SILIGURI INSTITUTE OF TECHNOLOGY

CIVIL ENGINEERING

COURSE FILE

2ND SEM, 1ST YEAR, 2019

SEC – A/B

PAPER DESCRIPTION : CHEMISTRY-I

PAPER CODE : BS-CH201

Course File

Course Title: Chemistry
Code: BS-CH201
Semester 2nd Year 2019
Name of the Faculty: Dr. Debabrata Moitra
E-mail: moitradebabrata85@gmail.com

Class Schedule			
Lecture		Tutorial	Practical
Wednesday (10:00A.M. to11:40 A.M).	Thursday (10:50A.M to 11:40A.M)	Thursday (14:10 P.M to 16:40 P.M)	Wednesday (14:10 P.M to 16:40 P.M)

Hours for meeting students:
Recess time or by appointment

i) Course Objective :

To impart knowledge on basic chemistry which will help students to establish their career in multidisciplinary area.

ii) Course Outcomes:

i. After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The student will be able to:

		Target
CO1	List major chemical reactions that are used in the synthesis of molecules. (Bloom's taxonomy level:1)	60%
CO2	Rationalise bulk properties and processes using thermodynamic considerations and periodic properties such as ionization potential, oxidation states and electronegativity. (Bloom's taxonomy level:2)	60%
CO3	Classify the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques. (Bloom's taxonomy level:3)	60%
CO4	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces. (Bloom's taxonomy level:4)	60%
CO5	Explain the data of quantitative chemical analysis and make use of simple model, equations to solve problems related to basic chemistry (Bloom's taxonomy level:4)	60%

ii. Once the student has successfully complete this course, he/she must be able to answer the following questions or perform/demonstrate the following:

Sl.	Question	BT Level
1.	**1.** Explain the following reactions with a suitable example. (i) Wolff-Kishner reduction, (ii) Cannizzaro reaction, iii) Friedel Crafts' reaction, iv) Tollens' test and Fehlings' test, v) SN_1 and SN_2 reaction mechanism, vi) Nucleophilic addition.(a) Phenol on treatment with Br_2 in CS_2 at low temperature gives two isomeric mono bromophenols 'X' and 'Y'. But phenol on treatment with bromine water gives a white precipitate 'Z'. Identify the products 'X', 'Y' and 'Z' with chemical reactions. (b) What do you mean by enantiomer and diastereomer? Differentiate them with examples. (c) Give one example of each of Friedel Crafts' alkylation and acylation reaction.(d) Predict the major product(s) of the following reactions and explain their formation: i) $H_3C - CH = CH_2 \xrightarrow[HBr]{(Ph-CO-O)2}$ ii) $H_3C - CH = CH_2 \xrightarrow{HBr}$ (e) Write down the criteria for aromaticity.	**1**
2.	**2.** (a) For a reaction both ΔH and ΔS are positive. Under what conditions will the reaction be spontaneous? (b) What will be the conjugate acids for the following Bronsted bases? NH_3, HCO_3^-, CH_3COO^-, $H_2PO_2^-$. **3**. (a) Assign oxidation no. of the followings : 'P' in H_3PO_2, 'Cr' in $K_2Cr_2O_7$, 'S' in H_2SO_5, 'C' in HCOOH. (b) How crystal field theory explains the colours of transition metal complexes? **4.** (a) pH of a solution of a strong acid is 5. What will be the pH of the solution obtained after diluting the given solution 100 times? (b) Write the Nernst equation for the cell reaction in the Daniel cell. How will the E_{cell} effected when the concentration of Zn^{2+} is increased? (c) Draw and explain the energy level diagrams for conductor, semiconductor and insulator. (d) Explain enantiomers and dia-stereoisomers with examples. **5.** Derive the Nernst equation. What is EMF of a cell? How EMF of a cell is related to free energy (mathematical relation)? **6.** State and explain the first law of thermodynamics. What is entropy? What is the physical significance of it? Derive the entropy change during reversible expansion of an ideal gas **7.** (a) What is Lewis acid? Give example (b) What is solubility product? What will be the solubility product of the salt A_xB_y? (c) Explain principle and applications of Florescence spectroscopy. (d) Draw figure to show the splitting of d orbitals in an octahedral crystal field. $[Fe(H_2O)_6]^{3+}$ is strongly paramagnetic whereas $[Fe(CN)_6]^{3-}$ is weakly paramagnetic. Explain	**2**
3.	**8.** What is spectrochemical series of crystal field theory? Explain the difference between a weak field ligand and strong field ligand. **9.** (a) What is the wavelength range of Ultra-violet radiation. (b) Write short note on i) Chromophore ii) Auxochrome. **10**. Define and derive Lambert-Beer's law. What is "Finger print region in IR spectra? What are the applications of IRspectroscopy? What is NMR spectroscopy? What is MRI? What is chemical shift in NMR spectroscopy?	**3**

4.	**11.** What is molecular orbital? Calculate the bond order of the following species and indicate their magnetic properties - O_2, O_2^+, O_2^-, O_2^{2-} **12.** Teacher asked two students to write the electronic configuration of d^4 system using CFT in octahedral crystal field. Student I: $t_{2g}^3\ e_g^1$, Student II: $t_{2g}^4\ e_g^0$. (a) Suggest which student gives correct configuration. Justify your answer. (b) Draw figure to show splitting of degenerate'd' orbitals in an octahedral crystal field. **13.** (a) Give molecular orbital energy level diagram of CO. Write its electronic configuration, magnetic behaviour and bond order. (b) Discuss different types of hydrogen bonding with example. **14.** What is a semiconductor? Classify the semiconductors and give examples. **15.** (a) Explain the terms band gap, valence band and conduction band with diagram. Classify the semiconductors with examples. (b) Estimate the critical constants of a gas (T_c, P_c and V_c) whose van der Waals constants are, a = 0.751	**4**

iii) Topic/Unit/Chapter Layout

Topic/Unit/Chapter	Lecture Hours
Module-1: Atomic and molecular structure.	10
Module-2: Spectroscopic techniques and applications.	8
Module-3: Intermolecular forces and potential energy surfaces.	4
Module-4: Use of free energy in chemical equilibria.	8
Module-5: Periodic properties.	4
Module-6: Stereochemistry.	4
Module-7: Organic reactions and synthesis of a drug molecule.	4

iv)Textbooks

1. **Text Book:** Chemistry by Gourkrishna Dasmohapatra.

2. **Reference books**
   1. Physical Chemistry by P.C. Rakshit
   2. Inorganic Chemistry by J. D. Lee
   3. Organic Chemistry by Morrison & Boyd

(v) Evaluation Scheme

1) Theory

Evaluation Criteria	Marks
Internal Exam*	15
Quiz / assignment	10
Attendance	5
University Exam/External Exam	70
Total	100

* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

2) Laboratory (If applicable)

Expt. No.	Experiment Name	Schedule	Marks
1.	Determination of absorption isotherm o acetic acid by activated charcoal.	3 hours	40
2.	Determination of surface tension of the given liquid at room temperature by stalagmometer.	3 hours	
3.	Estimation of dissolved oxygen in a given sample of water.	3 hours	
4.	Determination of rate constant of acid catalyzed hydrolysis of ethyl acetate.	3 hours	
5.	Determination of partition coefficient of acetic acid between n-butanol and water	3 hours	
6.	Determination of percentage composition of sugar solution from viscosity.	3 hours	
7.	(Conductrometric Titration) Determination of strength of a given solution of HCl by titration against a standard solution of Na OH.	3 hours	
8.	(pH metric Titration) Determination of strength of a given solution of Hcl by titration against a standard solution of NaOH.	3 hours	
University Exam			60

Course target attainment levels:

Attainment Level	Inference
Attainment Level 1	40% of the students have attained more than the target level of that CO
Attainment Level 2	50% of the students have attained more than the target level of that CO
Attainment Level 3	60% of the students have attained more than the target level of that CO

Overall Course Attainment Target = 60% of the students will get “A” Grade

Target has been set on the basis of last year's performance / result by the students, student quality this year and difficulty level of the course.

University Grading System:

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

(vi) Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes												PSOs	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12	1.	2.
BSCH201.1	2								1					
BSCH201.2	2	2							1			1	1	
BSCH201.3	2	2							1			1	1	
BSCH201.4	2	2							2			1	1	
BSCH201	2	2							2			1	1	

Justification: SinceBS- CH101 is a foundation course for B.Tech, CO1 to CO4 satisfy at low level of PO1 whereas CO2 to CO4 satisfy moderately with PO2. Since CO4 is satisfying through laboratory experiments and students works in group in the laboratory, it also satisfies little on individual and team work (PO9).

(vii) Assessment Methodology

Outcome	Assessment Tool
BSCH201.1	Internal Exam, Assignment, Quiz
BSCH201.2	Internal Exam, Assignment, Quiz
BSCH201.3	Internal Exam, Assignment, Quiz
BSCH201.4	Internal Exam, Assignment, Quiz

(VIII) A. Weekly Lesson Plan

Week	Lectures	Tutorial	Assignment
1st week	L1- Schrodinger equation. L2- Particle in a box solution and their applications for simple sample. L3- Molecular orbitals of diatomic molecules (e.g.H_2).	Tutorial 1 Discussions on pre-requisite of the syllabus.	

2nd week	L4- Energy level diagrams of diatomic molecules. L5- Pi-molecular orbitals of butadiene and benzene and aromaticity. L6- Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties	Tutorial 2 Question answer discussion on basics of crystal field theory and numerical problems	
3rd week	L7- Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. L8- Band structure of solids and the role of doping on band structures. L9- Band structure of solids and the role of doping on band structures.	Tutorial 3 Question answer discussions on crystal defects and semiconducting materials.	**Assignment Term Paper**
4th week	L10- Principles of spectroscopy and selection rules. L11- Electronic spectroscopy. L12- Fluorescence and its applications in medicine.	Tutorial 4 Question answer discussion on Spectroscopy	
5th week	L13- Vibrational and rotational spectroscopy of diatomic molecules & applications. L14- Nuclear magnetic resonance and magnetic resonance imaging. L15- Surface characterisation techniques	Tutorial 5 Question answer discussion on selection rule	**Assignment Problem solving**
6th week	L16- Diffraction and scattering. L17- Ionic, dipolar and van der Waals interactions. L18 - Equations of state of real gases and critical phenomena.	Tutorial 6 Problems related to real gas equation	
7th week	L19- Equations of state of real gases and critical phenomena. L20- First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. L21- First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy.	Tutorial 7 Problems related to 1st law of thermodynamics. entropy, free energy.	**Assignment mini project**
8th week	L22- Estimations of entropy and free energies. L23- Free energy and emf. L24- Cell potentials, the Nernst equation and applications	Tutorial 8 Problems related to electrolysis and electrochemical cell and numerical problems	
9th week	L25- Acid base, oxidation reduction and solubility equilibria. L26 - Water chemistry. L27- Corrosion. L28- Use of free energy considerations in metallurgy through Ellingham	Tutorial 9 Question answer discussions on the basics of water chemistry and corrosion	**Assignment ppt presentation**

	diagrams		
10th week	L29- Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations. L30- Atomic and ionic sizes, ionization energies, electron affinity and electronegativity.	Tutorial 10. Question answer discussions on periodic properties	
11th week	L31- Polarizability, oxidation states, coordination numbers and geometries. L32- Hard soft acids and bases, molecular geometries. L33- Representations of 3 dimensional structures, structural isomers and stereoisomer.	Tutorial 11 Problem solving related to slater's rule.	
12th week	L34- Configurations and symmetry and chirality, enantiomers, diastereomers. L35- Optical activity, absolute configurations and conformational analysis. L36- Isomerism in transitional metal compounds.	Tutorial 12 Question answer discussions on Stereochemistry .	
13th week	L37- Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. L38- Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. L39- Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.	Tutorial 13 Question answer discussions on organic chemistry and organic conversions .	**Quiz**
14th week	L39- Synthesis of a commonly used drug molecule.	Tutorial 14 Numerical Problem Solving.	

(VIII) B. COMBINED DAILY LESSON PLAN & EXECUTION REPORT

NAME OF FACULTY : Dr. DEBABRATA MOITRA	DEPARTMENT : DESH (CE)	SUBJECT: Chemistry CODE : (BS-CH201)	SEMESTER : 2nd

Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus)	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
1	**Atomic and Molecular Structure**		**12**					
	1.1	Schrodinger equation, Particle in a box solution and their applications for simple sample	01	16.01.19	16.01.19			
	1.2	Particle in a box solution and their applications for simple sample	01	16.01.19	16.01.19			
	1.3	Molecular orbitals of diatomic molecules (e.g.H_2).	02	16.01.19 17.01.19	16.01.19 17.01.19			
	1.4	Energy level diagrams of diatomic molecules.	02	17.01.19 24.01.19	17.01.19 24.01.19			
	1.5	Pi-molecular orbitals of butadiene and benzene and aromaticity.	02	24.01.19 30.01.19	24.01.19 30.01.19			

Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus)	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
	1.6	Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties	02	30.01.19	30.01.19			
	1.7	Band structure of solids and the role of doping on band structures.	01	31.01.19	31.01.19			
	1.8	Problem Solving	01	31.01.19	31.01.19			
2	**Spectroscopic Techniques and applications**		**08**					
	1.1	Principles of spectroscopy and selection rules.	01	06.02.19	06.02.19			
	1.2	Electronic spectroscopy.	01	06.02.19	06.02.19			
	1.3	Fluorescence and its applications in medicine	01	07.02.19	07.02.19			
	1.4	Vibrational and rotational spectroscopy of diatomic molecules & applications.	01	07.02.19	07.02.19			
	1.5	Nuclear magnetic resonance and magnetic resonance imaging.	01	13.02.19	13.02.19			
	1.6	Surface characterisation techniques	01	13.02.19	13.02.19			
	1.7	Diffraction and scattering.	01	14.02.19	14.02.19			
	1.8	Problem Solving	01	14.02.19	14.02.19			

Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus)	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
3	**Intermolecular Forces and potential energy Surfaces**		**04**					
	3.1	Ionic, dipolar and van der Waals interactions.	01	27.2.19	27.2.19			
	3.2	Equations of state of real gases and critical phenomena.	01	27.2.19	27.2.19			
	3.3	Potential Energy surfaces of H_2, H_2F and HCN and trajectories on these surfaces	01	28.02.19	28.02.19			
	3.4	Problem Solving	01	28.02.19	28.02.19			
4	**Use of Free Energy in Chemical Equilibria**		**06**					
	4.1	First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies	02	13.03.19	13.03.19			
	4.2	Free energy and emf. Cell potentials, the Nernst equation and applications.	01	14.03.19	14.03.19			
	4.3	Acid base, oxidation reduction and solubility equilibria, Water chemistry. Corrosion.	01	27.03.19	27.03.19			

Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus)	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
	4.4	Use of free energy considerations in metallurgy through Ellingham diagrams	01	27.03.19	27.03.19			
	4.5	Problem Solving	01	28.03.19	28.03.19			
5	**Periodic Properties**		**04**					
	5.1	Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations.	01	03.04.19	10.04.19			
	5.2	Atomic and ionic sizes, ionization energies, electron affinity and electronegativity. Polarizability, oxidation states, coordination numbers and geometries	01	03.04.19	10.04.19			
	5.3	Hard soft acids and bases, molecular geometries	01	4.04.19	11.04.19			
	5.4	Problem Solving	01	4.04.19	11.04.19			
6	**Stereochemistry**		**04**					
	6.1	Representations of 3 dimensional structures, structural isomers and stereoisomer, Configurations	01	10.04.19	24.04.19			

Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus)	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
		and symmetry and chirality, enantiomers, diastereomers.						
	6.2	Optical activity, absolute configurations and conformational analysis	01	10.04.19	24.04.19			
	6.3	Isomerism in transitional metal compounds	01	11.04.19	25.04.19			
	6.4	Problem Solving	01	11.04.19	25.04.19			
7	**Organic Reactions and Synthesis of a Drug Molecule**		**04**					
	7.1	Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.	2	24.04.19	2.05.19			
	7.2	Synthesis of a commonly used drug molecule.	1	25.04.19	08.05.19			
	7.3	Problem Solving	1	08.05.19	08.05.19			
45								

(IX) Teaching Strategy / Method

1. Detailed use of blackboard
2. Good oratory skill with clearly audible volume of lecture
3. Interactive classroom
4. Always encouraging the students to ask questions
5. Use of practical examples or similar models to illustrate the topics.

(IXA) Strategy to support weak students

1. Paying attention to their problems in understanding the subject
2. Encouraging them to express their point of trouble
3. Allotting extra time beyond schedules class hours to help them understand the topics
4. Suggesting them different ways (as found suitable depending upon the case) to overcome their problem.

(IXB) Strategy to encourage bright students

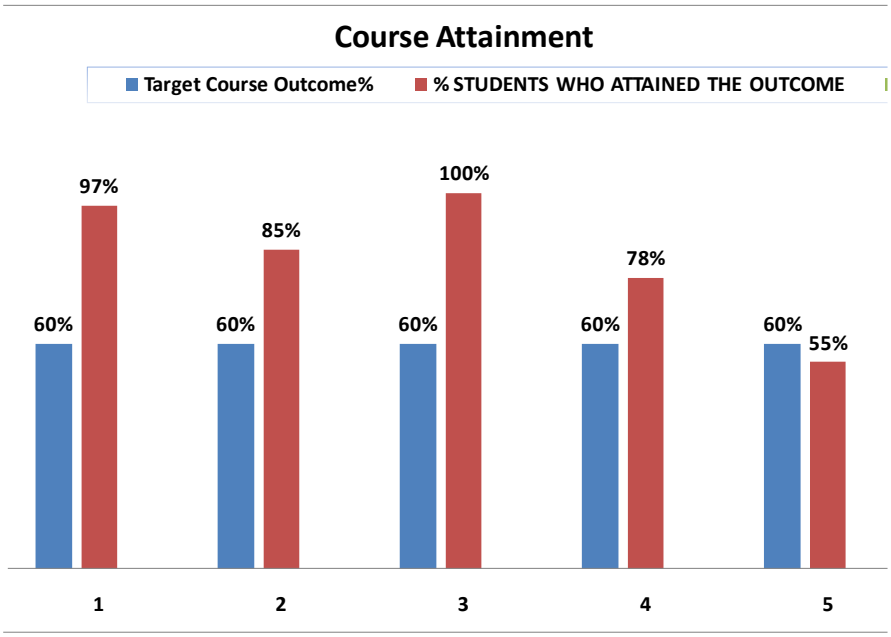
1. Try to encourage them to study beyond the syllabus
2. Ask them to develop the habit of reading anything good and rich in content
3. Advise them to try and solve higher level engineering numerical problems.

(IXC) Efforts to keep students engaged

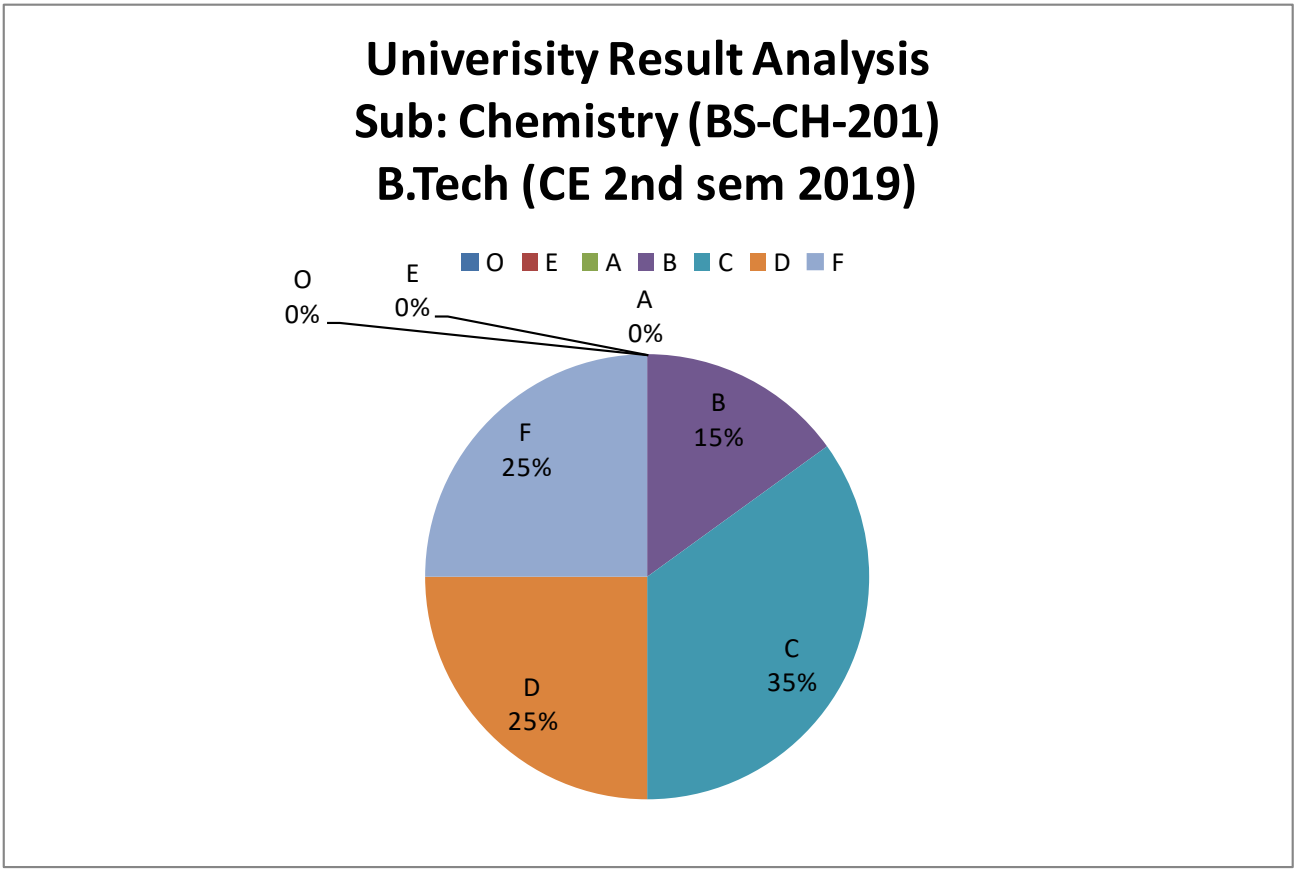
1. During class to avoid monotony some aptitude problems are given to solve.
2. Asking random questions to the students from the topic
3. Sometimes different tricks or techniques are shown to them to make the lecture interesting.
4. Informal technical quiz is also held.

(X) Analysis of Students performance in the course

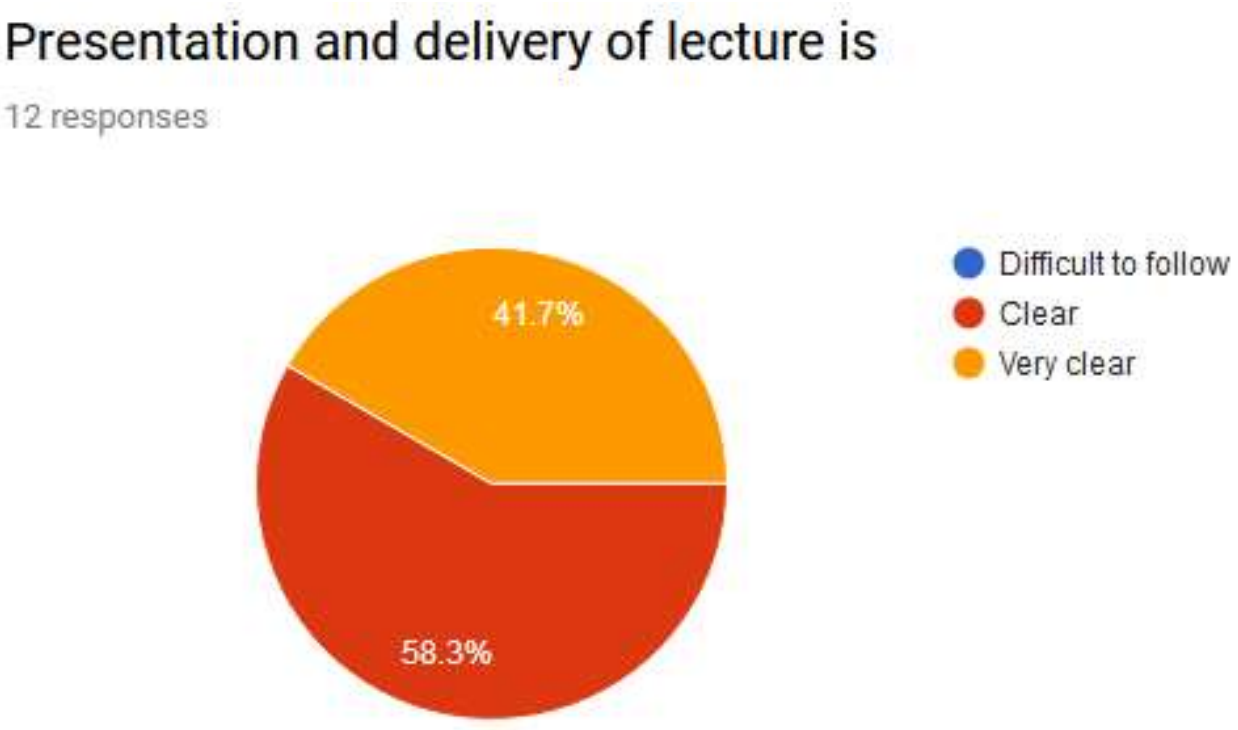
INTERNAL ASSESSMENT



UNIVERSITY EXAMINATION

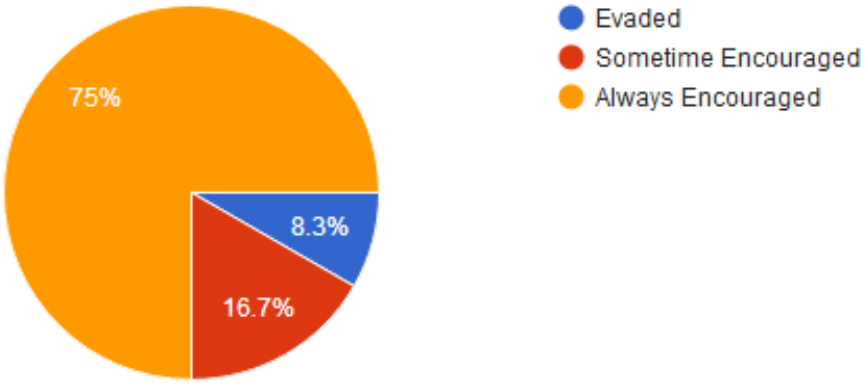


(XI) Analysis of Student Feed Back



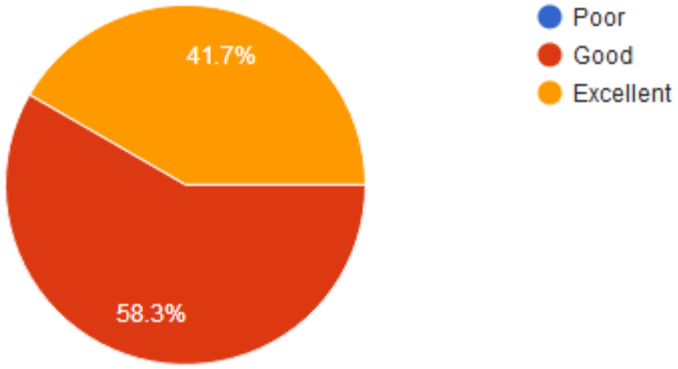
Interaction in class are

12 responses



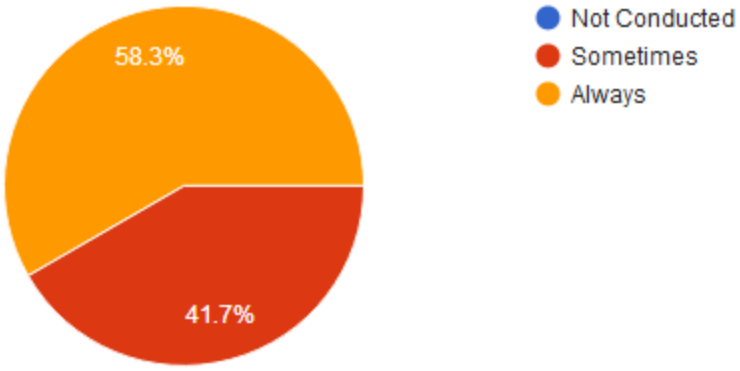
Course progressing as per the course description

12 responses



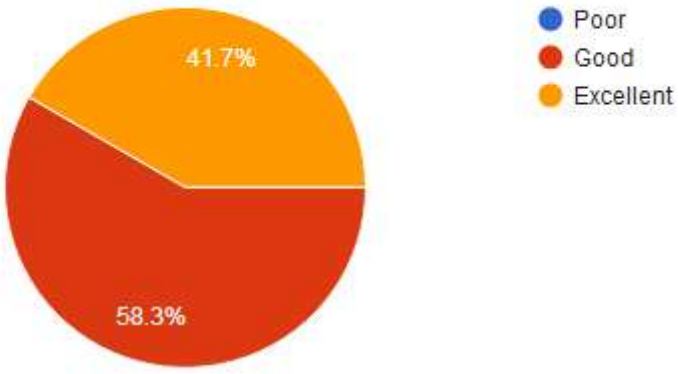
Tutorials are conducted as per the schedule (Include if the course has a tutorial)

12 responses



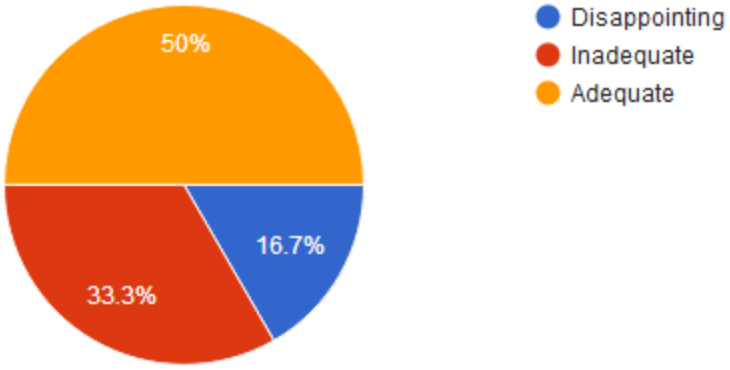
Class room ambiance is

12 responses



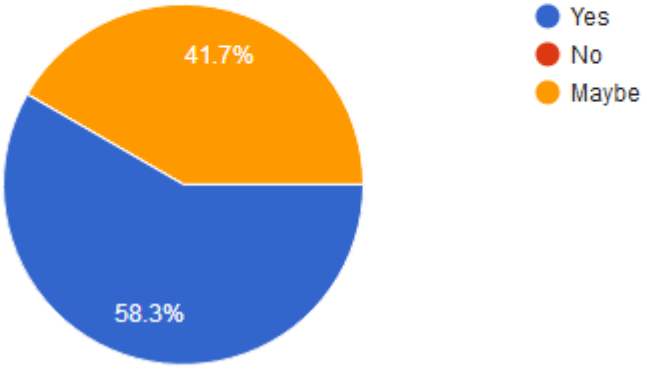
Library support for the Course is

12 responses



After completion of the course so far, do you understand the importance of this course in your engineering stream?

12 responses



(XII) Teacher Self-Assessment (at the completion of course)

- Syllabus coverage was almost 100%.
- Will have to give more effort to improve their performance in university exam.

(XIV) Recommendations/Suggestions for improvement by faculty

- To make it more interesting, syllabus of chemistry should be oriented towards more applications in engineering.
- For most of the lab classes (except expt no. 4 and 7) there is no theory part. So there is a gap between theory and lab class, which needs to be addressed by the University.
-

INTERNAL ASSESMENT RECORD

Subject with code: Chemistry-1, (BS CH201)

Section: Civil Engineering

Semester : 2nd

Discipline: Civil Engineering

Sl.	Roll No.	Name	Attendance		Internal Examination			Assignment / Quiz (50)	Total (100)
			Total (42)	Marks (5)	1st (50)	2nd (50)	Avg.		
1	11901318035	Swaraj Biswas	40	5	40	45	43	50	93
2	11901318036	Surajit Biswas	35	4	36	30	33	46	79
3	11901318038	Solanki Sinha	35	4	36	20	28	46	74
4	11901318039	Sneharta Roy	35	4	38	31	35	46	81
5	11901318040	Shuvam Naha	39	5	35	47	41	50	91
6	11901318041	Shivam Kumar	39	5	36	50	43	50	93
7	11901318042	Ribhu Biswas	35	5	35	35	35	50	85
8	11901318043	Rajdeep Ghosh	30	4	25	22	24	50	74
9	11901318044	Protik Saha	30	4	31	20	26	46	72
10	11901318045	Prodyut Roy	30	4	29	22	26	50	76
11	11901318046	Pratiksha Pradhan	31	4	36	25	31	46	77
12	11901318047	Manab Roy	38	5	50	50	50	50	100
13	11901318048	Love Ojha	30	4	38	20	29	46	75
14	11901318049	Dipan Nath	37	5	50	50	50	50	100
15	11901318050	Dig Bijay Shaha	32	4	20	20	20	46	66
16	11901318051	Brojabihari Das	39	5	34	43	39	50	89
17	11901318052	Ashif Iqubal	32	4	43	25	34	46	80
18	11901318053	Anubrata Barman	40	5	42	30	36	50	86
19	11901318054	Anindya Mahapatra	29	4	27	22	25	46	71
20	11901318055	Ajay Kumar	38	4	27	46	37	46	83

LIST OF PRACTICALS

Subject with code: BS-CH291

Section: Civil Engineering

Semester : 2nd

Discipline: Civil Engineering

Sl.	Details of Experiment(s)	Hours allotted
1	Determination of absorption isotherm o acetic acid by activated charcoal.	3 hours
2	Determination of surface tension of the given liquid at room temperature by stalagmometer.	3 hours
3	Estimation of dissolved oxygen in a given sample of water.	3 hours
4	Determination of rate constant of acid catalyzed hydrolysis of ethyl acetate.	3 hours
5	Determination of partition coefficient of acetic acid between n-butanol and water	3 hours
6	Determination of percentage composition of sugar solution from viscosity.	3 hours
7	(Conductrometric Titration) Determination of strength of a given solution of HCl by titration against a standard solution of Na OH.	3 hours
8	(pH metric Titration) Determination of strength of a given solution of Hcl by titration against a standard solution of NaOH.	3 hours

NAME WITH ROLL NO.s OF STUDENT WHOSE ACADEMIC PERFOMANCE IS NOT SATISFACTORY			
Sl.	**Roll No.**	**Name of Student**	**Remedial measures taken by teacher**
	11901318042	Ribhu Biswas	• Identify and work out on the weakness. • Teach them extra individually and in group. • Give them extra numerical problems for practice. • Help them to practice question answers and numerical. • Refer them extra study materials and books.
	11901318043	Rajdeep Ghosh	
	11901318044	Protik Saha	
	11901318047	Manab Roy	
	11901318049	Dipan Nath	
	11901318053	Anubrata Barman	

CERTIFICATE

I, the undersigned, have completed the course allotted to me as shown below

Sl. No.	Semester	Subject with Code	Total Units/ Chapters	Remarks

Date :	**Signature of Faculty**

Submitted to HOD

Certificate by HOD

I, the undersigned, certify that……..has completed the course work allotted to him/ her satisfactorily/ notsatisfactorily.

Date :	**Signature of HOD**

Submitted to Principal/Director

Date :	**Signature of Principal/Director**