Y	Y										
9	CV501	...	Y	Y										
10	CV501	...	Y	Y										
11	CV501	...	Y	Y										

12	CV501	...	Y	Y										
13	CV501	...	Y	Y										
14	CV501	...	Y	Y										
15	CV501	...	Y	Y										
16	CV501	...	Y	Y										
17	CV501	...	Y	Y										
18	CV501	...	Y	Y										
19	CV501	...	Y	Y										
20	CV501	...	Y	Y										
21	CV501	...	Y	Y										
22	CV501	...	Y	Y										
23	CV501	...	Y	Y										
24	CV501	...	Y	Y										
25	CV501	...	Y	Y										
26	CV501	...	Y	Y										
27	CV501	...	Y	Y										
28	CV501	...	Y	Y										
29	CV501	...	Y	Y										
30	CV501	...	Y	Y										

31	CV501	...	Y	Y										
32	CV501	...	Y	Y										
33	CV501	...	Y	Y										
34	CV501	...	Y	Y										
35	CV501	...	Y	Y										
36	CV501	...	Y	Y										
37	CV501	...	Y	Y										
38	CV501	...	Y	Y										
39	CV501	...	Y	Y										
40	CV501	...	Y	Y										
41	CV501	...	Y	Y										
42	CV501	...	Y	Y										
43	CV501	...	Y	Y										
44	CV501	...	Y	Y										
45	CV501	...	Y	Y										
46	CV501	...	Y	Y										
47	CV501	...	Y	Y										

Internal Member: *[Signature]*  
 External Member: *[Signature]*  
 Head of Institution: *[Signature]*  
 IGAC Representative: *[Signature]*

**Dr. G. Balakrishnan, M.E., Ph.D.,**  
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Sl. No.	Course Code	Course Name	10AL				10AL				Total
			Y	N	Y	N	Y	N	Y	N	
1	CYB101	ADVANCED MATHEMATICS I	Y		Y		Y		Y		4
2	CYB102	ADVANCED MATHEMATICS II	Y		Y		Y		Y		4
3	CYB103	ADVANCED MATHEMATICS III	Y		Y		Y		Y		4
4	CYB104	ADVANCED MATHEMATICS IV	Y		Y		Y		Y		4
5	CYB105	ADVANCED MATHEMATICS V	Y		Y		Y		Y		4
6	CYB106	ADVANCED MATHEMATICS VI	Y		Y		Y		Y		4
7	CYB107	ADVANCED MATHEMATICS VII	Y		Y		Y		Y		4
8	CYB108	ADVANCED MATHEMATICS VIII	Y		Y		Y		Y		4
9	CYB109	ADVANCED MATHEMATICS IX	Y		Y		Y		Y		4
10	CYB110	ADVANCED MATHEMATICS X	Y		Y		Y		Y		4

11	CYB111	ADVANCED MATHEMATICS XI	Y		Y						2
12	CYB112	ADVANCED MATHEMATICS XII	Y		Y						2
13	CYB113	ADVANCED MATHEMATICS XIII	Y		Y						2
14	CYB114	ADVANCED MATHEMATICS XIV	Y		Y						2
15	CYB115	ADVANCED MATHEMATICS XV	Y		Y						2
16	CYB116	ADVANCED MATHEMATICS XVI	Y		Y						2
17	CYB117	ADVANCED MATHEMATICS XVII	Y		Y						2
18	CYB118	ADVANCED MATHEMATICS XVIII	Y		Y						2
19	CYB119	ADVANCED MATHEMATICS XIX	Y		Y						2
20	CYB120	ADVANCED MATHEMATICS XX	Y		Y						2
21	CYB121	ADVANCED MATHEMATICS XXI	Y		Y						2
22	CYB122	ADVANCED MATHEMATICS XXII	Y		Y						2
23	CYB123	ADVANCED MATHEMATICS XXIII	Y		Y						2
24	CYB124	ADVANCED MATHEMATICS XXIV	Y		Y						2
25	CYB125	ADVANCED MATHEMATICS XXV	Y		Y						2
26	CYB126	ADVANCED MATHEMATICS XXVI	Y		Y						2
27	CYB127	ADVANCED MATHEMATICS XXVII	Y		Y						2

28	CYB128	ADVANCED MATHEMATICS XXVIII	Y		Y						2
29	CYB129	ADVANCED MATHEMATICS XXIX	Y		Y						2
30	CYB130	ADVANCED MATHEMATICS XXX	Y		Y						2
31	CYB131	ADVANCED MATHEMATICS XXXI	Y		Y						2
32	CYB132	ADVANCED MATHEMATICS XXXII	Y		Y						2
33	CYB133	ADVANCED MATHEMATICS XXXIII	Y		Y						2
34	CYB134	ADVANCED MATHEMATICS XXXIV	Y		Y						2
35	CYB135	ADVANCED MATHEMATICS XXXV	Y		Y						2
36	CYB136	ADVANCED MATHEMATICS XXXVI	Y		Y						2
37	CYB137	ADVANCED MATHEMATICS XXXVII	Y		Y						2
38	CYB138	ADVANCED MATHEMATICS XXXVIII	Y		Y						2
39	CYB139	ADVANCED MATHEMATICS XXXIX	Y		Y						2
40	CYB140	ADVANCED MATHEMATICS XL	Y		Y						2
41	CYB141	ADVANCED MATHEMATICS XLI	Y		Y						2
42	CYB142	ADVANCED MATHEMATICS XLII	Y		Y						2
43	CYB143	ADVANCED MATHEMATICS XLIII	Y		Y						2
44	CYB144	ADVANCED MATHEMATICS XLIV	Y		Y						2
45	CYB145	ADVANCED MATHEMATICS XLV	Y		Y						2

46	CYB146	ADVANCED MATHEMATICS XLVI	Y		Y						2
47	CYB147	ADVANCED MATHEMATICS XLVII	Y		Y						2
48	CYB148	ADVANCED MATHEMATICS XLVIII	Y		Y						2

Principal's Name and Signature: \_\_\_\_\_  
 Date: 28/05/2022

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