Computer Science and Engineering and allied branches(Chemistry group)

Course Title:	Applied Chemistry for Computer Science &Engineering stream		
Course Code:	BCHES102/202	CIEMarks	50
Course Type(Theory/Practical/Integrated)	Integrated	SEEMarks	50
		Total Marks	100
TeachingHours/Week(L:T:P:S)[1]	2:2:2:0	Exam Hours	03
TotalHoursofPedagogy	40hoursTheory+ 10to12Labslots	Credits	04

Courseobjectives

- Toenablestudentstoacquireknowledgeonprinciplesofchemistryforengineeringapplications.
- Todevelopanintuitiveunderstandingofchemistrybyemphasizingtherelatedbranchesofengineering.
- Toprovidestudentswithasolidfoundationinanalyticalreasoningrequiredtosolvesocietalproblems.

Teaching-LearningProcess

Thesearesamplestrategies,whichteachercanusetoacceleratetheattainmentofthevariouscourseoutcomesandmakeTeaching–Learningmoreeffective

- Tutorial&remedialclassesforneedystudents(notregularT/R)
- ConductingMakeupclasses/Bridgecourses forneedystudents
- Demonstrationofconceptseitherbybuildingmodelsorbyindustryvisit
- Experimentsinlaboratoriesshallbeexecutedinblendedmode(conventionalornon–conventionalmethods)
- UseofICT–Onlinevideos,onlinecourses
- Useofonlineplatformsforassignments/Notes/Quizzes(Ex.Googleclassroom)

MODULE1:SensorsandEnergySystems(8hr)

Sensors:Introduction,working,principleandapplicationsofConductometricsensors,Electrochemical sensors,Thermometricsensors (Flame photometry)andOpticalsensors (colorimetry).Sensorsforthemeasurement of dissolved oxygen (DO). Electrochemical sensors for the pharmaceuticals.ElectrochemicalgassensorsforSO_xandNO_x.Disposablesensorsin thedetectionofbiomoleculesandpesticides.

EnergySystems:Introductiontobatteries,construction,workingandapplicationsofLithiumionandSodiumionbatteries.QuantumDotSensitizedSolarCells(QDSSC's)-Principle, PropertiesandApplications.

Self-learning: Types of electrochemical sensor, Gas sensor - O_2 sensor, Biosensor - Glucosesensors.

MODULE2:MaterialsforMemoryandDisplaySystems(8hr)

Memory Devices: Introduction, Basic concepts of electronic memory, History of organic/polymerelectronicmemorydevices,Classificationofelectronicmemorydevices,

1.NOTE:Whereverthecontact hoursisnotsufficient,tutorialhourcanbeconvertedto theoryhours

typesoforganicmemorydevices(organicmolecules,polymericmaterials,organic-inorganichybridmaterials).

DisplaySystems:Photoactiveandelectroactivematerials,Nanomaterialsandorganicmaterials used in optoelectronic devices. Liquid crystals (LC's) - Introduction, classification,properties and application in Liquid Crystal Displays (LCD's). Properties and application ofOrganic Light Emitting Diodes (OLED's) and Quantum Light Emitting Diodes (QLED's), Lightemittingelectrochemicalcells.

Self-learning: PropertiesandfunctionsofSilicon(Si),Germanium(Ge),Copper(Cu), Aluminium(Al),andBrominatedflameretardantsincomputers.

MODULE3:CorrosionandElectrodeSystem(8hr)

CorrosionChemistry: Introduction,electrochemicaltheoryofcorrosion,typesofcorrosion-differentialmetalanddifferentialaeration.Corrosioncontrol-galvanization,anodization and sacrificial anode method. Corrosion Penetration Rate (CPR) - Introductionandnumerical problem.

Electrode System: Introduction, types of electrodes. Ion selective electrode – definition,construction, working and applications of glass electrode. Determination of pH using glasselectrode. Reference electrode- Introduction, calomel electrode– construction, workingandapplicationsofcalomelelectrode.Concentrationcell– Definition,constructionandNumericalproblems.

Analytical Techniques: Introduction, principle and instrumentation of Conductometry; itsapplication in the estimation of weak acid. Potentiometry; its application in the estimationofiron.

Self-learning:IRandUV-Visiblespectroscopy.

MODULE4:PolymersandGreenFuels(8hr)

Polymers: Introduction,Molecularweight-Numberaverage,weightaverageandnumericalproblems.Preparation,properties,andcommercialapplicationsofkevlar. Conductingpolymers–synthesisandconductingmechanismofpolyacetyleneandcommercialapplications.

Green Fuels: Introduction, construction and working of solar photovoltaic cell, advantages,and disadvantages. Generation of energy (green hydrogen) by electrolysis of water and itsadvantages.

Self-learning: Regenerativefuelcells

MODULE5:E-WasteManagement(8hr)

E-Waste: Introduction, sources of e-waste, Composition, Characteristics, and Need of e-wastemanagement.Toxicmaterialsusedinmanufacturingelectronicandelectricalproducts, health hazards due to exposure to e-waste. Recycling and Recovery: Differentapproachesofrecycling(separation,thermaltreatments,hydrometallurgicalextraction,pyro metallurgical methods, direct recycling). Extraction of gold from E-waste. Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers, andstatutorybodies).

Self-learning: Impactofheavymetalsonenvironmentandhumanhealth.

PRACTICALMODULE

A–Demonstration(anytwo)offline/virtual:

A1.ChemicalStructure drawingusingsoftware:ChemDraworACD/ChemSketch

A2. Determination of strength of an acid in Pb-acid
batteryA3:SynthesisofIron-oxideNanoparticles
A4.Electrolysisofwater

B–Exercise(compulsorilyany4tobeconducted):

B1.Conductometricestimationofacidmixture
B2.PotentiometricestimationofFASusing$K_2Cr_2O_7$
B3.DeterminationofpKaofvinegarusingpHsensor(Glasselectrode)
B4.Determinationofrateofcorrosionofmildsteelbyweightlossmethod B5.
Estimationoftotalhardnessofwaterby EDTA method

C–StructuredEnquiry (compulsorilyany4tobeconducted):

C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry) C2.DeterminationofViscositycoefficientoflubricant(Ostwald'sviscometer)
C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method C4.EstimationofSodiumpresentinsoil/effluentsampleusingflamephotometry
C5.DeterminationofChemicalOxygenDemand(COD)ofindustrialwastewatersample

D–OpenEndedExperiments(anytwo):

D1:Evaluationofacidcontentinbeveragesbyusing pH sensors and simulation. D2.
Construction of photovoltaic cell.
D3.Designanexperimenttoidentifythepresenceofproteinsingivensample.
D4.SearchingsuitablePDBfileandtargetformoleculardocking

Courseoutcome(CourseSkillSet)

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

CO1.	Identify the terms processes involved in scientific and engineering andapplications
CO2.	Explainthephenomenaofchemistrytodescribethemethodsofengineeringprocesses
CO3.	Solvetheproblemsinchemistrythatarepertinentinengineeringapplications
CO4.	Applythebasicconceptsofchemistrytoexplainthechemicalpropertiesandprocesses
CO5.	Analyzepropertiesandmultidi processes associated withchemical substances in sciplinarysituations

AssessmentDetails(bothCIEandSEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). Astudentshallbedeemedtohavesatisfiedtheacademicrequirementsandearnedthecreditsallotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in thesemester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total oftheCIE(ContinuousInternalEvaluation)andSEE(SemesterEndExamination)takentogether.

ContinuousInternalEvaluation(CIE):

The CIE marks for the theory component of the IC shall be **30 marks** and for the laboratory component **20 Marks**.

CIE for the theory component of the IC

- Three Tests each of 20 Marks; after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.
- Two Assignments/two quizzes/ seminars/one field survey and report presentation/one-course project totalling 20 marks.

Total Marks scored (test + assignments) out of 80 shall be scaled down to **30 marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test **(duration 03 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to **05 marks.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IC/IPCC for **20 marks**.

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks) in the theory component and 08 (40% of maximum marks) in the practical component. The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total marks of all questions should not be more than 25 marks.

The theory component of the IC shall be for both CIE and SEE.

Semester End Examination(SEE):

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

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.

There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

SuggestedLearningResources:

Books(TitleoftheBook/Nameoftheauthor/Nameofthepublisher/EditionandYear)

1. WileyEngineeringChemistry,WileyIndiaPvt.Ltd.NewDelhi,2013-2nd Edition.
2. EngineeringChemistry,Satyaprakash&ManishaAgrawal,KhannaBookPublishing,Delhi
3. ATextBookofEngg.Chemistry,ShashiChawla,DhanpatRai&Co.(P)Ltd.
4. EssentialsofPhysicalChemistry,Bahl&Tuli,S.ChandPublishing
5. AppliedChemistry,SunitaRattan,Kataria5.EngineeringChemistry,Baskar,Wiley
6. EngineeringChemistry–I,D.GrourKrishana,VikasPublishing
7. ATextbookofEngineeringChemistry,SSDara&Dr.SSUmare,SChand&CompanyLtd.,12thEdition,2011.
8. ATextBookofEngineeringChemistry,R.V.GadagandNityanandaShetty,I.K.InternationalPublishinghouse. 2nd Edition,2016.
9. TextBookofPolymerScience,F.W.Billmeyer,JohnWiley&Sons,4thEdition,1999.
10. NanotechnologyAChemicalApproachtoNanomaterials,G.A.Ozin&A.C.Arsenault,RSCPublishing,2005
11. CorrosionEngineering,M.G.Fontana,N.D.Greene,McGrawHillPublications,NewYork,3rd Edition,1996.

12. Linden'sHandbookofBatteries,KirbyW.Beard,FifthEdition,McGrawHill,2019.
13. OLEDDisplayFundamentalsandApplications,TakatoshiTsujimura,Wiley–Blackwell,2012
14. Supercapacitors:Materials,Systems,andApplications,MaxLu,FrancoisBeguin,ElzbietaFrackowiak,Wile y-VCH;1stedition,2013.
15. "HandbookonElectroplatingwithManufactureofElectrochemicals",ASIAPACIFICBUSINESSPRESS Inc., 2017. Dr.H. Panda,
16. ExpandingtheVisionofSensorMaterials.NationalResearchCouncil1995,Washington,DC:TheNationalAc ademies Press. doi:10.17226/4782.
17. EngineeringChemistry,EditedbyDr.MaheshBandDr.RoopashreeB,SunstarPublisher,Bengaluru,ISBN97 8-93-85155-70-3, 2022
18. HighPerformanceMetallicMaterialsforCostSensitiveApplications,F.H.Froes,etal.JohnWiley&Sons, 2010
19. InstrumentalMethodsofAnalysis,Dr.K.R.MahadikandDr.L.Sathiyanarayanan,NiraliPrakashan,2020
20. PrinciplesofInstrumentalAnalysis,DouglasA.Skoog,F.JamesHoller,StanleyR.CrouchSeventhEdition,Ce ngageLearning, 2020
21. PolymerScience,VRGowariker,NVViswanathan,Jayadev,Sreedhar,NewageInt.Publishers,4thEdition, 2021
22. EngineeringChemistry,PCJain&MonicaJain,DhanpatRaiPublication,2015-16thEdition.
23. Nanostructuredmaterialsandnanotechnology,Hari Singh, Nalwa,academicpress, 1stEdition,2002.
24. NanotechnologyPrinciplesandPractices,SulabhaKKulkarni,CapitalPublishingCompany,3rdEdition2014
25. Principlesofnanotechnology,Phanikumar,Scitechpublications,2ndEdition,2010.
26. ChemistryforEngineeringStudents,B.S.JaiPrakash,R.Venugopal,Sivakumaraiah&PushpaIyengar.,Suba shPublications,5thEdition, 2014
27. "EngineeringChemistry",O.G.Palanna,TataMcGrawHillEducationPvt.Ltd.NewDelhi,FourthReprint,20 15.
28. ChemistryofEngineeringmaterials,MaliniS,KSAnanthaRaju,CBSpublishersPvtLtd.,
29. LaboratoryManualEngg.Chemistry,AnupmaRajput,DhanpatRai&Co.

WeblinksandVideoLectures(e-Resources):

- http://libgen.rs/
- https://nptel.ac.in/downloads/122101001/
- https://nptel.ac.in/courses/104/103/104103019/
- https://ndl.iitkgp.ac.in/
- https://www.youtube.com/watch?v=faESCxAWR9k
- https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWh
- https://www.youtube.com/watch?v=j5Hml6KN4TI
- https://www.youtube.com/watch?v=X9GHBdyYcyo
- https://www.youtube.com/watch?v=1xWBPZnEJk8
- https://www.youtube.com/watch?v=wRAo-M8xBHM

ActivityBasedLearning(SuggestedActivitiesinClass)/PracticalBasedlearning

- https://www.vlab.co.in/broad-area-chemical-sciences
- https://demonstrations.wolfram.com/topics.php
- https://interestingengineering.com/science

COsandPOsMapping(Individualteacherhastofillup)

	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1				1					
CO2	3	1	1				1					
CO3	3	1	1				1					
CO4	3	1	1				1					
CO5	3	1	1				1					

|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust ®

SJC INSTITUTE OF TECHNOLOGY

Chickballapur – 562 101

Estd: 1986

Department of Chemistry
LESSON PLAN

SUBJECT TITLE	**Applied Chemistry for CSE stream**		
SUBJECT TYPE	**CORE**		
SUBJECT CODE	**22CHES202**		
ACADEMIC YEAR	**2023-24 (EVEN SEMESTER)**	**BATCH**	**2023-2027**
SCHEME	**CBCS scheme (Effective from the academic year 2023-24)**		
SEMESTER & SECTION	**II Sem & ISE-A**		
IA MARKS	**50**	*EXAM MARKS*	**50**
NUMBER OF LECTURE HOURs/WEEK	**5**	*TOTAL NUMBER OF LECTURE HOURS*	**40**
FACULTY NAME	**Dr. Chandrashekar K N**	*NO. OF TIMES HANDLED*	**25**

COURSE LEARNING OBJECTIVES: This course will enable students to

- To enable students to acquire knowledge on principles of chemistry for engineering applications.
- To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
- To provide students with a solid foundation in analytical reasoning required to solve societal problems

Course Outcomes: At the end of this course, students are able to:

CO1	Identify the terms and processes involved in scientific and engineering applications
CO2	Explore the phenomena of chemistry in engineering processes
CO3	Solve for the problems in chemistry that are pertinent in engineering applications
CO4	Apply the basic concepts of chemistry to explain the chemical properties and processes
CO5	Analyze properties and processes associated with chemical substances in multidisciplinary situations

CO-PO MATRIX

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	1	2	2	2	1	1	-	-	2	-	-	-	-
CO2	3	1	1	-	2	2	2	1	1	-	-	2	-	-	-	-
CO3	3	3	2	2	2	2	2	1	1	-	-	2	-	-	-	-
CO4	3	3	2	2	2	2	2	1	1	-	-	2	-	-	-	-
CO5	3	3	2	2	1	2	2	1	1	-	-	2	-	-	-	-

Note: Justification of CO-PO mapping

CO-PO Justification for Engg Chemistry

Students will be able to

CO1-PO1 – Understand the several terms and energy applications in engineering
CO1-PO2 – Analyse the various process used in engineering that related to chemistry
CO1-PO3—Understand the various engineering applications that causes to the environment and able to find the solution
CO1-PO4-Analyse the different samples using experimental methods
CO1-PO5-Use modern techniques like metal finishing and nanotechnology
CO1-PO6-Solve societal problems such as waste management, corrosion control, environmental issues
CO1-PO7—understand the societal problems due to various engineering application process.
CO1-PO8-Understand the usage and disposal of toxic chemicals for environmental sustainability and ecosystem
CO1-PO9-Find out solutions in multidisciplinary problem
CO1-PO12-Learn chemical applications in Engg. to solve societal problems such as power, Engg. Materials and to protect environment and ecosystem
CO2-PO1 –understands the several methods of chemistry for applications in engineering.
CO2-PO5-Select modern tools to understand Engg.process
CO2-PO6-Respond to societal issues using chemistry aspects
CO2-PO7—understand the societal problems due to technology.
CO2-PO8- Understand the usage and disposal of toxic chemicals for environmental sustainability and ecosystem
CO2-PO9-Find out solutions in multidisciplinary problem
CO2-PO12-Learn chemical applications in Engg. to solve societal problems such as power, Engg. Materials and to protect environment and ecosystem
CO3-PO1 –understand the problems in related to technology
CO3-PO2 –identify the various problem in associated with the engineering and technology
CO3-PO3—understand the problems and find the solution to avoid the environmental issues
CO3-PO4-Use Engg. Knowledge to solve the problems
CO3-PO5-Use modern techniques like metal finishing and nanotechnology
CO3-PO6-Solve societal problems such as waste management, corrosion control, environmental issues
CO3-PO7—understand the societal problems due to various engineering application process.
CO3-PO8-Understand the usage and disposal of toxic chemicals for environmental sustainability and ecosystem

CO3-PO9-Find out solutions in multidisciplinary problem
CO3-PO12-Learn chemical applications in Engg. to solve societal problems such as power, Engg. Materials and to protect environment and ecosystem
CO4-PO1 –understand the chemical properties and applications of various chemical components used in engineering and technology.
CO4-PO2 –apply the chemistry concepts to identify the various problem in associated with the engineering and technology
CO4-PO3—utilise the knowledge of chemistry in engineering and technology to find the solution to avoid the environmental issues
CO4-PO4-Use Engg. Knowledge to solve the problems
CO4-PO5-Select modern tools to understand Engg. process
CO4-PO6-Respond to societal issues using chemistry aspects
CO4-PO7—apply basic chemistry in find out the new technology for sustainable society.
CO4-PO8- Understand the usage and disposal of toxic chemicals for environmental sustainability and ecosystem
CO4-PO9-Find out solutions in multidisciplinary problem
CO4-PO12-Learn chemical applications in Engg. to solve societal problems such as power, Engg. Materials and to protect environment and ecosystem
CO5-PO1 – Students will be able to apply the basic chemical knowledge of chemical properties and applications of various chemical components used in engineering and technology.
CO5-PO2 – Students will be able to apply the chemistry concepts to solve the various problem in associated with the engineering and technology
CO5-PO3—Students will be able to develop the various solutions for to the environmental issues
CO5-PO4-Use Engg. Knowledge to solve the problems
CO5-PO5-Select modern tools to understand Engg. process
CO5-PO6-Respond to societal issues using chemistry aspects
CO5-PO7—apply basic chemistry in find out the new technology for sustainable society.
CO5-PO8- Understand the usage and disposal of toxic chemicals for environmental sustainability and ecosystem
CO5-PO9-Find out solutions in multidisciplinary problem
CO5-PO12-Learn chemical applications in Engg. to solve societal problems such as power, Engg. Materials and to protect environment and ecosystem

DELIVERY PLAN WITH DETAILS

MODULE – 1

Lecture #	Topic	Mode of Delivery (PlsTick √)				Date of Delivery	COs Covered
		1	2	3	4		
1.	MODULE 1: Sensors and Energy Systems, Sensors: Introduction, working principle and applications of Conductometric sensors,		√			17/2	CO_1
2.	Electrochemical sensors,		√			22/2	CO_1
3.	Thermometric sensors, and Optical sensors		√			23/2	CO_1
4.	Sensors for the measurement of dissolved oxygen (DO).		√			24/2	CO_1
5.	Electrochemical sensors for the pharmaceuticals, surfactants, hydrocarbons.		√			27/2	CO_1
6.	Electrochemical gas sensors for SOx and NOx.		√			6/3	CO_1
7.	Disposable sensors in the detection of Biomolecules and pesticides.		√			8/3	CO_1
8.	Energy Systems: Introduction to batteries,		√			13/2	CO_1
9.	Construction, working and applications of Lithium ion and Sodium ion batteries.		√			15/2	CO_1
10.	Quantum Dot Sensitized Solar Cells (QDSSC's)- Principle, Properties and Applications.		√			16/2	CO_1
Textbook : and chapter : Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition							
Signatures	**Faculty:**	**#HOURS**				**Allotted**	**Taken**
	HOD:					10	10
Remarks							

MODULE – 2

Lecture #	Topic	Mode of Delivery (PlsTick √)				Date of Delivery	COs Covered
		1	2	3	4		
11.	**MODULE 2: Materials for Memory and Display Systems Memory Devices**: Introduction, Basic concepts of electronic memory,		√			9/3	CO_2
12.	History of organic/polymer electronic memory devices,		√			10/3	CO_2
13.	Classification of electronic memory devices, types of organic memory devices		√			13/3	CO_2
14.	Display Systems: Photoactive and electro active materials,		√			15/3	CO_2
15.	Nanomaterials and organic materials used in optoelectronic devices.		√			17/3	CO_2
16.	Liquid crystals (LC's) - Introduction, classification,		√			20/3	CO_2
17.	Properties and application in Liquid Crystal Displays (LCD's).		√			23/3	CO_2
18.	Properties and application of Organic Light Emitting Diodes (OLED's)		√			24/3	CO_2
19.	Quantum Light Emitting Diodes (QLED's),		√			25/3	CO_2
20.	Light emitting electrochemical cells.		√			27/3	CO_2

Textbook : and chapter: OLED Display Fundamentals and Applications, Takatoshi Tsujimura,				
Signatures	Faculty:	#HOURS	Allotted	Taken
	HOD:		10	10
Remarks				

MODULE – 3

Lecture #	Topic	Mode of Delivery (PlsTick √)				Date of Delivery	COs Covered
		1	2	3	4		
21.	MODULE 3: Corrosion and Electrode System Corrosion Chemistry: Introduction, electrochemical theory of corrosion,		√			14/12	CO_3
22.	types of corrosion-differential metal and differential aeration		√			15/12	CO_3
23.	Corrosion control - galvanization, anodization and sacrificial anode method.		√			16/12	CO_3
24.	Corrosion Penetration Rate (CPR) - Introduction and numerical problem.		√			19/12	CO_3
25.	Electrode System: Introduction, types of electrodes		√			21/12	CO_3
26.	. Ion selective electrode – definition, construction, working and applications of glass electrode		√			22/12	CO_3
27.	Determination of pH using glass electrode.		√			28/12	CO_3
28.	Reference electrode - Introduction, calomel electrode – construction, working and applications of calomel electrode.		√			29/12	CO_3
29.	Concentration cell– Definition, construction and Numerical problems		√			29/12	CO_3
30.	Analytical Techniques: Introduction, principle and instrumentation of Conductometry; its application in the estimation of weak acid. Potentiometry; its application in the estimation of iron.		√			30/12	CO_3

Textbook: and chapter: Corrosion Engineering, M. G. Fontana, N. D. Greene				
Signatures	Faculty:	#HOURS	Allotted	Taken
	HOD:		10	10
Remarks				

MODULE – 4

Lecture #	Topic	Mode of Delivery (PlsTick √)				Date of Delivery	COs Covered
		1	2	3	4		
31.	MODULE 4: Polymers and Green Fuels Polymers: Introduction,		√			02/01	CO_4
32.	Number average, weight average		√			4/01	CO_4
33.	Numerical problems.		√			5/01	CO_4
34.	Conducting polymers – synthesis of polyacetylene		√			6/01	CO_4

35.	Conducting mechanism of polyacetylene and commercial applications.		√			09/01	CO_4
36.	Preparation, properties, and commercial applications of graphene oxide.		√			16/1	CO_4
37.	Green Fuels: Introduction,		√			18/1	CO_4
38.	construction and working of solar photovoltaic cell, advantages, and disadvantages		√			19/1	CO_4
39.	Generation of energy (green hydrogen)		√			20/1	CO_4
40.	Generation of energy (green hydrogen) by electrolysis of water and its advantages		√			23/1	CO_4

Textbook: and chapter : Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons

		#HOURS	Allotted	Taken
Signatures	**Faculty:**			
	HoD:		10	10
Remarks				

MODULE – 5

Lecture #	Topic	Mode of Delivery (PlsTick √)				Date of Delivery	COs Covered
		1	2	3	4		
41.	**E-Waste Management** - E-Waste: Introduction, sources of e-waste,		√			25/01	CO_5
42.	Composition, Characteristics, and Need of e waste management		√			27/01	CO_5
43.	Toxic materials used in manufacturing electronic and electrical products,		√			30/1	CO_5
44.	health hazards due to exposure to e-waste		√			30/1	CO_5
45.	Recycling and Recovery: Different approaches of recycling (separation, thermal treatments,)		√			02/2	CO_5
46.	Recycling and Recovery: Different approaches of recycling (hydrometallurgical extraction, pyrometallurgical methods)		√			03/2	CO_5
47.	Recycling and Recovery: Different approaches of recycling (direct recycling).		√			6/2	CO_5
48.	Extraction of gold from E-waste		√			8/2	CO_5
49.	Role of stake holders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies).		√			9/2	CO_5
50.	Role of stake holders in environmental management of e-waste (recyclers, and statutory bodies).		√			10/2	CO_5

Textbook : and chapter : B. Jaiprakash, R. Venugopal, Sivakumaraiah and Pushpa Iyengar, Chemistry for Engineering Students

		#HOURS	Allotted	Taken
Signatures	**Faculty:**			
	HOD:		10	10
Remarks				

Text Books:

1. P.C. Jain & Monica Jain. **"Engineering Chemistry"**
2. Engineering chemistry by Dr. Chandrashekara B M, Prof Basavaraju B C
3. S. S. Dara, A textbook of Engineering Chemistry
4. Physical Chemistry, by P. W. Atkins

Reference Books:

1. O.G. Palanna, **"Engineering Chemistry"**.
2. **"Wiley Engineering Chemistry"**

(Note: Mode of Delivery: 1:Black Board 2:PPT 3:Video 4:Demo/Hands-on)

INTERNAL/ASSIGNMENT/QUIZ SCHEDULE

TEST and QUIZ		COs and Portions Covered		ASSIGNMENT	
Test# and Quiz#	DATE	CO	Modules	Assignment#	DATE
T1 & Q1	11/01/23	CO3 & CO4	3 & 4	A1	5/1/23
T2 & Q2	08/3/23	CO4 & CO5	4 & 5	A2	08/3/23
T3 & Q3	6/4/23	CO1 & CO2	1 & 2	A3	

SUMMARY

Signatures With Date	Faculty: Dr. M N Manjunath	Total #HOURS	Allotted	Taken
	HOD:		50	50
Remarks	Syllabus completed as per plan			

ENCLOSURES

1. **Syllabus**
2. **CO Attainment**
3. **Gap Analysis**
4. **Special lectures/talks arranged if any**

Feedback by PAC

100% Results in the subject.

Faculty **Course coordinator** **PAC** **HOD**

|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust ®

SJC INSTITUTE OF TECHNOLOGY

Estd: 1986

Chickballapur – 562 101

Department of Chemistry

QUESTION BANK

SUBJECT TITLE	**Applied Chemistry for CSE Stream**		
SUBJECT TYPE	**CORE**		
SUBJECT CODE	**BCHES102**		
ACADEMIC YEAR	**2023-24 (Even-Semester)**	**BATCH**	**2023-2027**
SCHEME	**CBCS scheme (Autonomous) (Effective from the academic year 2024-25)**		
SEMESTER	**I Sem**		
FACULTY NAME and DESIGNATION	**Dr. Sreenivasa K /Dr. Chandrashekara K N, Professor/ Assistant professor**		

Module -1			
Q. No.	*Questions*	*Bloom's LL*	*COs*
1	Define the following: Sensor, transducer and actuator.	L1	CO1
2	Define electrochemical sensors ,thermometric and conductometric sensors.	L1	CO1
3	Name the key components in a lithium-ion battery.	L1	CO1
4	Explain the principle and working of electrochemical sensors and mention the applications of electrochemical sensors.	L2	CO1
5	Discuss the principle, working and applications of Conductometric and thermometric sensors.	L2	CO1
6	Explain how the energy storage capacity of a lithium-ion battery is calculated based on its construction and working principle	L2	CO1
7	Describe the process of determining dissolved oxygen (DO) using sensors in an industrial water treatment plant.	L3	CO1
8	How do electrochemical sensors detect SOx and NOx gases?	L3	CO1
9	Break down the steps involved in the operation of a sodium-ion battery.	L4	CO1
10	Assess the effectiveness of using disposable sensors for determining the concentration of Vitamin-C.	L5	CO1

Module -2			
Q. No.	*Questions*	*Bloom's LL*	*COs*

1	What is QLED? Mention any four properties and applications of QLED.	L1	CO2
2	Mention any four properties and applications of liquid crystals.	L1	CO2
3	What does OLED stand for? Mention the properties and applications .	L1	CO2
4	What are Memory Devices? Explain the Classification of electronic memory devices with examples	L2	CO2
5	Explain the types of organic memory devices by taking p- type and n-type semiconducting materials.	L2	CO2
6	Explain any four properties and applications of Polythiophenes (P3HT) suitable for optoelectronic devices.	L2	CO2
7	Define photoactive and electroactive materials. Apply this knowledge by explaining their working principles in display systems	L3	CO2
8	Explain any four properties of light-emitting materials – Poly [9-vinylcarbazole] (PVK) that make it suitable for optoelectronic devices.	L3	CO2
9	Define an optoelectronic device. Analyze its working principle by breaking down the key components and processes involved.	L4	CO2
10	Evaluate the working principle of Liquid Crystal Display (LCD)..	L5	CO2

Module -3

Q. No.	*Questions*	*Bloom's LL*	*COs*
1	Define a reference electrode and list its functions.	L1	CO3
2	List the different types of corrosion based on the electrochemical theory.	L1	CO3
3	What is galvanization, and how does it prevent corrosion?	L1	CO3
4	What are reference electrodes? Explain the construction, working and application of Calomel electrode.	L2	CO3
5	Explain the construction and working of ion selective electrode and how it can be used for the determination of pH of a solution.	L2	CO3
6	Explain the process of cathodic protection using the impressed current method.	L2	CO3
7	Define metallic corrosion. Describe the electrochemical theory of corrosion taking iron as an example.	L3	CO3
8	What is CPR? A thick brass sheet of area 300 square inch is exposed to moist air. After 1 yearsof period, it was found to experience a weight loss 475 g due to corrosion. If the density of brass is 8.73 g/cm3. Calculate CPR in mpy and mmpy.	L3	CO3
9	Differentiate between differential metal corrosion **and** water-line corrosion, and discuss their respective causes..	L4	CO3
10	Design a comprehensive **corrosion control** plan for an offshore oil rig, combining **galvanization, cathodic protection**, and modern computational methods.	L5	CO3

Module -4

Q.	*Questions*	*Bloom's*	*COs*

No.		LL	
1	What is Green Fuel (Hydrogen fuel)? Mention the advantages of green fuel.	L1	CO4
2	What is the number average and weight average molecular weight in polymers?	L1	CO4
3	What is PV cell. Mention the advantages and disadvantages.	L1	CO4
4	Describe the working principle of quantum dot sensitized solar cells.	L2	CO4
5	Explain the working principle of a **solar photovoltaic cell**.	L2	CO4
6	Explain the generation of hydrogen by photocatalytic water splitting & proton exchange membrane electrolysis.	L2	CO4
7	In a sample of a polymer, 20% molecules have molecular mass 15000 g/mol, 35% molecules have molecular mass 25000 g/mol, and remaining molecules have molecular mass 20000 g /mol, calculate the number average and weight average molecular mass of the polymer, Calculate PDI and comment on it.	L3	CO4
8	Show how Kevlar fiber composites are used in protective gear and discuss their unique properties.	L3	CO4
9	Differentiate between the structural properties of Kevlar fibers and graphene oxide, and explain how these differences affect their commercial applications.	L4	CO4
10	Discuss the role of conducting polymers in reducing the cost of electronic devices and increasing energy efficiency.	L5	CO4

Module -5

Q. No.	Questions	Bloom's LL	COs
1	Define E-Waste. List the sources and composition of e-waste.	L1	CO5
2	What are the toxic materials toxic materials commonly found in electronic and electrical products.	L1	CO5
3	Recall the major steps involved in direct recycling of e-waste.	L1	CO5
4	Explain the significance of the pyrometallurgical method in recycling e-waste.	L2	CO5
5	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.	L2	CO5
6	Discuss the following:(i) Pyrometallurgy (ii) Hydrometallurgy	L2	CO5
7	Illustrate **the** extraction of gold from e-waste using a metallurgical method.	L3	CO5
8	Show how the hydrometallurgical method can be applied to recover valuable metals from mobile phone waste.	L3	CO5
9	Differentiate between the roles of producers, consumers, recyclers, and statutory bodies in e-waste management.	L4	CO5
10	Evaluate the benefits and limitations of using artificial intelligence in e-waste management systems.	L5	CO5

|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust ®

SJC INSTITUTE OF TECHNOLOGY

Chickballapur – 562 101

Estd: 1986

Department of Chemistry
ASSIGNMENT

SUBJECT TITLE	**Chemistry for CSE stream**		
SUBJECT TYPE	**CORE / ELECTIVE**		
SUBJECT CODE	**BCHES202**		
ACADEMIC YEAR	**2023-2024 (EVEN Semester)**	**BATCH**	**2023-2027**
SCHEME	**CBCS scheme (Effective from the academic year 2022-23)**		
SEMESTER	**II/ Sem**		
FACULTY NAME and DESIGNATION	**Gayithri V , Assistant Professor**		

Module -1

Q. No.	*Questions*	*Bloom's LL*	*COs*
1	**How do you use the electrochemical sensor for detection of various kinds of pollutants in the sample?**	L3	CO1
2	**Explain the construction and working of QDSSC.**	L3	CO1
3	**Give the construction and working of calomel electrode. Mention its uses.**	L3	CO1
4	**What are the special properties of lithium that makes it advantages to use as an electrode material? Write the construction, charging and discharging reactions of lithium ion battery.**	L4&L5	CO1
5	**How do you estimate the presence of pesticide and Biomolecules in the sample .**	L4&L5	CO1

Module -2

Q. No.	*Questions*	*Blooms LL*	*COs*
1	**Compare the organic memory devices by taking p- type and n-type semiconducting materials.**	L3	CO_2
2	**Explain the working principle of Optoelectronic device.**	L3	CO_2
3	**Discuss the working of Liquid Crystal Display.**	L3	CO_2
4	**Discuss the use of Polyimide Polymeric material for Organic memory device.**	L4&L5	CO_2
5	**Explain the Classification of electronic memory devices with examples**	L4&L5	CO_2

Module -3

Q. No.	*Questions*	*Bloom's LL*	*COs*

1	What is CPR? A thick brass sheet of area 400 inch 2 is exposed to moist air. After 2 yearsof period, it was found to experience a weight loss 375 g due to corrosion. If the density of brass is 8.73 g/cm3. Calculate CPR in mpy and mmpy	L3	CO_3
2	Define concentration cell. Emf of the cell $Ag/AgNO_3(0.001M)$ // $AgNO_3(xM)$ /Ag is 0.0659 V at 298K. Write the cell representation, cell reactions and calculate the value ofx.	L3	CO_3
3	With a neat sketch explain the principle, instrumentation and working of potentiometry.	L3	CO_3
4	How do you control the corrosion of the metals and alloys?	L4&L5	CO_3
5	How do you construct the electrochemical cell for determination of pH of a solution.	L4&L5	CO_3

Module -4

Q. No.	*Questions*	*Bloom's LL*	*COs*
1	Define number average and weight average molecular weight. A polydisperse sample of polystyrene is prepared by mixing three monodisperse samples in the following proportions. 1g of 10000 molecular weight, 2g of 50000 molecular weight and 2g of 100000 molecular weight. Determine number average and weight average molecular Weight. Find the index of polydispersity	L3	CO_4
2	Describe the generation of hydrogen by water electrolysis with a neat labeled diagram.	L3	CO_4
3	With neat sketch Explain the construction and working of photovoltaic cells.	L3	CO_4
4	Discuss the conduction mechanism in Polyacetylene through oxidative and reductive doping technique.	L4&L5	CO_4
5	How do you defend the green energy sources more reliable than the fossil fuels?	L4&L5	CO_4

Module -5

Q. No.	*Questions*	*Bloom's LL*	*COs*
1	Discuss the causes, effects and disposable methods of E- waste.	L3	CO_5
2	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.	L3	CO_5
3	Describe the theory and instrumentation and applications of flame photometer.	L3	CO_5
4	Explain the roles and responsibilities of Producers, consumers, recyclers, and statutory bodies in managing the e-waste.	L4&L5	CO_5
5	How do you characterize the e-waste materials?	L4&L5	CO_5

Note:

1. Questions shall be framed by consolidating comprehensively from the following sources
   - Exercise problems of text books/ references
   - Previous year question VTU exam Question paper. (Mark the year/exam beside the question)
   - Questions by Experts during Interview/Academic Audit
   - Internet sources/ other Universities examination question papers.
   - Own / experience.
2. Questions shall follow all the Bloom's learning levels with appropriate action verbs
3. There shall be a total of 25 questions considering 5 questions from each module, of which, 3 questions at L3, 2 questions each at L4/L5.
4. Ensure the coverage of all COs
5. Rubrics to be specified for all assignment questions.

II Jai Sri Gurudev II

S J C INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CHEMISTRY

TUTORIAL -I

Subject: Applied Chemistry (For CSE Stream) **Subject Code: BCHES202**

Sl no	Questions	CO	Level
1.	Define the following: Sensor, transducer and actuator.	CO1	L1
2.	What are electrochemical sensors? Explain the principle and working of electrochemical sensors and mention the applications of electrochemical sensors.	CO1	L2
3.	Discuss the working principle and applications of Conductometric sensors.	CO1	L2
4.	Discuss the working principle and applications of optical sensors.	CO1	L2
5.	Explain electrochemical sensors application in the measurement of Dissolved Oxygen (DO)	CO1	L2
6.	Explain the detection of pharmaceutical pollutant diclofenac using electrochemical sensor with electro-oxidation reactions.	CO1	L2
7.	Explain the detection of hydrocarbon pollutant 1-hydroxy pyrene using electrochemical sensor with electro-oxidation reactions.	CO1	L2
8.	Discuss the working principle of electrochemical gas sensors for the detection of SOx and NOx	CO1	L2
9.	What are disposable sensors? Mention the advantages of disposable sensors.	CO1	L1
10.	Discuss the detection of a bio-molecule ascorbic acid using disposable sensor and write the electro oxidation reaction.	CO1	L2
11.	Explain the detection of Herbicide-Glyphosate with reactions	CO1	L2
12.	What is battery? Give the classification of batteries with example	CO1	L2
13.	Describe the construction and working of Lithium-ion battery. Mention its applications.	CO1	L2
14.	Describe the construction and working of sodium –ion battery. Mention its applications	CO1	L2
15.	What are Quantum Dot Sensitized Solar Cells? Explain its working Principle. Mention its Properties and Applications.	CO1	L2
16.	What are Memory Devices? Explain the Classification of electronic memory devices with examples	CO2	L2
17.	Explain the types of organic memory devices by taking p- type and n-type semiconducting materials.	CO2	L2
18.	. Define Optoelectronic device. Explain the principle of Optoelectronic device.	CO2	L2
19.	What are nanomaterials? Write the any four properties and applications of Silicon Nano Crystals for Optoelectronic devices.	CO2	L2
20.	Write any four properties and applications of light absorbing material - Polythiophenes (P3HT) suitable for optoelectronic devices.	CO2	L2
21.	Write any four properties and applications of Light emitting materials – Poly [9- vinylcarbazole] (PVK)] suitable for optoelectronic devices.	CO2	L2

II Jai Sri Gurudev II

S J C INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CHEMISTRY

TUTORIAL -II

Subject: Applied Chemistry (For CSE Stream) **Subject Code: BCHES202**

Sl no	Questions	CO	Level
1.	What is liquid crystal? Explain the classification of liquid crystals.	CO2	L2
2.	Mention the properties and applications of Liquid crystals.	CO2	L2
3.	Discuss the working principle of liquid crystal display.	CO2	L2
4.	Define OLED. Mention the properties and applications of OLED.	CO2	L2
5.	Define QLED. Mention the properties and applications of QLED.	CO2	L2
6.	Define corrosion. Explain the electrochemical theory of corrosion by taking Iron as an example.	CO3	L2
7.	Explain the following types of corrosion with suitable examples. a) Differential metal corrosion. b) Differential aeration corrosion.	CO3	L2
8.	Describe the waterline corrosion and pitting corrosion with neat diagram.	CO3	L2
9.	Explain the galvanization process with neat diagram.	CO3	L2
10.	What is anodizing? Explain the process of Anodizing of Aluminium.	CO3	L2
11.	What is cathodic protection? Explain the Sacrificial anode method of corrosion control.	CO3	L2
12.	What is corrosion penetration rate? Calculate the CPR in both mpy and mmpy for a thick steel sheet of area 200 $inch^2$ which experiences a weight loss of 585g after one year. (Density of steel=7.9g/cm^3).	CO3	L3
13.	A metal iron plate was found in a vessel containing acidic media, it was estimated that the original area was 30 $inch^2$that approximately 1.1 kg had corroded. Assuming a corrosion penetration rate of 400mpy for this iron in acidic, calculate time in years, density of iron 7.87g/ cm^3.	CO3	L3
14.	Calculate the CPR in both mpy and mmpy for a thick steel sheet of area 130 $inch^2$ which experiences a weight loss of 625g after one year. (Density of steel=7.9g/cm^3).	CO3	L3
15.	A metal iron plate was found in a vessel containing acidic media, it was estimated that the original area was 45 $inch^2$that approximately 1.3 kg had corroded. Assuming a corrosion penetration rate of 500 mpy for this iron in acidic, calculate time in years, density of iron 7.87g/ cm^3.	CO3	L3
16.	What is reference electrode? Describe the construction and working of calomel electrode.	CO3	L2
17.	What is ion selective electrode? Describe the construction and working of glass electrode.	CO3	L2
18.	Explain the determination of pH of a solution using glass electrode.	CO3	L2
19.	What is concentration cell? Derive an emf equation for a concentration cell.	CO2	L2
20.	A concentration cell is constructed by immersing two Silver electrodes in 0.05M and 1.0M Silver nitrite solutions at 298 K. Write the cell representation, cell reactions and calculate the emf of the cell.	CO2	L3
21.	The emf of the cell $Cd/CdSO_4$ (0.0093 M)// $CdSO_4$ (X M)/ Cd is 0.03 V at 298K. Find the value of X	CO2	L3
22.	The emf of the cell $Cu/CuSO_4$ (X M)// $CuSO_4$ (1.0 M)/ Cu is 0.0295 V at 298 K. Find the value of X	CO3	L3

23.	The emf of the cell $Ag/AgNO_3(0.1M)//AgNO_3(X\ M)/Ag$ is .80 Vat 298K. Find the value of X	CO3	L3
24.	Explain the theory, instrumentation and application of Conductometry.	CO3	L3
25.	Explain the theory, instrumentation and application of potentiometry.	CO3	L3

Assignment questions:

Sl no	Questions	CO	Levels
1	Describe the working principle of liquid crystal display. Mention its properties and applications	CO2	L2
2	A metal iron plate was found in a vessel containing acidic media, it was estimated that the original area was 20 $inch^2$ that approximately 1.2 kg had corroded. Assuming a corrosion penetration rate of 400mpy for this iron in acidic, calculate time in years, density of iron 7.87g/ cm^3	CO3	L3
3	How do you assess the Fe metal undergoes corrosion when exposed to the environment.	CO3	L4
4	How do you construct the calomel electrode, mention its working principle	CO3	L4
5	How do you propose the different methods for controlling the corrosion?	CO3	L5

II Jai Sri Gurudev II

S J C INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CHEMISTRY

TUTORIAL -III

Subject: Applied Chemistry (For CSE Stream) **Subject Code: BCHES202**

Sl no	Questions	CO	Level
1.	Define conducting polymers? Explain the synthesis of poly acetylene mention its applications.	CO4	L2
2.	Discuss the conduction mechanism in Polyacetylene through oxidative and reductive doping technique.	CO4	L2
3.	Explain the preparation, properties, and commercial applications of graphene oxide.	CO4	L2
4.	Explain the preparation, properties, and commercial applications of Kevlar Fiber.	CO4	L2
5.	What is photovoltaic cell? Explain the construction and working of photovoltaic cells. Mention the advantages and Disadvantages.	CO4	L2
6.	What is Green Fuel (Hydrogen fuel)? Mention the properties and advantages of hydrogen green fuel.	CO4	L2
7.	Describe the generation of hydrogen by using alkaline water and proton ion exchange membrane electrolysis of water with a neat labeled diagram.	CO4	L2
8.	In a sample of a polymer, 30% molecules have molecular mass 15000 g/mol, 40% molecules have molecular mass 25000 g/mol, and remaining molecules have molecular mass 20000 g /mol, calculate the number average and weight average molecular mass of the polymer, Calculate PDI and comment on it.	CO4	L3
9.	Define number average and weight average molecular weight. A polydisperse sample ofpolystyrene is prepared by mixing three monodisperse samples in the following proportions. 1g of 10000 molecular weight, 2g of 50000 molecular weight and 2g of 100000 molecular weight. Determine number average and weight average molecular.	CO4	L3
10.	Define E-Waste. Mention the sources and composition of e-waste.	CO5	L2
11.	Mention the sources of e-waste and explain the need for e-waste management	CO5	L2
12.	Briefly discuss the various steps involved in recycling of e-waste. (all the three steps)	CO5	L2
13.	Explain the steps involved in extraction of gold from e-waste.	CO5	L2
14.	Explain the ill effects of toxic materials used in manufacturing electrical and electronic Products.	CO5	L2
15.	Discuss the following: (i) Pyrometallurgy (ii) Hydrometallurgy	CO5	L2
16.	Write a brief note on role of stakeholders for example; producers, consumers, recyclers and statutory bodies.	CO5	L2

'Internal Test Question paper format- CBCS Scheme

Name of the staff/s: Prof. GAYITHRI V
Date: 29/4/24 Signature:

Reviewer's Signature:

S J C INSTITUTE OF TECHNOLOGY
DEPARTMENT OF CHEMISTRY

Semester: II **Test: I** **Sections: CSE A B C**

Subject Name & Code: Applied Chemistry for CSE stream & BCHEC202

Duration: 90 minutes Max Marks: 40

Note:
i. Answer four full questions, choosing ONE full question from part A, B, C, D & E
ii. Part F is compulsory Answer all the MCQ's.

Q No		Marks	CO	Levels
	PART-A			
	a) What is battery? Give the classification of batteries with example	04	CO1	L1
	b) What are disposable sensors? Mention the advantages of disposable sensors.	04	CO1	L2
	OR			
2	a) Define the following: Sensor, transducer and actuator.	04	CO1	L1
	b) Discuss the working principle of electrochemical gas sensors for the detection of NOx.	04	CO1	L2
	PART-B			
3	a) What are electrochemical sensors? Explain the working principle of electrochemical sensors and mention its applications.	04	CO1	L2
	b) Explain electrochemical sensors application in the measurement of Dissolved Oxygen (DO).	04	CO1	L2
	OR			
4	a) Discuss the working principle and applications of Conductometric sensors.	04	CO1	L2
	b) Explain the construction & working of Na ion Battery. Mention its applications.	04	CO1	L2
	PART-C			
5	a) Explain the detection of a bio-molecule ascorbic acid using disposable sensor and write the electro oxidation reaction.	04	CO1	L2
	b) Explain the construction & working of Li ion Battery. Mention its applications.	04	CO1	L2
	OR			
6	a) What are Quantum Dot Sensitized Solar Cells? Explain its working Principle.	04	CO1	L2
	b) Explain the detection of hydrocarbon pollutant 1-hydroxy pyrene using electrochemical sensor with electro-oxidation reactions.	04	CO1	L2
	PART-D			
7	a) What are Memory Devices? Explain the Classification of electronic memory devices with examples.	08	CO2	L2
	OR			
8	a) What are organic memory devices? Explain the types of organic memory devices by taking p- type and n-type semiconducting materials.	04	CO2	L2
	b) Define Optoelectronic device. Explain the principle of Optoelectronic device.	04	CO2	L2
	PART –E			

	PART –E			
9	a) Write any four properties and applications of Light emitting materials – Poly [9-vinylcarbazole] (PVK)] suitable for optoelectronic devices.	04	CO2	L2
	b) What are nanomaterials? Write any four properties and applications of Silicon nano crystals for suitable for optoelectronic devices.	04	CO2	L2
	OR			
10	a) Define photoactive and electroactive materials? Describe its working principle in display system.	04	CO2	L2
	b) Write any four properties, applications of light absorbing material - Polythiophenes (P_3HT) suitable for optoelectronic devices.	04	CO2	L2
	Prepared by: Gayathri Reviewed by: Approved by:			

SJCIT

DEPARTMENT: CHEMISTRY

Scheme & Solutions- TEST- I **Date: 29.04.24**

Semester: II **Subject Title: Applied Chemistry (CSE stream)**

Subject Code: BCHES202

Question Number	Solution	Marks Allocated
	Part A	
1 a)	Battery Definition ------	1M
	classification - i) primary with example	1M
	ii) secondary with example	1M
	iii) Reserve battery with ex	1M
b)	Disposable sensor definition -------	1M
	Any three advantages ------	3M
	(or)	
2 a)	Definition of i) sensors with example ---	2M
	ii) Transducer and actuator --	2M
b)	Electrochemical gas sensors introduction ---	1M
	Explanation with Diagram ----	3M
	Part B	
3 a)	Electrochemical sensors meaning ----	1M
	working principle, explanation ---	3M
b)	construction of electrochemical sensor ---	1M
	Diagram ---------	1M
	Reactions :- oxidation :- $2Zn \rightarrow 2Zn^{2+} + 4e^{\ominus}$	1M
	Reduction :- $2H_2O + O_2 + 4e^{\ominus} \rightarrow 4OH^{\ominus}$	1M
	(or)	

Subject Title: Applied Chemistry (CSE stream) **Subject Code: BCHES202**

Question Number		Solution	Marks Allocated
4	a)	Explanation of working principle (ohm's law)	2M
		Diagram	1M
		Any two applications	1M
	b)	Construction of Na-ion Battery	1M
		Diagram	1M
		Rxns $Na_xC_6 + Na_{1-x}MO_2 \underset{C}{\overset{D}{\rightleftharpoons}} NaMO_2 + 6C$	1M
		Any two applications	1M.
		Part C	
5	a)	working principle Explanation (AA)	3M
		Electro oxidation reaction	1M
	b)	construction of Li-ion Battery	1M
		Diagram	1M
		Rxns $LiC_6 + MO_2 \underset{C}{\overset{D}{\rightleftharpoons}} Li^+MO_2 + 6C$	1M
		Any two applications	1M
		(or)	
6	a)	Definition of Quantum dot sensitized Solar cells	1M
		Diagram	1M
		Explanation - working principle	2M
	b)	Explanation, working principle	3M
		Electrooxidation reaction	1M

Subject Title: Applied Chemistry (CSE stream) **Subject Code: BCHES202**

Question Number	Solution	Marks Allocated
	part-1)	
7 a)	memory device meaning and explanation	
	1) Transistor type electronic memory device	2M
	2) Resistor type electronic memory device	2M
	3) capacitor type electronic memory - " -	2M
	4) charge transfer effect - - -	2M
	(or)	
8 a)	organic memory device - meaning - - - - - -	1M
	Types of organic memory device - - -	3M
	P-type & n-type	
b)	optoelectronic device - definition - - - -	1M
	working principle, Diagram - - - -	3M
	part-E	
9)		
a)	Any four properties of PVK - - - -	2M
	Any four Applications of PVK - - - -	2M
b)	Nanomaterials - meaning - - - - - - -	1M
	properties - } Any four each - -	3M
	Applications - }	
	(or)	

Subject Title: Applied Chemistry (CSE stream) **Subject Code: BCHES202**

Question Number	Solution	Marks Allocated
10 a)	photoactive & electroactive definitions — —	1M
	working principle in display system —	2M
	diagram — — — — — — —	1M
b)	P_3HT - Any four properties — — —	2M
	- Any four Applications — — —	2M
	— ☆ ☆ ☆ —	

`Internal Test Question paper format- CBCS Scheme

Name of the staff/s: Prof. GAYITHRI V
Date: Signature:

Reviewer's Signature:

S J C INSTITUTE OF TECHNOLOGY
DEPARTMENT OF CHEMISTRY

Semester: II **Test: II** **Sections: CSE A B C**

Subject Name & Code: Applied Chemistry for CSE stream & BCHEC202

Duration: 90 minutes Max Marks: 40

Note:
i. Answer four full questions, choosing ONE full question from part A, B, C, D & E
ii. Part F is compulsory Answer all the MCQ's.

Q No		Marks	CO	Levels
	PART-A			
1	a) Define QLED. Mention any four properties and applications of QLED.	04	CO2	L1
	b) Define corrosion. Explain the electrochemical theory of corrosion by taking Iron as an example.	04	CO3	L2
	OR			
2	a) What is liquid crystal? Explain the classification of liquid crystals.	04	CO2	L1
	b) Explain Differential metal corrosion of with suitable examples.	04	CO3	L2
	PART-B			
3	a) Define OLED. Mention any four properties and applications of OLED.	04	CO2	L2
	b) Explain Differential aeration corrosion with suitable examples	04	CO3	L2
	OR			
4	a) Discuss the working principle of liquid crystal display.	04	CO2	L2
	b) Describe the pitting corrosion with neat diagram.	04	CO3	L2
	PART-C			
5	a) Explain the galvanization process with neat diagram.	04	CO3	L2
	b) What is cathodic protection? Explain the Sacrificial anode method of corrosion	04	CO3	L2
	OR			
6	a) What is concentration cell? Derive an emf equation for a concentration cell.	04	CO3	L2
	b) What is ion selective electrode? Describe the construction and working of glass electrode	04	CO3	L2
	PART-D			
7	a) What is corrosion penetration rate? Calculate the CPR in both mpy and mmpy for a thick steel sheet of area 200 inch^2 which experiences a weight loss of 585g after one year. (Density of steel=7.9g/cm^3).	04	CO3	L3
	b) What is reference electrode? Describe the construction and working of calomel electrode.	04	CO3	L2
	OR			
8	a) A concentration cell is constructed by immersing two Silver electrodes in 0.05M and 1.0M Silver nitrite solutions at 298 K. Write the cell representation, cell reactions and calculate the emf of the cell.	04	CO3	L3

	b) Explain the determination of pH of a solution using glass electrode.	04	CO3	L2
	PART –E			
9	a) Explain the theory, instrumentation and application of Conductometry.	04	CO3	L2
	b) A metal iron plate was found in a vessel containing acidic media, it was estimated that the original area was 30inch^2 that approximately 100g had corroded. Assuming a corrosion penetration rate of 500 mpy for this iron in acidic medium, calculate time in years, density of iron 7.87g/ cm^3.	04	CO3	L3
	OR			
10	a) What is anodizing? Explain the process of Anodizing of Aluminium.	04	CO3	L2
	b) The emf of the cell Cd/$CdSO_4$ (0.0093 M)//$CdSO_4$ (X M)/ Cd is 0.03 V at 298K. Find the value of X	04	CO3	L3
	Prepared by: **Reviewed by:** **Approved by:**			

DEPARTMENT: CHEMISTRY

Scheme & Solutions - TEST- II **Date: 27-05-2023**

Semester: II **Subject Title: Applied Chemistry for CSE stream** **Subject Code:** BCHES202

Question Number	Solution	Marks Allocated
	Part-A	
(1) a)	Definition of QLED	1M
	Any four properties and Any four applications	3M
(b)	Definition of corrosion	1M
	Anode Rxn :- $Fe \longrightarrow Fe^{2+} + 2e^{\ominus}$	1M
	cathode Rxn :- $O_2 + 2H_2O + 4e^{\ominus} \longrightarrow 4OH^{\ominus}$	1M
	final Rxn : $2Fe^{2+} + 4OH^{\ominus} \longrightarrow 2Fe(OH)_2$	1M
	$4Fe(OH)_2 + O_2 + 2H_2O \longrightarrow 2[Fe_2O_3 \cdot 3H_2O]$	1M
	(OR)	
(2) a)	Definition of OLED - - - - - - -	1M
	Any four properties and Any four applications	3M
b)	explanation of differential aeration corrosion	2M
	construction and Reactions	2M
	Part-B	
(3) a)	Definition of liquid crystals - - - - - - -	1M
	classification 1) thermotropic liquid crystals a) Nematic b) Smectic c) cholesteric d) discotic liquid crystals	2M
	2) Lyotropic liquid crystals	1M
b)	explanation, construction and Reactions	4M

Subject Title: Applied Chemistry **Subject Code: BCHES202**

Question Number	Solution	Marks Allocated
(4) a)	Explanation of working principle of LCD construction (or)	3M 1M
b)	Explanation of pitting corrosion — — — construction and reactions — — —	2M 2M
(5) a)	part c Explanation of process of galvanization steps diagram — — — — —	3M 1M
b)	Definition for cathodic protection — — — Explanation of sacrificial anode methode Diagram and example — — —	1M 2M 1M
	(or)	
(6) a)	Definition of concentration cell — — — Derivation of an emf eqn $E_{cell} = \frac{0.05}{n} \log\left[\frac{C_2}{C_1}\right]$ — — — — $Cu/Cu^{2+}(C_1)//Cu^{2+}(C_2)/Cu$ — — — — anode:- $Cu \longrightarrow Cu^{2+} + 2e^{\ominus}$ cathode:- $Cu^{2+} + 2e^{\ominus} \longrightarrow Cu$ } — — —	1M 1M 1M 1M
(5) b)	Definition of ion selective electrode — — diagram - with construction explanation - cell representation — — — — —	1M 1M 1M

Subject Title: Applied Chemistry **Subject Code: BCHES202**

Question Number	Solution	Marks Allocated
	$E_G = E_b + E_{ag|agcl} + E_{asy}$	
	$E_G = L^1 - 0.059 \text{ pH}$ - - - - -	1M
	part-D	
(7) a)	$CPR = \frac{K \times W}{D \times A \times T}$ in mpy and mmpy	2M
	i) $\frac{534 \times 88 \times 1000}{7.9 \times 200 \times 365 \times 24} = 22.57$ mpy	1M
	ii) $\frac{87.6 \times 88 \times 1000}{7.9 \times 200 \times 6.45 \times 365 \times 24} = 0.574$ mmpy	1M
b)	Definition for reference electrode - - - -	1M
	Diagram with construction & explanation - -	1M
	Acts as Anode $2Hg + 2Cl \rightarrow Hg_2Cl_2 + 2e^{\ominus}$	1M
	— " — Cathode $Hg_2Cl_2 + 2e^{\ominus} \rightarrow 2Hg + 2Cl$	
	working of E_{cell} - - - - - - - - -	1M
	(or)	
(8) a)	$Ag^{+1} \mid AgNO_3(0.05M) \parallel AgNO_3(1.0M) \mid Ag^{+1}$ - - - -	1M
	cell representation	
	cell Rxns :- Anode :- $Ag \rightarrow Ag^{+1} + 1e^{\ominus}$	1M
	Cathode :- $Ag^{+1} + 1e^{\ominus} \rightarrow Ag$	
	$E_{cell} = \frac{0.059}{n} \log \frac{C_2}{C_1} \Rightarrow \frac{0.059}{n} \log \left[\frac{1}{0.05}\right] = 0.076$ V	2M
b)	construction and explanation - - - -	1M
	cell representation - - - - - - - -	1M
	$pH = \frac{E^{\circ}_G - E_{SCE} - E_{cell}}{0.059}$ - - - - -	2M

DEPARTMENT: CHEMISTRY

Scheme & Solutions - TEST- II **Date: 27-05-2023**

Semester: II **Subject Title: Applied Chemistry for CSE stream** **Subject Code:** BCHES202

Question Number	Solution	Marks Allocated
(9) a)	Part-E explanation of theory, instrumentation and construction - - - - - - - -	2M
	Rxn :- $CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$ - -	1M
	diagram, middle of graph - - - - - -	1M
b)	$CPR = \frac{K \times W}{D \times A \times T}$; $T = \frac{K \times W}{D \times A \times CPR}$ - - -	2M
	$T = \frac{534 \times 100 \times 1000}{7.87 \times 30 \times 500} = \frac{53400000}{118050} = 452.35$ hrs	1M
	$T = \frac{452.35}{365 \times 24} = 0.508$ years - -	1M
	(or)	
10) a)	Definition for Anodizing - - - -	1M
	Explanation and construction - - - - -	1M
	Rxns :- Anode :- $4Al + 6H_2O \longrightarrow 2Al_2O_3 + 12H^{\oplus} + 12e^{\ominus}$	1M
	cathode :- $[2H^{\oplus} + 2e^{\ominus} \longrightarrow H_2] \times 6$	1M
b)	$E_{cell} = \frac{0.0591}{n} \log \frac{C_2}{C_1} \Rightarrow \log \frac{C_2}{C_1} = \frac{E_{cell} \times n}{0.0591}$	2M
	$\frac{C_2(x)}{0.0093} = \text{Anti.log} \frac{0.03 \times 2}{0.0591} \Rightarrow$	1M
	$\frac{x}{0.0093} = 10.3561 \Rightarrow \boxed{x = 0.09631M}$ - -	1M

`Internal Test Question paper format- CBCS Scheme

Name of the staff/s: Prof. GAYITHRI V
Date: Signature: gayithri

Reviewer's Signature:

S J C INSTITUTE OF TECHNOLOGY
DEPARTMENT OF CHEMISTRY

Semester: II **Test: III** **Sections: CSE A B C**

Subject Name & Code: Applied Chemistry for CSE stream & BCHEC202

Duration: 90 minutes Max Marks: 40

Note:

i. Answer four full questions, choosing ONE full question from part A, B, C, D & E

ii. Part F is compulsory Answer all the MCQ's.

Question Number		Marks	CO	Levels
	PART-A			
1	a) Write a brief note on Number average and Weight average molecular mass of polymers.	04	CO4	L2
	b) In a sample of a polymer, 100 molecules have molecular mass 25000g/mol, 150 molecules have molecular mass 20000 g/mol, and 50 molecules have molecular mass 15000g /mol, calculate the number average and weight average molecular mass of the polymer, Calculate PDI and comment on it.	04	CO4	L3
	OR			
2	a) What are conducting polymers? Explain the conduction mechanism in polyacetylene.	04	CO4	L2
	b) In a sample of a polymer, 30% molecules have molecular mass 15000 g/mol, 40% molecules have molecular mass 25000 g/mol, and remaining molecules have molecular mass 20000 g /mol, calculate the number average and weight average molecular mass of the polymer, Calculate PDI and comment on it.	04	CO4	L3
	PART-B			
3	Define polymer composite? Give the synthesis, properties and application of Kevlar fibre.	08	CO4	L2
	OR			
4	a) What is Green Fuel? Mention the advantages of green fuel. b) Describe the generation of hydrogen by Alkaline water electrolysis with a neat labeled diagram.	08	CO4	L2
	PART-C			
5	Define photovoltaic cell? Explain the construction and working of photovoltaic cells. Mention its advantages and disadvantages.	08	CO4	L2
	OR			
6	Explain the synthesis, properties, and commercial applications of graphene oxide.	08	CO4	L2
	PART-D			
7.	Explain the following a) Extraction of gold metal from e-waste by hydrometallurgical method. b) Need of e-waste management.	08	CO5	L2
	OR			
8.	Explain the roles and responsibilities of following stake holder in e-waste management. a) Government Statutory bodies b) Producers c) Consumers d)Recyclers	08	CO5	L2

	PART –E			
9	Explain the following a) General methods of Pyrometallurgy of e-waste management. b) Direct recycling of e-waste.	08	CO5	L2
	OR			
10	a) What is e-waste? Mention its sources and composition. b) Explain characteristics and ill effects of e-waste.	08	CO5	L2

Prepared by: **Reviewed by:** **Approved by:**

DEPARTMENT: CHEMISTRY

Scheme & Solutions - TEST- III **Date: 27-06-2023**

Semester: II **Subject Title: Applied Chemistry for CSE stream** **Subject Code:** BCHES202

Question Number	Solution	Marks Allocated
① a)	Part-A Defination of Number average & weight average	2M
	$\bar{M}_n = \frac{\sum N_i M_i}{\sum N_i}$ & $\bar{M}_w = \frac{\sum N_i M_i^2}{\sum N_i M_i}$	2M
b)	$\bar{M}_n = \frac{N_1M_1 + N_2M_2 + N_3M_3}{N_1+N_2+N_3} = \frac{100 \times 25000 + 150 \times 20 \times 10^3 + 450 \times 15 \times 10^3}{100+150+50}$	
	$\bar{M}_n = \frac{6250000}{300} = 20833.33$ g/mol	2M
	$\bar{M}_w = \frac{N_1M_1^2 + N_2M_2^2 + N_3M_3^2}{N_1M_1 + N_2M_2 + N_3M_3} =$	
	$= \frac{100 \times (25000)^2 + 150 \times (20000)^2 + 50 \times (15000)^2}{6250000}$	
	$\bar{M}_w = 21400$ g/mol ; $PDI = \frac{\bar{M}_w}{\bar{M}_n} = 1.027$	2M
	given polymer is polydispersive and less homogenous	
	(or)	
② a)	Defination of conducting polymers - - -	1M
	conduction mechanism of polyacetylene through oxidative and reductive doping	3M

Subject Title: Applied Chemistry **Subject Code: BCHES202**

Question Number	Solution	Marks Allocated
b)	$\bar{M}_n = \frac{N_1M_1 + N_2M_2 + N_3M_3 \cdots}{N_1 + N_2 + N_3}$ —	1M
	$\bar{M}_n = \frac{30\times15\times10^3 + 40\times25\times10^3 + 30\times20\times10^3}{100}$	
	$\bar{M}_n = \frac{2050000}{100} = 20500$ g/mol —	1M
	$\bar{M}_w = \frac{30\times(15\times10^3)^2 + 40\times(25\times10^3)^2 + 30\times(20\times10^3)^2}{2050000}$	
	$\bar{M}_w = 21341.46$ g/mol — — —	1M
	$PDI = \frac{21341.46}{20500} = 1.04$ — — —	1M
	polydispersive and less homogeneous	
	part-B	
3)	Definition of polymer composite ———	2M
	Synthesis of kevlar fibre - - - - - -	2M
	any four properties — — — —	2M
	any four applications — — — — —	2M
	(or)	
4)	a) Definition of Green fuel - - - - - -	2M
	Explanation of advantages of green fuel	2M
	b) explanation of generation of hydrogen by alkaline water electrolysis	3M
	Diagram — — — — — —	1M.

Subject Title: Applied Chemistry **Subject Code: BCHES202**

Question Number	Solution	Marks Allocated
	part C	
(5)	Definition of photovoltaic cell	2M
	explanation of construction	2M
	Explanation of working	2M
	Any two ~~prop~~ advantages	1M
	Any two disadvantages	1M
	(or)	
(6)	Synthesis of graphene oxide	4M
	Any four properties	2M
	Any four applications	2M
	part-D	
(7)	a) Extraction of gold metal from e-waste by hydrometallurgical steps with reaction	4M
	b) Any four needs of e-waste	4M
	(or)	
(8)	Roles and Responsibilities of e-waste	
	Govt. regulatory bodies	2M
	producers	2M
	consumers	2M
	Recyclers	2M

Subject Title: Applied Chemistry **Subject Code: BCHES202**

Question Number	Solution	Marks Allocated
(9)	a) Steps involved in pyrometallurgy —	4M
	b) Explanation of direct recycling with steps.	4M
	(OR)	
(10)	a) Definition of e waste —	1M
	Any four sources and composition of e-waste	3M
	b) Any four characteristics —	2M
	Any four in effects of e-waste	2M

MAKE-UP EXAM

USN | | | | | | | | | | |

BCHES102/202

First/Second Semester B.E./B.Tech. Degree Examination, Nov./Dec. 2023
Applied Chemistry for CSE Stream

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

			M	L	C
		Module – 1			
Q.1	a.	What is conductometric sensor? Explain its working principle and two applications.	07	L1	CO1
	b.	Define electrochemical sensor? Explain working principle of electrochemical sensors and its application?	07	L1	CO1
	c.	What is electrochemical gas sensors SO_x ? Explain electrode reactions and its application.	06	L1	CO1
		OR			
Q.2	a.	What is electrochemical gas sensors NO_x ? Explain in detail working principle and its application.	07	L1	CO1
	b.	Explain construction working and application of lithium-ion battery and its advantages and its application.	07	L2	CO1
	c.	What is disposable sensors? Explain in detail working principle in the detection of biomolecules with an example.	06	L1	CO1
		Module – 2			
Q.3	a.	Discuss in detail basic concepts of electronic memory classification.	07	L2	CO2
	b.	What are the types of organic morganic memory devices are used in computers with example?	07	L1	CO2
	c.	Write briefly about electronic memory device (i) Transistors (ii) Capacitors	06	L1	CO2
		OR			
Q.4	a.	What are liquid crystals display? Explain classification, properties and its application in liquid crystal display technique.	07	L1	CO2
	b.	Explain the properties and applications of organic light emitting diode in details.	07	L2	CO2
	c.	Discuss the properties and application of Quantum light emitting diodes in detail.	06	L2	CO2
		Module – 3			
Q.5	a.	Define metallic corrosion. Explain the electrochemical theory of corrosion taking iron as example.	07	L1	CO3
	b.	Define anoding. Explain the process of anoding of aluminium with electrode reaction and its application.	07	L1	CO3
	c.	A steel of area 100 $inch^2$ is exposed to air near the seashore. After 1 year it was found that the steel sheet has lost 485 g due to corrosion. What is the value of CPR in mpy and in mmpy? Can such steel sheet applicable for the construction purpose where the steel sheet is exposed? (Given area A = 100 $inch^2$, total weight lost W = 485 g, T = 1 year, D = 7.9 g/cm^3 , K = 87.6 mmpy)	06	L3	CO3

		OR			
Q.6	a.	What are reference electrodes? Explain the construction, working and application of calomel electrode.	07	L1	CO3
	b.	Explain theory, instrumentation of potentiometric estimation of ferrous ammonium sulphate and its applications?	07	L2	CO3
	c.	A concentration cell is constructed by dipping copper rods in 0.001 M and 0.1 M copper sulphate solutions. Calculate EMF of cell at 298 K.	06	L3	CO3
		Module – 4			
Q.7	a.	Define conducting polymers? Explain synthesis and conducting mechanism of polyacetylene and its application.	07	L1	CO4
	b.	Explain the synthesis, properties and commercial applications of Kevlar.	07	L2	CO4
	c.	A polymer has the following composition 100 molecular mass 1000g mol, 200 molecules of molecular mass 2000g/mol and 500 molecules of molecular mass 5000g/mol. Calculate the number and weight average, molecular weight.	06	L3	CO4
		OR			
Q.8	a.	Define PV Cell. Explain construction working with diagram and its advantages and applications.	07	L1	CO4
	b.	Explain generation of energy (green hydrogen) by electrolysis of water splitting and its applications.	07	L2	CO4
	c.	Explain any four advantages and disadvantages of hydrogen production sustainability.	06	L2	CO4
		Module – 5			
Q.9	a.	What is E-waste? Mention the source of E-waste and explain the need for e-waste management.	07	L1	CO5
	b.	Explain thermal treatment and pyrometallurgical methods of direct recycling from E-waste.	07	L2	CO5
	c.	Explain the five ill effects of toxic materials used in manufacturing electrical and electronic E-waste in details.	06	L2	CO5
		OR			
Q.10	a.	Explain the extraction of Gold from E-waste in detail steps involved.	07	L2	CO5
	b.	Explain hydrometallurgical extraction methods involved in extraction from E-waste.	07	L2	CO5
	c.	Write brief note on role of stakeholder for example producer, consumer, recycler and statutory bodies.	06	L1	CO5

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

BCHES102/202

First/Second Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
Applied Chemistry for CSE Stream

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the working principle of conductometric sensors and mention any two applications.	06	L2	CO2
	b.	Discuss the construction and working of Li-ion batteries. Mention its applications.	07	L2	CO4
	c.	Describe the application of Electrochemical gas sensors for the detection of SO_x and NO_x.	07	L3	CO3
		OR			
Q.2	a.	Explain the working principle of an Electrochemical sensor in the detection of Dissolved Oxygen (DO).	06	L2	CO2
	b.	Discuss the construction and working of Quantum Dot Sensitized Solar Cells (QDSSCs). Mention its applications.	07	L2	CO4
	c.	Describe the use of disposable sensor in the detection of herbicide Glyphosate.	07	L3	CO3
		Module – 2			
Q.3	a.	What are memory devices? Explain the classification of Electronic memory devices with examples.	07	L1 L2	CO1
	b.	What are nanomaterials? Explain any four properties of polythiophenes (P_3HT) suitable for optoelectronic devices.	07	L1 L2	CO1 CO4
	c.	Mention any three properties and applications of QLED.	06	L1	CO4
		OR			
Q.4	a.	Explain the types of organic memory. Devices by taking p-type and n-type semiconductor materials.	07	L2	CO2
	b.	What are photoactive and electroactive materials and explain their working principle in the display system.	07	L2	CO1 CO2
	c.	Mention any 3 properties and applications of LC-displays.	06	L1	CO4
		Module – 3			
Q.5	a.	Define metallic corrosion. Describe the electrochemical theory of corrosion taking.	07	L1 L2	CO1 CO2
	b.	Describe galvanizing and mention its applications.	06	L2	CO4
	c.	What is CPR? A thick brass sheet of area 400 inches exposed to moist air. After 2 years of period. It was found to experience a weight loss of 375 g due to corrosion. If the density of brass is 8.73 g/cms, calculate CPR in mpy and mmpy.	07	L2	CO1 CO3
		OR			
Q.6	a.	Explain the construction and working of the Calomel electrode.	07	L2	CO2
	b.	Explain the application of conductometric electrodes in the estimation of a weak acid.	06	L2	CO4
	c.	Define concentration cell. Derive an expression for emf of the cell.	07	L1 L2	CO1 CO3

		Module – 4			
Q.7	a.	A polydisperse sample of polystyrene is prepared by mixing three monodisperse samples in the following proportions. 1 g of 10000 molecular weight. 2 g of 50000 mol. wt and 2 g of 100000 mol.wt. Determine the number and weight average mol. wt.	07	L2	CO3
	b.	What is Green fuel (hydrogen fuel)? Mention the advantages of Green fuel.	06	L1	CO1
	c.	Explain the construction and working of Photovoltaic cells.	07	L2	CO2
		OR			
Q.8	a.	Discuss the conduction mechanism in polyacetylene through oxidative or reductive doping techniques (Any one).	07	L3	CO2
	b.	Explain the generation of hydrogen by alkaline water electrolysis.	07	L2	CO4
	c.	Explain the preparation, properties and applications of Kevlar.	06	L2	CO4
		Module – 5			
Q.9	a.	What is e-waste? Explain the need for e-waste management.	07	L2	CO1
	b.	Explain the process of recycling e-waste.	06	L2	CO5
	c.	Discuss the following : (i) Pyrometallurgy (ii) Hydrometallurgy	07	L3	CO5
		OR			
Q.10	a.	Explain the extraction of gold from e-waste.	07	L2	CO2
	b.	Write a brief note on the role of stakeholders for example: Producers, Consumers, Statutory bodies.	07	L3	CO5
	c.	Explain the health hazards due to exposure to e-waste.	06	L2	CO3

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

BCHES102/202

First/Second Semester B.E./B.Tech. Degree Examination, June/July 2023
Applied Chemistry for CSE Stream

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

			M	L	C
		Module – 1			
Q.1	a.	What are sensors? Explain how Electrochemical gas sensors used to detect SO_x and NO_x gases.	07	L1	CO1
	b.	With a neat sketch explain the measurement of dissolved oxygen by electro-chemical sensors.	06	L1	CO1
	c.	Explain the construction and working of Li-ion battery. Write the charging and discharging reaction.	07	L1	CO1
		OR			
Q.2	a.	Explain the construction and working of sodium ion battery, Write the charging and discharging reaction.	07	L1	CO1
	b.	Explain the detection of pharmaceutical pollutant diclofenac using electrochemical sensor.	07	L1	CO1
	c.	What are disposable sensors? Explain the detection of ascorbic acid. Write the oxidation reaction.	06	L1	CO1
		Module – 2			
Q.3	a.	What are memory device? Briefly explain the classification of memory device.	07	L1	CO1
	b.	Explain organic memory devices of p-type and n-type by taking example of Pentacene.	06	L2	CO1
	c.	Discuss the application of liquid crystals in display devices.	07	L2	CO1
		OR			
Q.4	a.	What are Photoactive and Electroactive material? Briefly discuss their role in opto-electronic devices.	07	L1	CO1
	b.	What are liquid crystals? Briefly explain the classification of liquid crystals with example.	07	L2	CO1
	c.	Discuss the application of Polyimide Polymeric material for organic memory device.	06	L1	CO1
		Module – 3			
Q.5	a.	What is corrosion? Explain Electrochemical theory of corrosion taking iron as example.	07	L2	CO3

	b.	What are reference electrodes? Explain the construction and working of calomel electrode.	07	L2	CO3
	c.	Two cadmium rods immersed in Cadmium Sulphate solution of concentration 0.002 M and 0.4 M. Write the cell representation, cell reaction and calculate the EMF at 25°C.	06	L2	CO3
		OR			
Q.6	a.	What are ion selective electrode? Explain the determination of pH of an unknown solution using glass electrode.	07	L1	CO3
	b.	What is anodizing? Explain the anodizing of aluminium.	07	L1	CO3
	c.	A thick steel sheet of area 450 cm^2 is exposed to air near ocean. After one year it was found to experience a weight loss of 385g due to corrosion. Calculate the rate of corrosion in mpy and mmpy. [Density of specimen 7.9 g/cm^3, k = 534 for mpy and k = 87.6 for mmpy]	06	L1	CO3
		Module – 4			
Q.7	a.	Discuss the conduction mechanism of Polyacetylene.	07	L1	CO4
	b.	With a neat sketch, explain the generation of Hydrogen by Alkaline Electrolysis of water.	07	L1	CO4
	c.	In a polymer sample 20% of molecules have molecular mass 15000 g/mol, 35% molecules have molecular mass 25000 g.mol and remaining percentage have molecular mass 20000 g/mol. Calculate number average and weight average molecular mass of the polymer	06	L1	CO4
		OR			
Q.8	a.	What are PV cell? Explain the construction and working of PV cell.	07	L2	CO4
	b.	Explain the preparation, properties and application of graphene oxide.	07	L2	CO4
	c.	What is green fuel? Mention the advantages of green fuel.	06	L2	CO4
		Module – 5			
Q.9	a.	What are e-waste? Explain the sources and composition of e-waste.	06	L1	CO5
	b.	Discuss the various steps involved in recycling of e-waste.	07	L1	CO5
	c.	Write a note on various stakeholders in e-waste management.	07	L2	CO5
		OR			
Q.10	a.	Explain the various steps involved in extraction of gold from e-waste.	07	L2	CO5
	b.	Discuss the extraction of metals from e-waste by pyrometallurgy.	07	L2	CO5
	c.	What are the toxic metal used in electrical and electronics products? Discuss their ill effects.	06	L1	CO5

* * * * *

SJCIT/NBA/COURSE/2023-24

SJC INSTITUTE OF TECHNOLOGY
Chickballapur - 562 101
Department of Information Science and Engineering

Course Information

Programme Name:	Information Science and Engineering						
Academic Year:	2023-24	Semester:	2	Section:	All	Subject Type:	Theory
Course Title:	Applied Chemistry for CSE Stream						
Course Instructor Name:	Dr. Sreenivasa K/Dr. Chandrashekara K N					Class Strength:	
Subject Code:	22BCHES202	Course No:	2	Course ID:	C202	127	

Scheme of Teaching & Marks

Contact Hr/Week:	5	Lecture Hours (Hr.):	3	Tutorials (Hr.):	2
Max.CIE Marks:	50	Max. SEE Marks:	50	Total Max.Marks:	100
Min.CIE Marks:	22	Min.SEE Marks:	18	Total Min.Marks:	40
Final CIE (IA) Marks:	50	Assignment Marks:	10	Test Marks:	40

Threshold Values for Attainment Calculation							Final CO Attainment			
Attainment level	3	%	2	%	1	%	(Percentage Contribution, %)			
Internal Assessment	>=	70	>=	60	>=	50	CIE	40	SEE	50
SE Examination	>=	60	>=	50	>=	40	-		CES	10

Statements of Course Outcomes		No.of CO's	5	Target(%)	BL
C112.1	Identify the terms and application processes involved in scientific and engineering			60	
C112.2	Explore the phenamenona of chemistry in engineering processes			60	
C112.3	Solve the problems in chemistry that are pertinent in engineering applications			60	
C112.4	Apply the basic concepts of chemistry to explain the chemical properties and processes			60	
C112.5	Analyse properties and multi disciplinary situation processes associated with chemical substance in interdisciplinary situations			60	

Semester End Exam. (SEE) Target(%)	60	Course End Survey(CES) Target (%):	70

CO-PO Mapping Table (In the scale of 3)													CO-PSO Mapping Table				
CO/PO	1	2	3	4	5	6	7	8	9	10	11	12	CO/PSO	1	2	3	4
C112.1	3	1	1	1	2	2	2	1	1			2	C112.1	1			
C112.2	3	1	1		2	2	2	1	1			2	C112.2	1			
C112.3	3	3	2	2	2	2	2	1	1			2	C112.3				
C112.4	3	3	2	2	2	2	2	1	1			2	C112.4				
C112.5	3	3	2	2	1	2	2	1	1			2	C112.5				
Total	15	11	8	7	9	10	10	5	5			10	Total	2			

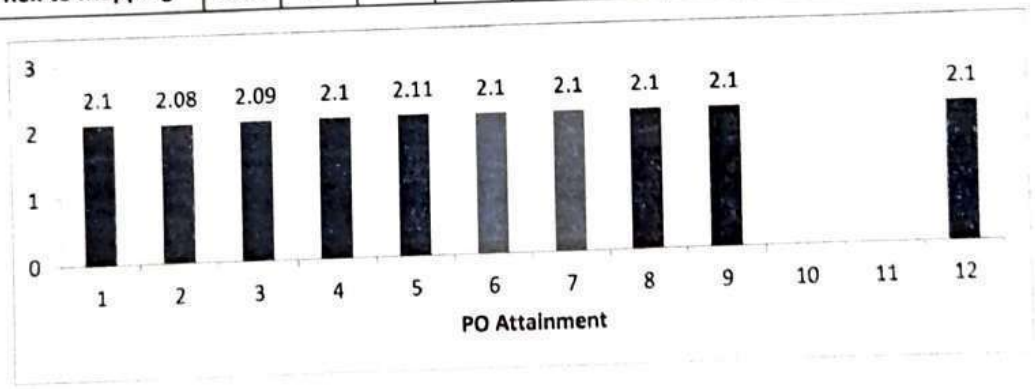
SJCIT/NBA/ CO-PO-PSO REPT/ 2023-24	S J C INSTITUTE OF TECHNOLOGY Chickballapur - 562 101 Department of Information Science and Engineering						
Course Title	Applied Chemistry for CSE Stream					Course Code	C112
Subject Code	22CHES202	Semester	2	Section	AB	Emp.ID	1508
Faculty Name	Dr. Sreenivasa K/Dr. Chandrashekara K N					No.students	127

Summary of CO attainments of Sub 22CHES202 Based on TYPE-1 Academic Year:2023-24

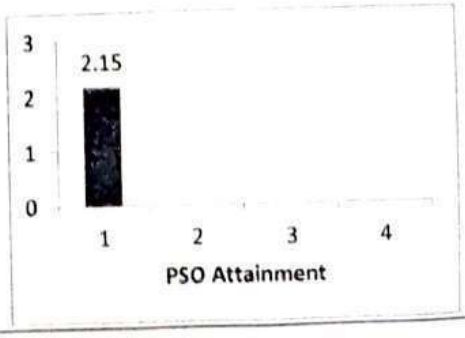
CO	CID_CO	CIE			SEE			CES			TOT_Attainment		
		S_AT	T_ST	ATN	S_AT	T_ST	ATN	S_AT	T_ST	ATN	ATN	%	Status
CO1	C112.1	127	127	3	67	127	1.6	127	127	3	2.3	77	YES
CO2	C112.2	122	127	2.9	67	127	1.6		127	0	2	66	YES
CO3	C112.3	122	127	2.9	67	127	1.6		127	0	2	66	YES
CO4	C112.4	116	127	2.7	67	127	1.6	127	127	3	2.2	73	YES
CO5	C112.5	123	127	2.9	67	127	1.6		127	0	2	66	YES

Summary of PO attainments of Sub: 22CHES202Based on TYPE-1 Academic Year:2023-24

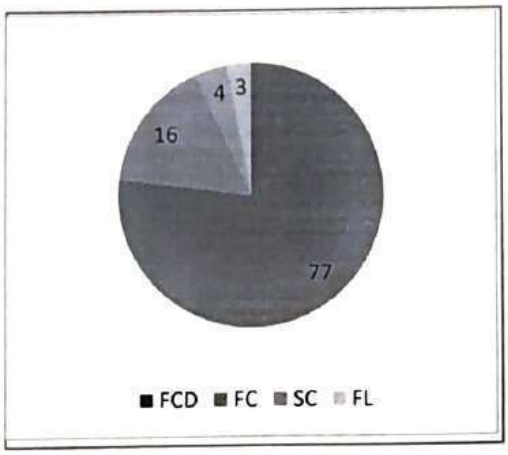
PO Number	1	2	3	4	5	6	7	8	9	10	11	12
Direct ATNT(D)	2.17	2.16	2.16	2.16	2.17	2.17	2.17	2.17	2.17			2.17
Indirect ATNT(ID)	1.2	1.09	1.13	1.29	1.33	1.2	1.2	1.2	1.2			1.2
Total-ATNT	2.1	2.08	2.09	2.1	2.11	2.1	2.1	2.1	2.1			2.1
Total-ATNT (%)	70	69	70	70	70	70	70	70	70			70
Rel. to Mapping	10.5	7.6	5.6	4.9	6.3	7	7	3.5	3.5			7



Summary of PSO attainments in Year:2023-24				
PSO Number	1	2	3	4
Direct ATNT(D)	2.2			
Indirect ATNT(ID)	1.5			
Total-ATNT	2.15			
Total-ATNT (%)	72			
Rel. to Mapping	1.4			



SJCIT/NBA/ SEE-REPT/ 2023-24	S J C INSTITUTE OF TECHNOLOGY Chickballapur - 562 101 Department of Information Science and Engineering						
Course Title	Applied Chemistry for CSE Stream					Course Code	C112
Subject Code	22CHES202	Semester	2	Section	AB	Emp.ID	1508
Faculty Name	Dr. Sreenivasa K/Dr. Chandrashekara K N					No.students	127
	Result Analysis of Subject Code -22CHES202 for the Academic year 2023-24						



Result Analysis of Section: 2 - AB				
No. Students	Pass	%	Fail	%
127	123	97	4	3

Class Analysis of Section: 2 - ABC			
No. Students	127	%	Grade Point
FCD	98	77	10,9,8
FC	20	16	7
SC	5	4	6,4
FL	4	3	0

Max. and Avg. Marks					
CIE	AVG	SEE	AVG	TOT	AVG
50	47	50	30	100	76

CO Attainment in SEE	
Sum_AT	271
T_students	127
Avg.ATNT	2.1
Sum_AT(=3)	67
AT(=3)%	53
Attainment	YES

ANALYSIS OF GRADE POINT AND GRADE LETTER							
Grade Letter	S	A	B	C	D	E	F
Grade Point	10	9	8	7	6	4	0
No.of Students	16	45	37	20	3	2	
% of Students	13	35	29	16	2	2	

CIE and SEE correlation Coefficient	0.31

Course Coordinator Remarks on Semester End Results for the Academic Year2023-24

Qf 100% results. Needs to improve the '3' grade percentage.

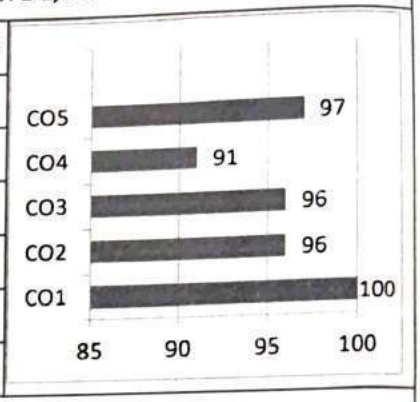
Signature of Course Coordinator

Signature HOD/DAC

SJCIT/NBA/ CO-REPT/ 2023-24	S J C INSTITUTE OF TECHNOLOGY Chickballapur - 562 101 Department of Information Science and Engineering							
Course Title	Applied Chemistry for CSE Stream						Course Code	C112
Subject Code	22CHES202	Semester	2	Section	ABC		Emp.ID	1508
Faculty Name	Dr. Sreenivasa K/Dr. Chandrashekara K N						No.students	127

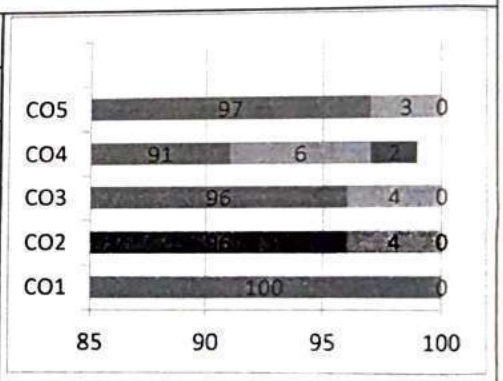
CO Attainment from -TEST - 3, in the Subject 22CHES202 *Based on: TYPE-1, Academic Year 2023-24*

Sl.	CO Number	Sum	T_Std	Av-AT	TS(=3)	AT,%	Ac_AT	ATNT
CO1	C112.1	381	127	3	127	100	3	YES
CO2	C112.2	376	127	3	122	96	2.9	YES
CO3	C112.3	376	127	3	122	96	2.9	YES
CO4	C112.4	366	127	2.9	116	91	2.8	YES
CO5	C112.5	377	127	3	123	97	2.9	YES



Distribution of CO Attainment from -TEST - 3, in Subj 22CHES202 *Based on: TYPE-1, ACDY:2023-24*

Sl.	CO Number	3	%	2	%	1	%
CO1	C112.1	127	100		0		0
CO2	C112.2	122	96	5	4		0
CO3	C112.3	122	96	5	4		0
CO4	C112.4	116	91	8	6	2	2
CO5	C112.5	123	97	4	3		0



Remarks of Course Intructor

All the CO's are achieved.

Signature of HOD/DAC	*Signature of Course Instructor*