BANKURA ZILLA SARADAMANI MAHILA MAHAVIDYAPITH
Nutanchati, Opposite Axis Bank, Bankura,
West Bengal, Pin-722101

ACADEMIC AUDIT REPORT
For the Academic year 2018 - 2019

Academic Audit of Department : CHEMISTRY

Period of Audit: 2018-2019

I - COLLEGE PROFILE (To be filled in by the IQAC Co-ordinator)

1	Name of the Department, Website, email and Ph. No.		Department: Chemistry, E-mail id: sarada_6@yahoo.co.in ; Ph. No.: 03242-251194
2	Name of the HOD, email & Mob. No.		Dr. Sayantan Mondal ,E-mail: sayantan.saradamani@gmail.com; Mobile No: 9641408245
3	Name of the IQAC Coordinator, email & Mob. No.		Dr.Nityananda Patra, nityananda.patra1967@gmail.com Mobile No.: 9474144885
4	Year of Establishment/ Year of Affiliation		1973/1975
5	NAAC Grade with Cycle, Accredited Year (if not Accredited Status of Preparations)		Grade A (3.04) Cycle 2 2015
6	UGC Recognition (2F & 12 B)		YES
7	Departmental Working Hours (if shift system mention details of both shifts & give reasons for shift system)		10.10 a.m-5.00 p.m (Monday to Saturday)

8	No. of Posts Sanctioned: Teaching - Non Teaching- Supportive Staff - Other if any -			Teaching	Non Teaching
			Govt. approved :	1	-
			Management approved :	1	1
			Govt. approved Contractual :	-	-
			Management approved Contractual :	-	-
			Guest Working:	3	1

9	Course wise & Year wise Students strength particulars		**No of Students**	**Sem-I**	**Sem-II**	**Sem-III**	**Sem-IV**		**3rd Year**
				17-18	**18-19**	**17-18**	**18-19**		**18-19**
			Honours	21	21	12	12		07
			General	68	68	38	38		06

II - CURRICULAR ASPECTS		**Statement**	**Impression/Recommendation/ Remark by Academic Advisors**	**Status**	**Grade**
1	Departmental Annual Curricular Plans	Distribution of syllabus in modules and unitization of syllabus were prepared well before the commencement of classes and executed in a planned and systematic manner. (Annexure I) PO, CO & PSO is also formulated.	Practical experience on theoretical knowledge be given importance through the introduction of Internship, if possible.	Good	A
2	Departmental Activities and Records of students' and Teachers' participation for the Academic Year 2018 to 2019	Every activity is recorded such as Departmental meetings,Departmental Seminer,Student-Seminer,Class Tests, Meetings of committees related to Parent-Student -Teacher formed by the department etc.	Database on the pass out students for making alumni association more dynamic and productive be made an integral part of the departmental activities every year.	Good	A
3	Add-on Courses completed during Academic Year 2018 to 2019	NIL	At least introduction of some vocational training courses be made compulsory every year to impart practical knowledge.	Poor	C
4	Plan for introduction of new Add-on Courses in Academic Year 2018 to 2019	NIL	Efforts be made for the introduction of some vocational training courses or at least hands on training be made compulsory every year to impart practical knowledge.	Poor	C
5	Coverage of Syllabus (Average Percentage)	More than 90% syllabus is covered for all courses of UG program. Records are kept in the individual Teacher's Diary.	100% coverage of the syllabus should be made mandatory because it will help the advanced students immensely.	Good	A
6	Maintenance of Student Attendance Registers	Day to day attendance is recorded in the Student Attendance Registers.	Poor attendance (i.e. less than 50%) of the students be compulsorily intimated to the parents.	Good	A
7	Feedback forms on Curriculum from students	Feedback is taken and analyzed. (**Annexure –II**) Attempts are being made to submit the Feedback online by the students from the current session.	Online feedback procedure should be made compulsory.	Satisfactory	B

		Suggestations and Proposals from students have been carefully analysed. Some of the demands have been fulfilled by the department in the interest of the students.			

** Grade A (Good) / B (Satisfactory) / C (Poor)

III - TEACHING, LEARNING & EVALUATION		**Statement**	**Impression/Recommendation/Remark by Academic Advisors**	**Status**	**Grade**
1	Teaching Diaries & Plans in the Prescribed Formats	The teaching diaries and plans are maintained by all the teachers of the department and those are verified and signed by the Principal.	Well maintained.	Good	A
2	Co-Curricular Activities (Departmental Level)	Students of each year/ semester organized Teachers' Day celebration program every year in the department. They used to participate in the "Chem Quiz" Contest, "Concept Test In Chemistry" conducted by the Department.	Arrangement of Exhibition at least once a year is recommended.	Good	A
3	Degrees offered	UG programs run by the department.	Job-oriented programmes be introduced, if possible.	Good	A
4	Conduct of Internal Examinations-continuous assessment & Mid-Term Test	Continuous assessment is carried out by the department in the form of Class Test, Mid-term test, Concept Test, Surprise Test, Practical Test and Internal Assessment.	Well maintained and documented.	Good	A
5	Remedial Classes	Remedial classes are conducted for each semester as and when required subject to the availability of time and convenience of student and teachers. Sometimes in the remedial classes, evaluated and assessed	Assessed answer scripts reflecting the academic improvement of the students be given to the students to show their parents.	Good	A

		answer scripts are shown to the students for their self-assessment and better understanding of the subject.			
6	Record of Mentoring of students by teachers	Record of mentoring of students by teachers is maintained by the department. However, mentoring is also provided outside the class .	Performances of the students in all respects be intimated to the parents periodically, if possible.	Good	A
7	Result Analysis for the years 2018 & 2019	Result analysis is done according to result sheet provided by the University (**Annexure-III**).After critical analysis of the results ,the students are advised about how to improve both the theoretical and practical marks.	Final result sheet should be well-circulated through college prospectus, website etc.	Good	A

** Grade A (Good) / B (Satisfactory) / C(Poor)

IV - RESEARCH AND CONSULTANCY		**Statement**	**Impression/Recommendation/Remark by Academic Advisors**	**Status**	**Grade**
1	No. of Research Guides in the Department	1 (one)-Annexure-IV(Document attached)	All Departmental teachers be encouraged to complete their Ph.D.	Poor	C
2	No. of Faculty registered for Ph. D (attach details)	One permanent faculty and one Guest faculty have Ph.D.	All Departmental teachers be encouraged to complete their Ph.D.	Satisfactory	B
3	Number of Major/Minor/Other Research Projects (attach details)	Major: Nil Minor: Nil Others: Nil	Other funding agencies may be explored.	Poor	C
4	Number of Research Papers Published in Academic year (Internationals/Nationals Journals) (attach details)	National : Nil International: 1 (**Annexure-IV**	Inadequate.	Satisfactory	B
5	Number of Papers Presented in Academic year 2018 to 2019 (International/National/State Level Conference) (attach details)	International: Nil National : 1 (Annexure-VI) State Level Conference: Nil	Inadequate.	Satisfactory	B
6	Number of Books Published in Academic year 2018 to 2019 (Single Author/Co Author) (attach details)	As a Single Author – Nil As a Co-Author – Nil	Inadequate.	Satisfactory	B
7	Number of Seminars / Workshops / Training Program Conducted in the Academic year (International / National / State) (attach details)	Nil	Efforts to be made to conduct National/International Seminars	Satisfactory	B
8	Student Seminars/ Workshop/ Exhibition/ Project in the Academic Year (other than University)	04 (**Annexure-V**)	Arrangement of Exhibition at least once a year is recommended.	Satisfactory	B
9	Record of Consultancy in Academic year 2018 to 2019 (attach details)	Nil	Initiative should be taken by the college to invite various companies for placement, if possible.	Poor	C
10	Record of MOUs in Academic year 2018 to 2019 (attach details)	Initiatives are being taken by the Department to sign MOUs with adjacent institutions of Bankura University for Faculty exchange, Collaborative Seminers.	Initiative should be taken by the college, if possible.	Poor	C

** Grade A (Good) / B (Satisfactory) / C (Poor)

V - EXTENSION ACTIVITIES		**Statement**	**Impression/Recommendation/ Remark by Academic Advisors**	**Status**	**Grade**
1	Record of Subject/Department Related Extension Activities (attach details)	NIL	Initiative may be taken by the Department.	Poor	C
2	Field Visit (attach records)	NIL	Initiative may be taken by the Department.	Poor	C
3	Industry Visit (attach records)	NIL	Initiative may be taken by the Department.	Poor	C
4	Any Other Club (attach records)	NIL	Initiative may be taken by the Department.	Poor	C
5	Any other social service activity undertaken by the students and teachers/students/teachers of the department (attach records)	Some teachers are members of some non-govt. social organizations.	Adequate	Good	A

** Grade A (Good) / B (Satisfactory) / C (Poor)

Recommendation/Suggestions by Academic Advisors

	Suggestions for improvement/progress of the department	Sheet attached		
			Signatures of Academic Advisor with designation	Seal
	Declaration by the Department	1	(Inspector of Colleges)	Inspector of Colleges (Addl. Charge) Bankura University
		2		
		3		
	Signature of the HOD with date			
	Signature of the Principal with date			

Declaration by the Principal

On behalf of the College Governing Body and as Institutional Head, I will forward the observations by the Academic Advisors to IQAC and also to the Governing Body of the Institution for further necessary action regarding Academic development of the department.

Date:

Signature of Principal
Principal
Bankura Zilla Saradamani Mahila Mahavidyapith

BANKURA ZILLA SARADAMANI MAHILA MAHAVIDYAPITH
DEPARTMENT OF CHEMISTRY
Programme Outcome, Programme Specific Outcome and Course Outcome
For B.Sc. Honours (CBCS Pattern) in Chemistry
2018-2019

Department of Chemistry		After successful completion of three year degree program in Chemistry a student should be able to;
PO	**Programme Outcomes**	**Description**
PO 1	**Sound domain knowledge**	Acquiring sound knowledge of chemical concepts and emerging issues in chemical science.
PO2	**Academic and Scientific Endeavour**	To help the students in developing academic and scientific endeavour by fostering and nurturing the young talent for proper scientific pursuit.
PO3	**Creative and Practical Ability to analyse and deal with data**	Analysis of experimental data and their representation in the form of graphs and plots. Use of statistics as a means to express complicated chemical data.
PO4	**Familiarity with Recent Developments in a Particular Field**	Should be able to apply modern theories and approaches to explain all spatial phenomena and relate nature with human inter relations
PO5	**Environmental Awareness**	Impact of environmental changes on human and how it can be explained at a global and regional perspective.
PO 6	**Laboratory Skill**	The students are exposed to modern equipments in the Laboratory where they get hands-on training which help them to succeed at any entry-level position in chemical industry.
PSO	**Programme Specific Outcomes**	**Description**
PSO 1	**Critical appreciation of the Subject.**	Acquiring sound knowledge on the fundamentals of Physico-chemical concepts and applying them in practical and professional situations.
PSO 2	**Academic and Scientific Endeavour.**	To help the students in developing, Cultivating and demonstrating the art of science learning and teaching by fostering and nurturing the young talent for proper scientific pursuit.
PSO 3	**Scientific Attitude**	Developing the right scientific temper compatible with creative impulse.

PSO 4	**Technical Skill Development**	Creating updated knowledge on research methodology and developing skills in the application oriented Chemistry.
PSO 5	**Environmental Consciousness**	Impact of environmental changes on human and its reflection on society.
PSO 6	**Communication Skill**	Classroom discussions, student seminar ,written assignments, debates etc. help students to develop effective communication skill which will aid them to enhance employability.
PSO 7	**Personality Development**	Personality development skills are likely to help students in their professional and personal lives thus making them responsible and sincere citizens of the socie√ty.
PSO 8	**Spirit of Team Work**	Encouraging students to co-ordinate with one another in a team environment rather than trying to excel individually.
PSO 9	**Basic Human Values**	Study of various texts and mutual interaction among the students inside and outside the class room help the learners to understand human behavioural science.

Course Outcomes B. ScChemistry (Honours Semester-I)	
Course	Outcomes After completion of these courses students should be able
CC-1 Organic Chemistry I	CO-1. To learn about bonding and physical properties of organic molecules CO-2. To learn general treatment of reaction mechanism CO-3. To learn stereochemistry of organic molecules CO-4. To learn separation techniques, determination of boiling point and identification of organic compounds
CC-2 Physical Chemistry I	CO-5. To learn properties and behaviors of gaseous state CO-6. To learn chemical thermodynamics and its application CO-7. To learn kinetics of chemical reactions CO-8. To study kinetics of chemical reactions experimentally and determination of pH and solubility product

Course Outcomes B. Sc Chemistry (Honours Semester-II)	
Course	Outcomes After completion of these courses students should be able

CC-3 Inorganic Chemistry-I	CO-9. To learn about extranuclear structures of atoms CO-10. To learn chemical periodicity CO-11. To learn about acid base reactions, redox reactions and precipitationreactions CO-12. To learn redox titrations (experimentally)
CC-4 Organic Chemistry-II	CO-13. To learn stereochemistry of organic molecules CO-14. To learn general treatment of reaction mechanism CO-15. To learn substitution and elimination reactions in organic chemistry CO-16. To prepare organic compounds, purify them and to determine melting point
Course Outcomes B. Sc Chemistry (Honours Semester-III)	
Course	Outcomes After completion of these courses students should be able
CC-5 Physical Chemistry-II	CO-17. To learn about transport process CO-18. To learn application of thermodynamics in chemistry CO-19. To learn about basic quantum mechanics CO-20. To determine viscosity, partition coefficient, equilibrium constant and to perform conductometric experiments
CC-6 Inorganic Chemistry-II	CO-21. To learn chemical bonding CO-22. To learn radioactivity and nuclear structure CO-23. To learn about iodometric and iodimetric titrationsexperimentally
CC-7 Organic Chemistry-III	CO-24. To learn about chemistry of alkenes and alkynes CO-25. To learn aromatic substitutions CO-26. To learn about carbonyl compounds and organometallic reagents CO-27. To detect special elements and functional groups in organic compounds and to prepare suitablederivatives
SEC-1 Basic Analytical Chemistry	CO-28. To learn about fundamental mathematical procedure and their applications in chemistry CO-29. To learn computer programming for statistical analysis CO-30. To handle numeric data Co-31. To learn about application of basic analytical procedures in chemistry
Course Outcomes B. Sc Chemistry (Honours Semester-IV)	

Course	Outcomes After completion of these courses students should be able
CC-8 Physical Chemistry-III	CO-32. To learn about transport process CO-33. To learn application of thermodynamics in chemistry CO-34. To learn about basic quantum mechanics CO-35. To determine viscosity, partition coefficient, equilibrium constant and to perform conductometric experiments
CC-9 Inorganic Chemistry	CO-36. To learn about general principle of metallurgy CO-37. To learn about chemistry of s and p block elements and also on inorganic polymers CO-3. To learn about basic coordination chemistry CO-38. To studies complexometric titration and inorganic preparation of complex salts
CC-10 Organic Chemistry	CO-39. To studies about nitrogen compounds and various types of name reactions CO-40 To know about the rearrangement reaction and stereochemicalfeachers of aliphatic and aromatic compounds CO-41. To studies retrosynthesis analysis, ring synthesis, asymmetric synthessis CO-42. To learn about UV, IR and NMR spectroscopy CO-43 To learn about the estimation of organic compounds experimentally
SEC-2 Pharmaceutical Chemistry	CO-44. To learn about pharmaceuticals chemistry includingdrugs CO-45. To study about fermentation
Course Outcomes B. Sc Chemistry (Honours Semester-V)	
Course	Outcomes After completion of these courses students should be able
CC-11Inorganic Chemistry IV	CO-46. To learn about VBT and CFT, magnetic, colour properties of coordination compounds CO-47. To study coordination chemistry CO-48. To have idea about 3d, 4d and 5d elements in term of electronic configuration, oxidation states, redox properties, coordination chemistry. CO-49. To learn about the chemistry of transitions metal and lanthanoids and actinoids

CC-12 Organic Chemistry V	CO-50. To learn about heterocyclic compounds and poly nuclear aromatic compounds CO-51. To study about alicyclic ompounds CO-52To understand about pericyclic reactions CO-53. To know about the amino acids and proteins CO-54 To learn about nuclic acids
DSE-1 Advanced Physical Chemistry	CO-55. To learn about Crystal Structure CO-56. To learn about statistical thermodynamics CO-57. To study about Specific heat of solid, 3rd law and Adiabatic demagnetization CO-58. To know about Computer Programming based on numerical methods
DSE-2 Green Chemistry	CO-59. To know about the principles of Green Chemistry and Designing a chemical synthesis CO-60. To study some examples of Green Synthesis/ Reactions CO-61. To learn about Future Trends in Green Chemistry

Programme Outcome, Programme Specific Outcome and Course Outcome For B.Sc. Generic and Programme Cources (CBCS Pattern) in Chemistry 2018-2019

Department of Chemistry		After successful completion of three year degree program in Chemistry a student should be able to;
PO	**Programme Outcomes**	**Description**
PO 1	**Sound domain knowledge**	Acquiring sound knowledge of chemical concepts and emerging issues in chemical science.
PO2	**Academic and Scientific Endeavour**	To help the students in developing academic and scientific endeavour by fostering and nurturing the young talent for proper scientific pursuit.
PO3	**Creative and Practical Ability to analyse and deal with data**	Analysis of experimental data and their representation in the form of graphs and plots. Use of statistics as a means to express complicated chemical data.
PO4	**Familiarity with Recent Developments in a Particular Field**	Should be able to apply modern theories and approaches to explain all spatial phenomena and relate nature with human inter relations
PO5	**Environmental Awareness**	Impact of environmental changes on human and how it can be explained at a global and regional perspective.
PO 6	**Laboratory Skill**	The students are exposed to modern equipments in the Laboratory where they get hands-on training which help them to succeed at any entry-level position in chemical industry.
PSO	**Programme Specific Outcomes**	**Description**
PSO 1	**Critical appreciation of the Subject.**	Acquiring sound knowledge on the fundamentals of Physico-chemical concepts and applying them in practical and professional situations.
PSO 2	**Academic and Scientific Endeavour.**	To help the students in developing, Cultivating and demonstrating the art of science learning and teaching by fostering and nurturing the young talent for proper scientific pursuit.
PSO 3	**Scientific Attitude**	Developing the right scientific temper compatible with creative impulse.

PSO 4	**Technical Skill Development**	Creating updated knowledge on research methodology and developing skills in the application oriented Chemistry.
PSO 5	**Environmental Consciousness**	Impact of environmental changes on human and its reflection on society.
PSO 6	**Communication Skill**	Classroom discussions, student seminar ,written assignments, debates etc. help students to develop effective communication skill which will aid them to enhance employability.
PSO 7	**Personality Development**	Personality development skills are likely to help students in their professional and personal lives thus making them responsible and sincere citizens of the socie√ty.
PSO 8	**Spirit of Team Work**	Encouraging students to co-ordinate with one another in a team environment rather than trying to excel individually.
PSO 9	**Basic Human Values**	Study of various texts and mutual interaction among the students inside and outside the class room help the learners to understand human behavioural science.

Course Outcomes B. ScChemistry Generic Elective and Programme (Semester-I)	
Course	Outcomes After completion of these courses students should be able
GE-1/C-1A	CO-1. To learn about extranuclear structures of atoms CO-2. To learn chemical periodicity CO-3. To learn about acid base reactions, redox reactions and precipitationreactions CO-4. To learn redox reactions CO-5. To learn about fundamental features of organic chemistry CO-6. To learn about stereochemistry CO-7. To study about nucleophilic substitution and elimination reactions CO-8. To learn fundamentals features of alkanes, alkenes and alkynes
Course Outcomes B. Sc Chemistry Generic Elective and Programme (Semester-II)	
Course	Outcomes After completion of these courses students should be able

GE-2 /C-1B	CO-9. To learn about features of gaseous states CO-10. To learn properties of liquids CO-11. To learn about properties of solids CO-12. To learn kinetics of chemical reactions CO-13. To learn about chemical bonding and molecular structures CO-14. To learn about comparative study of p- blockelements CO-15. To study about determination of physical and chemical parameters experimentally CO-16. To learn qualitative semimicro inorganic analysis
Course Outcomes B. Sc Chemistry Generic Elective and Programme (Semester-III)	
Course	Outcomes After completion of these courses students should be able
GE-3 /C-1C	CO-17. To learn about chemical thermodynamics and itsapplication CO-18. To learn equilibrium for chemical reactions CO-19. To learn about equilibrium in ionic solutions CO-20. To learn aromatic hydrocarbon CO-21. To learn about organometallic compounds CO-22. To learn about aryl halides CO-23. To study about alcohols, phenols, ethers and carbonyl compounds CO-24. To learn determination of pH of various solutions CO-25. To identify pure organic compounds
SEC-1 Basic Analytical Chemistry	CO-26. To learn about fundamental mathematical procedure and their applications in chemistry CO-27. To learn computer programming for statistical analysis CO-28. To handle numeric data Co-29. To learn about application of basic analytical procedures in chemistry
Course Outcomes B. Sc Chemistry Generic Elective and Programme (Semester-IV)	
Course	Outcomes After completion of these courses students should be able
GE-4 /CC-1D	CO-30. To learn about the Carboxylic Acids and Their Derivatives CO-31. To study about Amines and Diazonium Salts CO-32. To learn amino acids CO-33 To learn about aromatic nitro compounds. CO-34. To learn carbohydrate chemistry CO-35. To learn about general group trends in periodic table CO-36. To study Lanthanides and actinides CO-37. To learn Coordination chemistry CO-38. To study about Industrial chemistry CO-39. To study Error Analysis and Computer Applications

SEC-2 Pharmaceutical Chemistry	CO-40. To learn about pharmaceuticals chemistry includingdrugs CO-41. To study about fermentation
Course Outcomes B. Sc Chemistry Programme (Semester-V)	
DSE-1A Green Chemistry	CO-42. To know about the principles of Green Chemistry and Designing a chemical synthesis CO-43. To study some examples of Green Synthesis/ Reactions CO-44. To learn about Future Trends in Green Chemistry
SEC-3	CO-45. To know about Uncertainty in experimental techniques and measurement. CO-46. To study Algebraic operations, Differential calculus and Numerical integration. CO-47. To know about basics of Computer programming CO-48. Acquire Practical Knowledge on Handling numeric data, Numeric modelling and tatistical analysis.

Programme Outcome, Programme Specific Outcome and Course Outcome
For B.Sc. Honours (1+1+1 Pattern) In Chemistry
2018-2019

Modalities of Marking

Total Marks: 600 (theoretical) + 200 (Practical) = 800

PART I **Theoretical Marks** Paper I: Inorganic 50 Paper II: Organic 50 Paper III: Physical 50	**Practical** Paper IV: Organic 50
PART II **Theoretical Marks** Paper V: Inorganic 50 Paper VI: Organic 50 Paper VII: Physical 50	**Practical** Paper VIII: Inorganic 50
PART III **Theoretical Marks** Paper IX: Inorganic 100 Paper X: Organic 100 Paper XI: Physical 100	**Practical** Paper XII: 100

Department of Chemistry		After successful completion of three year degree program in Chemistry a student should be able to;
PO	**Programme Outcomes**	**Description**
PO 1	**Sound domain knowledge**	Acquiring sound knowledge of chemical concepts and emerging issues in chemical science.
PO2	**Academic and Scientific Endeavour**	To help the students in developing academic and scientific endeavour by fostering and nurturing the young talent for proper scientific pursuit.
PO3	**Creative and Practical Ability to analyse and deal with data**	Analysis of experimental data and their representation in the form of graphs and plots. Use of statistics as a means to express complicated chemical data.
PO4	**Familiarity with Recent Developments in**	Should be able to apply modern theories and approaches to explain all spatial phenomena and relate nature with human inter relations

	a Particular Field	
PO5	**Environmental Awareness**	Impact of environmental changes on human and how it can be explained at a global and regional perspective.
PO 6	**Laboratory Skill**	The students are exposed to modern equipments in the Laboratory where they get hands-on training which help them to succeed at any entry-level position in chemical industry.
PSO	**Programme Specific Outcomes**	**Description**
PSO 1	**Critical appreciation of the Subject.**	Acquiring sound knowledge on the fundamentals of Physico-chemical concepts and applying them in practical and professional situations.
PSO 2	**Academic and Scientific Endeavour.**	To help the students in developing, Cultivating and demonstrating the art of science learning and teaching by fostering and nurturing the young talent for proper scientific pursuit.
PSO 3	**Scientific Attitude**	Developing the right scientific temper compatible with creative impulse.
PSO 4	**Technical Skill Development**	Creating updated knowledge on research methodology and developing skills in the application oriented Chemistry.
PSO 5	**Environmental Consciousness**	Impact of environmental changes on human and its reflection on society.
PSO 6	**Communication Skill**	Classroom discussions, student seminar ,written assignments, debates etc. help students to develop effective communication skill which will aid them to enhance employability.
PSO 7	**Personality Development**	Personality development skills are likely to help students in their professional and personal lives thus making them responsible and sincere citizens of the socie√ty.
PSO 8	**Spirit of Team Work**	Encouraging students to co-ordinate with one another in a team environment rather than trying to excel individually.
PSO 9	**Basic Human Values**	Study of various texts and mutual interaction among the students inside and outside the class room help the learners to understand human behavioural science.
<u>Course Outcomes B. ScChemistry (Honours Part-I)</u>		

Paper-I (Inorganic Chemistry)	CO-1. To learn about atomic structure and periodic properties of elements CO-2. To learn chemical bonding and structures of covalentcompounds CO-3. To learn about acid base reactions CO-4. To study redox reactions CO-5. To study coordination chemistry
Paper-II (Organic Chemistry)	CO-6. To learn about nomenclature of organic molecules CO-7. To learn about structures and properties of aliphatic, aromatic compounds CO-8. To learn about the introduction to organic reactions CO-9. To know about the reactive intermediates CO-10. To study about stereochemistry CO-11. To study about aliphatic nucleophilic substitution reactions CO-12. To know about elimination reactions
Paper-III Physical Chemistry	CO-13. To learn about kinetic theory of gas CO-2. To learn about basic thermodynamics CO-14. To learn about detailed thermodynamics and different types of expression CO-15. To study chemical kinetics
Paper-IV Organic Chemistry Practical	CO-16. To study about qualitative analysis of organic samples CO-17. To investigate different types of organic preparation
Course Outcomes B. Sc Chemistry (Honours Part-II)	
Course	Outcomes After completion of these courses students should be able
Paper-V (Inorganic Chemistry)	CO-18. To learn about VBT and CFT, magnetic, colour properties of coordination compounds CO-19. To learn about the chemistry of normal, inert gases, transitions metal and lanthanoids and actinoids
Paper-VI (Organic Chemistry)	CO-20.To learn about stereochemistry of organiccompounds CO-21. To learn about electrophilic and radiacl addition CO-22. To learn about nucleophilic addition of carbonyl group CO-23. To know about the molecular rearrangement

	CO-24. To study about reagents in organic synthesis CO-25. To study about named reactions CO-26. To know about alicyclic compounds CO-27. To understand about synthesis of organiccompounds CO-28. To investigate about the aromatic electrophilicsubstitution CO-29. To learn about aromatic nucleophilic substitution reactions
Paper-VII Physical Chemistry	CO-30. To learn about thermodynamics and equilibrium CO-31. To learn about phase equilibrium and colligative properties CO-32. To learn about chemical kinetics CO-4. To study about properties of fluids CO-5. To know about macromolecules
Paper-VIII Inorganic Chemistry Practical	CO-33. To study qualitative analysis of inorganicsamples CO-34. To investigate different types of inorganicpreparation
Course Outcomes B. Sc Chemistry (Honours Part-III)	
Course	Outcomes After completion of these courses students should be able
Paper-IX (Inorganic Chemistry)	CO-35. To learn about the chemistry of inorganic solids CO-36. To learn about inorganic reaction mechanism CO-37. To learn about the use of metal ions in living system CO-38. To understand organometallic compounds CO-39. To about the synthesis, structure and bonding of carbonyl, nitrosyl and organic compounds CO-40. To learn about nano and supramolecular chemistry CO-41. To clarify about nuclear and radioanalytical chemistry CO-42. To learn about statistical methods in analytical chemistry CO-43. To know about different types of volumetric analysis, titrations, electroanalytical analysis and spectrophotometric analysis CO-44. To know about methodologies in separation chemistry
Paper-X (Organic Chemistry)	CO-45. To learn about chemistry of dyes CO-46. To learn about medicinal chemistry CO-47. To learn about heterocyclic compounds CO-48. To know about the amino acids and proteins

	CO-49. To study about carbohydrates CO-50. To study about alkaloids and terpinoids CO-51. To know about synthetic methodologies CO-52. To understand about pericyclic reactions CO-53. To investigate about the spectral features of organic compounds CO-54. To learn about nuclic acids CO-55. To learn about green chemistry
Paper-XI Physical Chemistry	CO-56. To learn about conductive properties of electrolytic solutions CO-57. To learn about electrochemical cell CO-58. To learn about properties of solids and crystallography CO-59. To study about surface chemistry and adsorption CO-60. To know about colloids CO-61. To learn about electrical properties of molecules CO-62. Learn about symmetry elements and group theory CO-63. To learn about application of quantum theory to chemical systems CO-64. To learn theoretical background of photochemical features and spectral features of elements and compounds CO-65. To learn about statistical thermodynamics
Paper-XII Inorganic, Analytical and Physical Chemistry Practical	CO-66. To study quantitative analysis of inorganic mixtures by redox and complexometric methods CO-67. To investigate titrimetric and colorimetric analysis CO-68. To learn about various physical and chemical properties, to study kinetics of chemical reactions and conductometric and potentiometric titration

Programme Outcome, Programme Specific Outcome and Course Outcome
For B. Sc. General (1+1+1 Pattern) in Chemistry
2018-2019

Total Marks: 265 (theoretical) + 135 (Practical) = 400

PART I **Theoretical Marks** Paper I: Group A: General principles 50 Group B: Organic 50	Practical -20
PART II Paper II: Group A: Inorganic 50 Group B: Physical 50	**Practical Marks** Paper III: Qualitative (Inorganic + Organic) 65 Laboratory Note Book 05 Viva-Voce 10
PART III **Theoretical Marks** Paper IV: Chemistry (General) 65	**Practical** Paper V: Inorganic Quantitative 35

COURSE OUTCOME FOR CHEMISTRY GENERAL

Paper I

Module -General Principles

Group A

COURSE	OUTCOME
Unit-1 :Atomic Structure Bohr's theory: energy and radius calculations for H-like atoms, dual nature of matter and light, de Broglie's relationship, Heisenberg's uncertainty principle (qualitative), quantum numbers, Pauli exclusion principle, qualitative introduction of orbitals, shapes of orbitals, electron distribution of elements - Aufbau principle and Hund's rule.	Outcome : 1.1 Students have been exposed to the important features of the quantum mechanical model of atom. 1.2 Bohr's theory, de Broglie relation, Heisenberg uncertainty Principle, Pauli Exclusion Principle, Aufbau Principle all stated and explained.
Unit -2 :Radioactivity Theory of disintegration, rate constant, half life period (their interrelationship – deduction) idea of disintegration series, artificial transmutation and artificial radioactivity, uses and abuses of radioactivity. Stability of atomic nucleus, n/p ratio, mass defect, binding energy.	Outcome : 2.1 Students are able to understand the nature of the nucleus and the nuclear properties that are of most importance inchemistry and mankind. 2.2 Students are also familiarized with how the use of both radioactive and stable isotopes has aided in the determination of the mechanisms of simple chemical reactions and complex biological processes.
Unit-3 :Periodic Table and Periodic Properties Periodic law, Periodic classification of elements on the basis of electron distribution, s-, p- and d-block elements, connection among valencies, electron distribution and positions of the elements in the long form of the periodic table. Periodic properties: atomic radii, ionic radii, covalent radii, ionisation energy, electron affinity, electronegativity and its different scales.	Outcome : 3.1 Students will be able to learn how with the help of Periodic law it is possible to organise and to systematise the chemistry of the elements into a manageable subject. 3.2 Students will be able to appreciate how the concept of grouping elements in accordance to their properties led to the development of the Periodic Table. 3.3 Classify elements into s, p, d blocks and learns their main characteristics.
Unit-4 :Chemical Forces and Molecular Structure Ionic bond, covalent bond (octet rule and expanded octet), dative bond, deformation of ions and Fajan's rules, Born-Haber cycle, hydrogen bond: intra- and intermolecular, bond polarity and dipole moment. Bond lengths, bond angles and qualitative description of shapes of some simple molecules like CO2, SO2, H2O, BeCl2, BF3, NH3, CH4, C2H4, C2H2, C6H6.	Outcome : 4.1 Students will be able to explain the formation of different types of bonds. 4.2 Students will understand the important parameters associated with chemical bonds like bond length, bond angle, bond enthalpy, bond order, and bond polarity. 4.3 Students will appreciate the different types of hybridization and draw the shapes of simple covalent molecules.
Unit- 5 : Oxidation and Reduction Electronic concepts, oxidation number, ion-electron method of balancing equations,	Outcome : 5.1 Mechanism of redox reactions by electron transfer process is explained.

application of redox reactions, idea of standard potential and formal potential. Derivation of thermodynamic quantities of cell reactions (ΔG, ΔH and ΔS).	5.2 Students will learn how to balance chemical equations using ion-electron method. 5.3 Student will be able to understand the concept of redox reactions in terms of electrode processes.

Unit-6 :Acids and Bases, Buffers and Ionic Equilibrium Different concept of acids and bases, ionic product of water, salt hydrolysis, pH and its colorimetric determination, Strengths of strong and weak acids and bases, Ostwald dilution law, Henderson equation, neutralization and acid-base indicators, buffers, common ion effect, solubility product (application in analytical chemistry)	Outcome : 6.1 This unit offers the students a chance to learn general principles which are important in industrial, analytical, and physiological chemistry. 6.2 Students are exposed to different modern theories of acids and bases and different equilibrium processes involved in solutions of acids, bases and salts. 6.3 The pH scale, Henderson equation, Mechanism of Buffer action ,Solubility Product all explained in details.

Group B

Module - <u>Organic Chemistry</u>

Unit- 7:Functional Nature of Organic Compounds Classification of organic compounds in terms functional groups, their IUPAC nomenclature and valence bond structures.	Outcome : 7.1 Students will be able to understand the classification of organic compounds on the basis of functional groups. 7.2 They will appreciate the reasons for the tetra valence of carbon and shapes of organic molecules and their valence bond structures. 7.3 Students will be able to name the compounds according to IUPAC system.
Unit-8:Electron Displacement in Molecules Concept of Inductive effect, Electromeric effect, Hyperconjugation, Resonance, Aromaticity and Tautomerism.	Outcome : 8.1 Students are exposed to understand the influence of electronic displacements on structure and reactivity of organic compounds.
Unit-9:Introduction to Organic Reaction Mechanism Homolytic and heterolytic bond cleavage; Reaction intermediates: carbocation, carbanion, free radical. Classification of organic reactions (substitution, elimination, addition and rearrangement) and reagent types (electrophiles, nucleophiles, acids and bases), Ideas of organic reaction mechanism (SN1, SN2, E1 and E2).	Outcome : 9.1 Student will learn and understand the basic concept of organic reaction mechanism. 9.2 They will also be able to identify the different types of organic reactions and mechanisms and classify their categories.

Unit-10:Chemistry of Hydrocarbons a) Free radical substitutions of alkanes; b) Formation of alkenes, electrophilic addition reactions of alkenes (upto four carbon atoms), Markwonikoff's rule, peroxide effect, ozonolysis, radical addition and catalytic reductions; c) Formation of alkynes, their partial and complete reductions and hydration. Halogen derivatives of alkanes, their nucleophilic substitutions and elimination reactions.	Outcome : 10.1 Student will learn various methods of formation of alkanes, alkenes and their important physical and chemical properties. 10.2 They will be able to predict the formation of the addition and substitution products of alkanes , alkenes, and alkynes on the basis of their electronic mechanism.
Unit-11 :Mono and Bifunctional Compounds Preparations and properties of primary, secondary and tertiary monohydric alcohols, ethers, ethylene glycol, pinacol and glycerol; aldehydes and ketones; monocarboxylic acids and their derivatives: acid chlorides, anhydrides, esters, amides; amines; unsaturated alcohol (allyl alcohol), unsaturated aldehyde (acrolein), unsaturated carboxylic acid (acrylic acid), unsaturated ester (methyl acrylate), di- and tribasic acids (oxalic, malonic, succinic acids; malic and citric acids).	Outcome : 11.1 This unit describes the preparation , physical properties and main chemical reactions of alcohols, ethers, glycerol ,aldehydes and ketones, amides, amines , acids and esters.
Unit-12: Stereochemistry Concept of optical activity, optical properties of lactic acid and tartaric acid, *D,L* and *R,S* nomenclature; Geometrical isomerism with reference to fumaric acid and maleic acid; *cis-trans* and *E, Z* nomenclature.	Outcome : 12.1 This unit deals with the study of molecules in three dimensions. 12.2 Students learn how atoms in a molecule are arranged in space relative to one another. 12.3 Three main aspects of stereochemistry are covered in this unit i.e. geometric isomers,conformation of molecules and chirality of molecules along with cis-trans and E , Z nomenclature.
Unit-13: Chemistry of Aromatic Compounds Modern concept of structure of benzene, general mechanism of aromatic electrophilic substitution reactions, preparations and properties of toluene, xylene, halobenzenes, benzyl chloride, benzoyl chloride, benzotrichloride, nitrobenzene, dinitrobenzene, TNT, aniline, methyl and dimethyl aniline, benzyl amine benzene diazonium chloride, phenols, benzyl alcohol, benzaldehyde, acetophenone, benzoic acid, anhydride, amides, esters; phenyl acetic acid, salicylic acid, cinnamic acid, sulphanilic acid, phenyl hydrazine, nitrophenols and picric acid.	Outcome : 13.1 This unit formalizes the definition of aromaticityand discusses the properties and reactions of benzene and substituted benzenes. 13.2 Students will be familiarised with the modern concept of structure of benzene and general mechanism of aromatic electrophilic substitution reactions. 13.3 They will be able to draw orbital picture of aromatic compounds and explain the origin of directive effect.
Unit-14: Organic Synthesis Preparation and synthetic uses of diethyl malonate and ethylacetoacetate. Application of	Outcome : 14.1 Students will get acquainted with the preparation and synthetic uses of diethyl malonate and ethyl

Grignard reagents in synthesis of ketones, secondary and tertiary alcohols and carboxylic acids.	acetoacctata. 14.2 Application of Grignard reagents in the synthesis of ketones, alcohols, and carboxylic acids.
Unit-15: Carbohydrates Open-chain and ring structures glucose, fructose and their mutarotation, idea of dissacharides with reference to cane sugar.	Outcome : 15.1 Students are able to differentiate between open-chain and ring structure of glucose, fructose and their important properties.

PART II

Paper II

Group A

Module - Inorganic Chemistry

Unit-16: Coordination Chemistry Double and complex salts, Werner's theory, ligands, coordination number, inner metallic complexes, chelate effect, different types of isomerism, IUPAC nomenclature.	Outcome : 16.1 Students will be able to appreciate the nature of bonding in co-ordination compounds. 16.2 They will learn about primary and secondary valences, IUPAC nomenclature of complexes, different types of structural and stereo-isomers, Chelate effect.
Unit-17:Group Chemistry **Group 1**: Hydrogen – isotopes and binary hydrides, lithium and its similarities and differences from other alkali metals, diagonal relationship with magnesium, lithium aluminium hydrides. **Group 2:** Calcium, stroncium and barium, hydrolith, calcium cyanamide, gypsum and plaster of paris. **Group 12:** Zinc, cadmium and mercury. Nesslar's reagent, Millon's base. **Group 13:** Diborane, boron trifluoride, sodium borohydride, inorganic benzene. **Group 14:** Carbon, silicon, tin and lead, carbide, silicon carbide, silica, sodium silicate. Silica gel, hydrofluorosilicic acid, silicon tetra chloride, glass, fullerene. **Group 15:** Nitrogen, phosphorus, arsenic, antimony and bismuth, hydrazine, hydrazoic acid, hydroxyl amine, hyponitrous acid, phosphorus oxyacids (H_3PO_2, H_3PO_3, H_3PO_4, $H_4P_2O_7$ and HPO_3), sodium bismuthate. **Group 16:** Oxygen and sulphur, composition and structure of ozone, oxyacids of sulphur (H_2SO_3, H_2SO_4, $H_2S_2O_3$,$H_2S_2O_8$), persulphate **Group 17:** Fluorine, chlorine, bromine and iodine, oxides and oxyacids of chlorine, isolation of fluorine. **Group 18:** Rare gases (isolation and uses) with special reference to general fluorides (structure)	Outcome : 17.1 This unit describes and explain the general characteristics of the alkali and alkaline earth metals. 17.2 Students will be able to present informed opinions on the position of Hydrogen in the periodic table. 17.3 Students will appreciate the general trends in the chemistry of p-block elements. 17.4 Students will be able to understand the trends in physical and chemical properties of group 12 to group 18 elements.

Unit-18 :Transition Metals **Groups 6** and **7:** Chromium, manganese, K2CrO4, K2Cr2O7, CrO2Cl2, KMnO4, chrome alum. **Groups 8, 9** and **10:** Iron, cobalt and nickel, principles of isolation of Ni (excluding details), composition and uses of alloys, steels, rusting of iron, galvanization and tin plating **Group 11**: Cu, Ag, Au, principles of Ag and Au isolation, different valency states	Outcome : 18.1 Students will appreciate the general trends in the chemistry of group 6 to group 11 elements. 18.2 They will know the principles of isolation and different valency states of coinage metals.

Group B

Module - <u>Physical Chemistry</u>

Unit-19 : Kinetic Theory of Gases Ideal gas equation, derivation of gas laws, Maxwell's speed and energy distributions (derivation excluded); distribution curves; different types of speeds and their significance, concept of equipartition principle, van der Waals equation, Virial equation, continuity of state, Boyle temperature, critical constants, specific heats and specific ratios, laws of partial pressure, vapour density and density method of determination of molecular weights, limiting density, abnormal vapour density, frequency of binary collisions; mean free path	Outcome : 19.1 To understand the basic assumption of Kinetic theory. 19.2 To develop the concept of pressure and temperature on the basis of kinetic theory of gases. 19.3 Collision phenomenon and mean free path are treated in brief. Distribution of velocities is discussed in detail. 19.4 Maxwell's speed distribution in one, two and three dimension are derived. 19.5 Different types of velocities, equipartition principle and heat capacity of gases discussed.
Unit-20 :Thermodynamics Thermal equilibrium and zeroth law, First law, reversible and irreversible work, criteria of perfect gas, isothermal and adiabatic expansions, Joule-Thomson effect (derivation excluded); Thermochemistry: Hess's law and its application Second law and its elementary interpretation, Carnot's cycle and theorems, Clausius inequality, criteria of spontaneity, free energy and entropy	Outcome : 20.1 To introduce students to some basic concepts of thermodynamics including heat, energy, work. 20.2 Reversible and Irreversible processes, perpetual motion 1st law. 20.3 Enable students to learn about thermodynamics equations and the related laws. 20.4 The second law provides proper information about spontaneous processes and the direction of a particular spontaneous transformation can also be obtained with its help. 20.5 The concept of entropy is developed through Carnot cycle and other auxiliary state functions have been introduced. 20.6 The concept of inversion temperature is introduced through Joule- Thomson experiment.
Unit-21: Equilibrium Conditions of spontaneity and equilibrium,	Outcome :

degree of advancement and Le Chatelier principle; Van't Hoff isotherm, isobar and isochore	21.1 In this unit free energy considerations have been applied to reacting systems. 21.2Simple chemical reactions, their equilibrium positions and applications of Le Chatelier principle are discussed. 21.3Thermodynamic applications have also been considered.
Unit-22 : Phase Equilibria and Colligative Properties Phase rule equation (derivation excluded); phase diagram of water system, Miscibility (phenol-water) and distillation of completely miscible binary liquid mixtures; azeotropes, Steam distillation Graphical approach of Raoult's law of vapour pressure and colligative properties: osmosis, lowering of freezing point, elevation of boiling point, experimental methods of determination of molecular weights of substances in dilute solutions, van't Hoff 'i' factor and abnormal behaviour of electrolytic solutions	Outcome : 22.1 Statement and derivation of phase rule done to interpret and explain various physical changes that occur frequently in one component systems. 22.2The solution process is explainedthermodynamically. Different concentration terms are interrelated. 22.3 Ideal solution and ideally dilute solutions are defined. 22.4 Colligative properties are defined ,explained and studied. Deviations are also explained.
Unit-23: Properties of Matter Viscosity of fluids, temperature and pressure dependence, Surface energy and surface tension of liquids: temperature dependence Unit cell, Bravais lattice; crystal system, Miller indices; Bragg's equation and its applications	Outcome : 23.1 This unit deals with the internal and external structure and properties of crystals. 23.2Miller notations for specifying crystal faces and planes have been explained. 23.3X-ray diffraction and Powder diffraction method treated for structural analysis sodium chloride. Crystal planes ,interplanar distance and indexing of planes are explained. Different types of crystal systems are discussed. Bragg method of X-ray structural analysis of crystals discussed.
Unit-24: Electrochemistry Electrolytic conduction, transport number (experimental determination excluded), velocity of ions: specific, equivalent and molar conductances, determination of equivalent conductivity of solutions, Kohlrausch's law, strong and weak electrolytes, Ion atmosphere; electrophoretic and relaxation effects, Debye-Huckel theory (qualitative) and the limiting law. Electrochemical cells, half-cells (with	Outcome : 24.1 This sectiondeals withsolutions of electrolytes and the phenomena occurring at the electrodes. 24.2The students will study the effects of of the passage of a current through electrolytes. The properties of electrolyte solutions are discussed. 24.3Methods of experimental determination of Specific conductance are discussed. Some applications of conductance measurements are explained.

types and examples), Nernst equation and standard electrode potentials, standard cells	24.4 Experimental methods of determination of transport number are outlined. The effects of frequency and voltage on conductance of solution are explained.
Unit-25: Chemical Kinetics Order and molecularity of reactions, integrated rate laws (first and second order), average life period, concept of Arrhenius activation energy Catalysis, autocatalysis, enzyme catalyst, catalyst poisons, promoters, elementary treatment of mechanism of catalysis	Outcome : 25.1 This unit deals with the rates of chemical reactions. The rate equation, order and molecularity are defined. Kinetic experiments are outlined. Methods are suggested for determining the order of reactions. Different types of simultaneous reactions have been discussed. 25.2The role of temperature and theories of reaction rates have been discussed. The mechanism and methods of proposing it are outlined. Uni and bi molecular reactions are analysed. 25.3Activation energy concept is enumerated. Finally some aspects of collision and transition state theory are discussed.
Unit-26: Photochemistry and Spectroscopy Absorption, Lambert-Beer's law, photochemical laws, primary photophysical processes, potential energy diagram, Franck-Condon principle, fluorescence and phosphorescence, Jablonsky diagram, Laws of photochemistry, quantum yield, kinetics of HI decomposition, H2-Br2 reactions Elementary idea of rotational and vibrational spectra	Outcome : 26.1 The study of photochemistry embraces all of the phenomenon associated with absorption and emission of radiation . 26.2 It deals with that are mainly spectroscopic, such as fluorescence and phosphorescence. 26.3 Student will be in a position to understand and interpret absorption of radiation and Lambert-Beer's law. They should be able to explain the kinetics of photochemical reactions. 26.4 Elementary idea of rotational and vibrational spectra introduced.

Module - Practical

Paper III

Unit - 27 :Inorganic Qualitative Detection of three radicals by analysis of mixture containing not more than three radicals from the following list (insoluble salts excluded) Silver, lead, mercury, bismuth, copper, cadmium, arsenic, antimony, tin, iron, aluminium, chromium, zinc, manganese, cobalt, nickel, calcium, strontium, barium, magnesium, sodium, potassium, ammonium and their oxides, hydroxides, chlorides, bromides, iodides, sulphates, sulphites, sulphides, thiosulphates, chromates, phosphates, nitrites, nitrates and borates.	Outcome : 27.1 The goal of this unit is to provide the students with enough chemical tests for individual metal ions ,non-metal ions and radicals. 27.2 Students will be able to carry out qualitative analysis of unknown inorganic sample containing not more than three radicals.
Unit – 28 : Organic Qualitative Detection of elements (N, S, Cl) and any one of the following groups in organic compounds (solid only): -NH2, -NO2, -CONH2, -OH, >C=O, -CHO, -COOH	Outcome : 28.1 The goal of this unit is to provide the students with enough chemical tests for the detection of elements and functional groups present in a solid organic compound.

PART III
Paper IV

Module - Chemistry (General)

Unit-29: Analytical Chemistry (a) Accuracy and precision in analysis, types of errors, data analysis and curve fitting (linear Y = mX + C type), numerical problems, mean, mode and variant (b) Principles of acid-base titration, use of indicators and indicator constant, titration of Na2CO3 + NaHCO3 mixture vs HCl using different indicators, estimation of mixture of strong and weak acids, qualitative discussion of salt hydrolysis (no derivation) (c) Single electrode potential and emf of a chemical cell, principles of redox titration, use of redox potentials, iodometry, iodimetry, use of K2Cr2O7 and KMnO4 as oxidant (acid, neutral and alkaline media)	Outcome : 29.1 To instil among the students the basic knowledge of Accuracy and Precision in quantitative analysis. 29.2 To give a thorough understanding of mean ,mode , variant and standard deviation and their use in data analysis and curve fitting. 29.3 Student will be familiar with the principles of acid-base titration, redox titration, iodometry and iodimetry.
Unit-30 :Green Chemistry Basic principles of green chemistry. Tools of green chemistry including the use of alternative feed stocks or starting materials, reagents, solvents, target molecules, and catalysts	Outcome : 30.1 Students will appreciate the importance of green chemistry tn day to day life. 30.2 Understand the basic principles and tools of green chemistry.

(homogeneous, heterogeneous and biocatalysis), green chemistry as the alternative chemistry for protection of environment.	30.3 Develop green chemistry as the alternative chemistry for the protection of environment.
Unit-31 : Chemistry of Selected Biomolecules Structural aspects (excluding elucidation and stereochemistry, unless specified) and important function of d/l-sucrose and polysaccarides (starch and cellulose), amino acids (classification, essential amino acids like glycine, alanine, methionine and tryptophan with d/l), proteins (special reference to the peptide bond, action of haemoglobin, idea of denaturation of proteins, classification and functions of enzymes in general), pyrrole, pyridine, pyrimidine and purine, nucleic acids (DNA and RNA), nucleotide and nucleoside.	Outcome : 31.1 In this unit the students will learn that Biomolecules like proteins, carbohydrates, amino acids, nucleic acids are present in extraordinary variety and most of them are extremely complex. 31.2 They will be able to understand the properties and functions of enzymes, nature of peptide bond, denaturation of proteins, structure and functions of Nucleic acids, action of haemoglobin.
Unit-32 :Medicinal Chemistry Antipyretics and analgesics like paracetamol and aspirin, sulpha-drugs like sulphadiazine, antibiotics like penicillin and chloramphenicol, ofloxacin; antiamoebic like metronidazole, anticancer drugs, drugs used for AIDS (detailed structures are not needed, only the nature and function of the drugs)	Outcome : 32.1 Students will appreciate how chemistry plays an important role in improving the quality of human life. 32.2 They will be able to understand how medicines are used to prevent or reduce sufferings caused by diseases. 32.3 Nature and function of antibiotics, anticancer drugs,drugs used for AIDS.
Unit-33 :Nano Chemistry Elementary idea on nano materials. Basic chemical strategy for making nanomaterials. Nanoclusters, Nanowires and Carbon Nanotubes. Applications.	Outcome : 33.1 Students are exposed to the elementary ideas on nano-materials. 33.2 Basic chemical strategy for making nano-materials. 33.3 Students will be familiarised with Nanoclusters, Nanotubes, Nanowires.
unit-34: Colloidal State General classification, general methods of preparation of lyophobic colloids and general properties of colloids, ideas of coagulation, peptization, protective colloids, dialysis, gold number, isoelectric point, Brownian motion	Outcome: 34.1 Students get acquainted with the general methods of preparation of different types of colloids. 34.2 They will get ideas on coagulation ,.peptization, protective colloids, origin of charge on colloids.
unit-35 : Macromolecular Chemistry Introduction, definition of macromolecules, natural and synthetic polymers, monomers, polymers, degree of polymerization, simple idea of polymer structure: homopolymer (linear, branched, cross-linked) and copolymer (random, block, graft), polymerization reaction step (growth, addition, ring opening), importance of polymers both natural and synthetic Number and weight average molecular weights of polymers – significance, structure and use of natural rubber, synthetic rubber (neoprene), synthetic fibres	Outcome : 35.1 Students will be able to explain the terms monomer, polymer, degree of polymerisation, and appreciate their importance. 35.2 They will understand the distinction between various classes of polymers and different types of polymerisation processes. 35.3 Student will appreciate the formation of polymers from mono and bi-functional monomer molecules. 35.4 They will also appreciate the importance of polymers in daily life.

(Nylon 66, poly ester), plastics like polyethylene and PVC, macromolecules and environment	

Module – Practical **Paper V**

Unit 36 :Inorganic Quantitative a. Titration of Na_2CO_3 + $NaHCO_3$ mixture vs HCl using phenolphthalein and methyl orange indicators b. To find the total hardness of water by EDTA titration c. To find the pH of an unknown solution by comparing colour of a series of (HCl solutions + 1 drop of methyl orange) and a similar series of (NaOH solutions + 1 drop of phenolphthalein) d. Estimation of saponification equivalent of a supplied ester/oil e. Titration of ferrous iron by $KMnO_4/K_2Cr_2O_7$ f.Titration of ferric iron by $KMnO_4/K_2Cr_2O_7$ using $SnCl_2$ reduction	Outcome : 36.1 The students will be exposed to inorganic quantitative analysis by performing (a) Acid-base titration (b) Redox titration (c) Complexometric titration.

Program Outcome (PO): B.Sc.(General) Chemistry

PO	Program Outcome	Description
PO 1	**Sound domain knowledge**	**Acquiring sound knowledge of chemical concepts and emerging issues in chemical science.**
PO2	**Academic and Scientific Endeavour**	**To help the students in developing academic and scientific endeavour by fostering and nurturing the young talent for proper scientific pursuit.**
PO3	**Creative and Practical Ability to analyse and deal with data**	**Analysis of experimental data and their representation in the form of graphs and plots. Use of statistics as a means to express complicated chemical data.**
PO4	**Familiarity with Recent Developments in a Particular Field**	**Should be able to apply modern theories and approaches to explain all spatial phenomena and relate nature with human inter relations**
PO5	**Environmental Awareness**	**Impact of environmental changes on human and how it can be explained at a global and regional perspective.**
PO 6	**Laboratory Skill**	**The students are exposed to modern equipments in the Laboratory where they get hands-on training which help them to succeed at any entry-level position in chemical industry.**

BANKURA ZILLA SARADAMANI MAHILA MAHAVIDYAPITH
Department of Chemistry

Program Specific Outcome (PSO): B.Sc.(General) Chemistry

PSO	Program Specific Outcome	Description
PSO 1	**Critical appreciation of the Subject.**	Acquiring sound knowledge on the fundamentals of Physico-chemical concepts and applying them in practical and professional situations.
PSO 2	**Academic and Scientific Endeavour.**	To help the students in developing, Cultivating and demonstrating the art of science learning and teaching by fostering and nurturing the young talent for proper scientific pursuit.
PSO 3	**Scientific Attitude**	Developing the right scientific temper compatible with creative impulse.
PSO 4	**Technical Skill Development**	Creating updated knowledge on research methodology and developing skills in the application oriented Chemistry.
PSO 5	**Environmental Consciousness**	Impact of environmental changes on human and its reflection on society.
PSO 6	**Communication Skill**	Classroom discussions, student seminar ,written assignments, debates etc. help students to develop effective communication skill which will aid them to enhance employability.
PSO 7	**Personality Development**	Personality development skills are likely to help students in their professional and personal lives thus making them responsible and sincere citizens of the socie√ty.
PSO 8	**Spirit of Team Work**	Encouraging students to co-ordinate with one another in a team environment rather than trying to excel individually.
PSO 9	**Basic Human Values**	Study of various texts and mutual interaction among the students inside and outside the class room help the learners to understand human behavioural science.

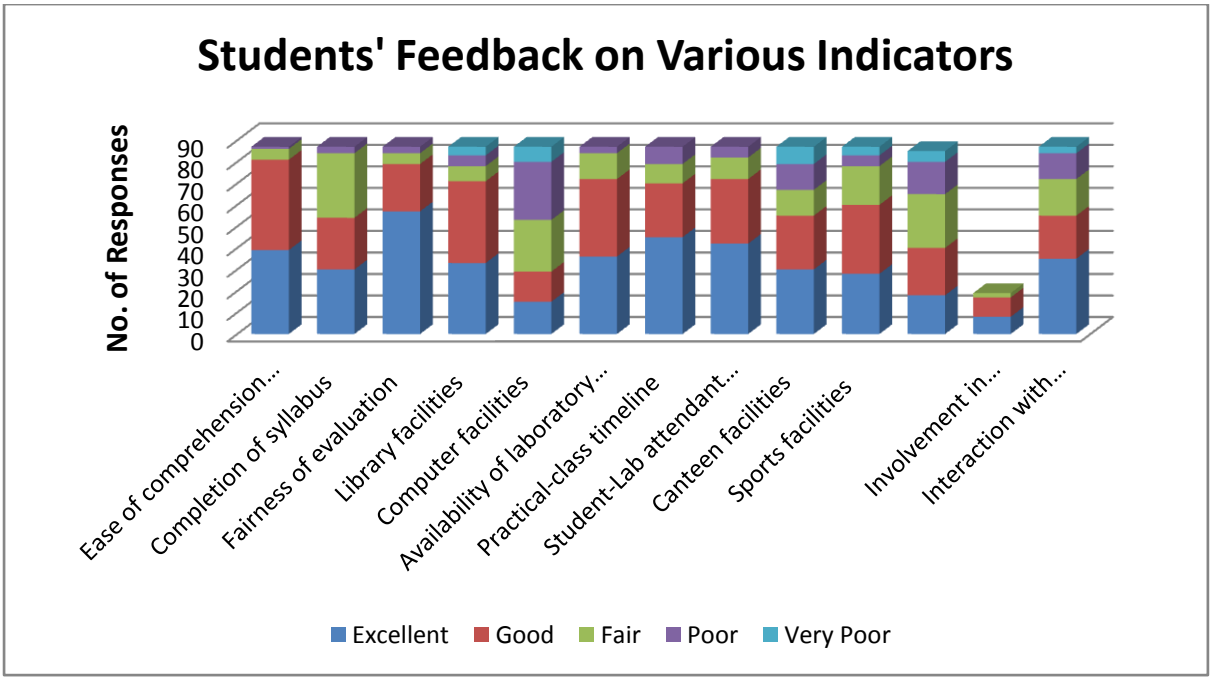
Annexure-II
Feedback Analysis
Department of Physics
Session: 2018 -19

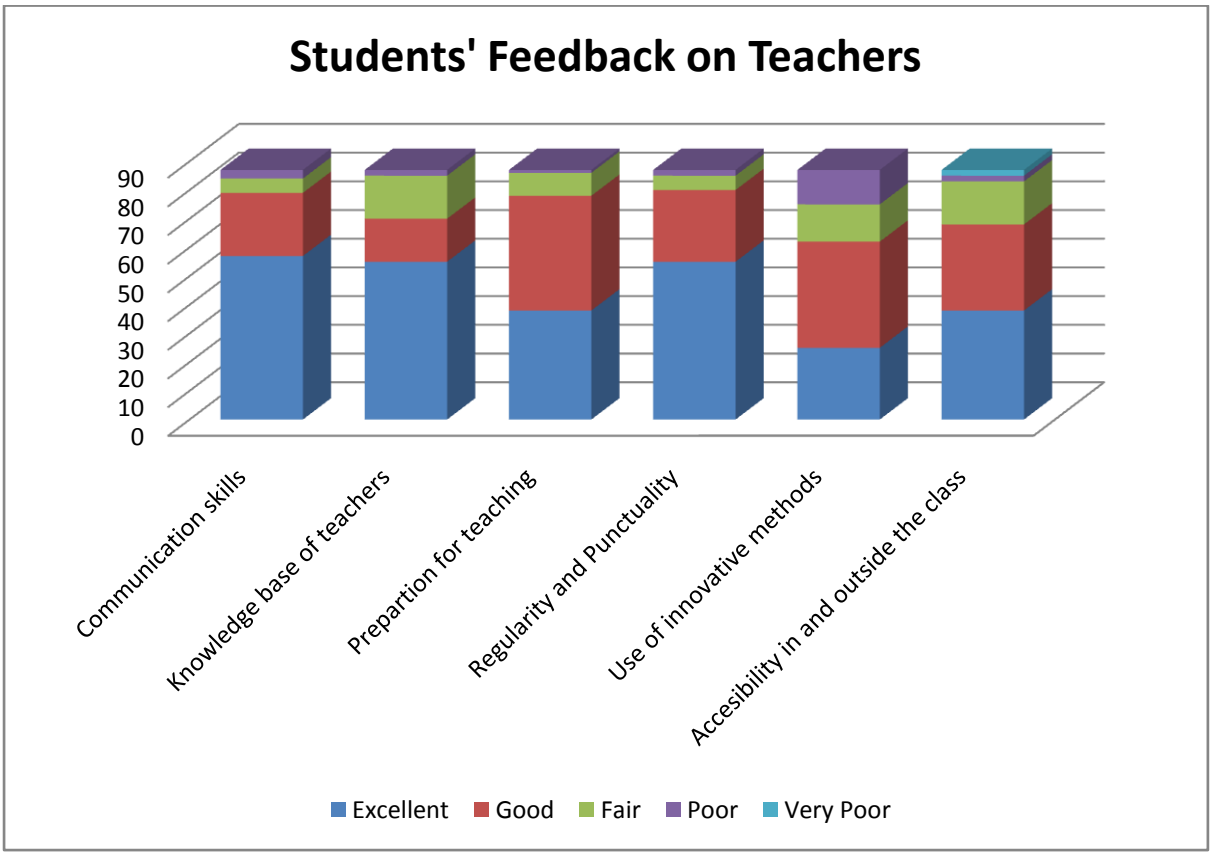
Students' Class/Year of study		No. of students participated	Total no. of students participated
1st year	Honours	**21**	**87**
	General	**26**	
2nd year	Honours	**12**	
	General	**20**	
3rd year	Honours	**5**	
	General	**3**	

Students' Feedback (2018-19) No. of Responses						
Questions	Excellent	Good	Fair	Poor	Very Poor	
Ease of comprehension of subjects taught	39	42	5	1		87
Completion of syllabus	30	24	30	3		87
Fairness of evaluation	57	22	5	3		87
Library facilities	33	38	7	5	4	87
Computer facilities	15	14	24	27	7	87
Availability of laboratory equipments and Chemicals	36	36	12	3		87
Practical-class timeline	45	25	9	8		87
Student-Lab attendant interaction	42	30	10	5		87
Canteen facilities	30	25	12	12	8	87
Sports facilities	28	32	18	5	4	87
Participation in Seminars at own college and other colleges	18	22	25	15	5	87
Involvement in preparation of Departmental wall magazines	8	9	2			19
Interaction with administration	35	20	17	12	3	87
On Teachers						
Communication skills	57	22	5	3		87
Knowledge base of teachers	55	15	15	2		87
Prepartion for teaching	38	40	8	1		87
Regularity and Punctuality	55	25	5	2		87
Use of innovative methods	25	37	13	12		87
Accesibility in and outside the class	38	30	15	2	2	87

Analysis:

The students are the most important stakeholders of Higher Education systems. The interest andparticipation of students at all levels in both internal quality assurance and external quality assurancehave to play a central role. We have collected feedback from our under graduate students. A special five point scale feedback form on the curriculum is development. We havereceived total 87 student's feedback on the syllabus of the various programmes designed by The University of Burdwan, Burdwan (Part-III)as well as Bankura University (Semester-I, II and III).





Action Taken Report on Feedback Analysis

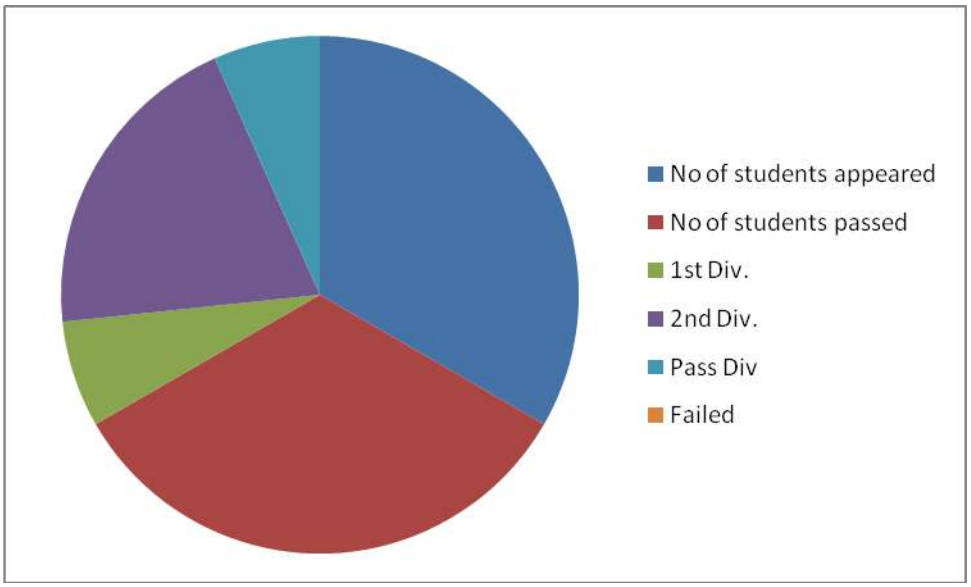
Year-wise feedbacks are collected from the students at four levels: institutional level, department level, teacher level and curriculum-based. The received data are analysed, the suggestions of the students are discussed in the college council and then, corrective measures are taken. Department and teacher feedbacks are discussed in the department council. The student-centred programmes are mostly conducted based on their suggestions.

- To resolve the complaints by the students regarding the insufficient books more grants are issued by the college authority.
- Enough officials were recruited to improve the office administration.
- Posters and banners were placed at various places in the campus to inform the students about the consequences of ragging; a phone number was also given to contact while there are complaints
- Numerous academic initiatives have been taken in this academic year to enrich the academic capabilities of students as well as teachers. Seminars, workshops, exhibitions, quiz competitions, etc. was conducted.
- As part of tapping the external resources, eminent personalities have been invited to the institution and students get opportunities to interact with them.
- Some of the students were dissatisfied with the office assistance. Due to the administrative delay in sanctioning posts by the government, there were unfilled vacancies in the office. This affected the smooth functioning of the office.
- About 20% of the students suggested enhancing the measures for discipline enforcement. The college discipline committee considered this opinion and strictly executed new. Monthly attendance statements were collected. Students having attendance below 75% were identified, and their parents were informed of the matter. Necessary actions were taken to improve students' attendance percentage.
- The students were satisfied with the academic initiatives of the institution in this academic year.
- Students suggested improvement of library facilities. Due to the administrative delay in the appointment of full-time library staff, the smooth functioning of the library was affected
- The students pointed out the lack of time to cover the topics prescribed in the syllabus. The teachers too, almost all raised the same complaint. The department took initiatives to arrange special classes to cover the syllabus fully.
- Students wanted initiatives to enrich academic activities. The Department took initiatives to organize more class tests.The Department also made a decision which ensures that the students get their papers valued in time. Those students who delivered low academic performance were given remedial classes.
- Students, teachers and parents had the previous complaint that there was shortage of time to cover the syllabus in detail. Some of the students were dissatisfied with the contents of the syllabi as they do not meet the requirements. These grievances were keenly considered during the syllabus revisions.
- As part of strengthening the co-curricular activities, the college council, with the guidance of the Principal, ensured the conduct of inter-departmental arts and sports competitions. Department exhibitions, conferences, inter-departmental competitions, etc. facilitated the expressions of varied talents inherent in students, taking into consideration the individual differences in abilities and aptitudes.
- In order to improve IT facilities, more computers with internet facility were provided to the lab.

Annexure-III

Result Analysis
Department of Chemistry
Session: 2018 -19

No. of Students Appeared	No. of Students Passed	Division/Class		No. of Student Failed
05	05	1st	01	00
		2nd	03	
		Pass	01	



Analysis:

1. Updated information regarding the subject should be provided in the class hours.
2. Some special classes apart from the regular classes should be taken in certain week.
3. Students should be inspired to take online classes for better knowledge and perfection.
4. Analyze the previous year's questions and follow the question pattern accordingly the preparation should be started and thoroughly practice more and more question answers.
5. The number of reference books, journals, and magazines and text books should be increased in the library.

Annexure-IV

Publications

Academic year 2018-19

Department of Chemistry

Sl. No.	Name of the faculty	Designation	Research Publication		Book Publication
			National	International	
1	Dr. SayantanMondal	Assistant Professor	0	1	0
2	Dr. Samir Roy	Visiting Faculty	0	0	0
3	Tutun Ghosh	Guest Faculty	0	0	0
4	SoumenMandal	Guest Faculty	0	0	0
5	Sudip Panda	Guest Faculty	0	0	0

Details of Publication:

A. Research Article/ Journals:

Sl. No	Title with pageno.	Journal	ISSN/ISBN No.	Whether peer reviewed. Impact factor, (if any)
1	Reactions of Radical Anion and Cations: An Overview.*Vol. No. 04(1)(January, 2019) Page No. 59-65*	IJASRM	2455-6378	YES, 3.005

B. Invited Lectures/papers

Sl. No.	Title of the invited lecture /paper presented	Title of Conference/ Seminar with date	Organized by	Whether International/ National/State or University level
1	Chirality of Helicine like Molecules.	Two day National Symposium on "Celebrating International Year of Periodic Table" 18.03.2019-19.032019	Jointly Organised by BankuarSammilani College and Bankura University.	National