Annexure-I

Sarvodaya Kelavani Samaj managed,

Shri Manibhai Virani and Smt. Navalben Virani Science College

(Autonomous)

(Affiliated to Saurashtra University, Rajkot)

Re-Accredited at 'A' Level by NAAC

STAR college Scheme & Status by MST-DBT

UGC-College with Potential for Excellence (CPE)

UGC-DDU KAUSHAL Kendra

GAAA –Grade A-1 by KCG, Government of Gujarat

GPCB-Government of Gujarat approved Environment Audit Center

Nodal Center for capacity building by GSBTM

Department of Chemistry

B.Sc. Chemistry

SCHEME OF LEARNING AND EVALUATION

Department of Chemistry

B. Sc. Chemistry

OBJECTIVES OF THE PROGRAM: B.Sc. Chemistry

Courses offered in this program are geared towards providing students with an overall understanding of general chemistry so that they can enter the workforce with the necessary knowledge and skills. It will enable students to gain familiarity with the current industry practices and technologies.

The objectives are to:

- Train graduates with the requisite knowledge and skill to pursue M.Sc. & Ph.D. degrees in Chemistry.
- Turn out graduates who can teach the subject in secondary and tertiary level of education in the county.
- Train graduates who can be employed in Industry and the other sectors of the economy.

- **Graduate attributes for Under Graduate Programs (B.Sc. Chemistry)**

  - **Academic excellence**: Ability to identify key questions, research and pursue rigorous evidence-based arguments
  - **Critical Thinking and Effective communications:** Analysis and evaluation of information to form a judgement about a subject or idea and ability to effectively communicate the same in a structured form.
  - **Global Citizenship:** Mutual understanding with others from diverse cultures, perspectives and backgrounds
  - **Life Long Learning:** Open, curious, willing to investigate, and consider new knowledge and ways of thinking

PROGRAM EDUCATIONAL OBJECTIVES (PEO): B.Sc. Chemistry Our programme will produce Graduates who will attain following PEOs after few years of graduation		
PEO_1	**Core competency**	Understand and apply the fundamental core of chemistry to a broad variety of chemical problems.
PEO_2	**Breath of knowledge**	Competent chemistry graduates with strong fundamental knowledge to cater the needs of GOs and NGOs related to chemical science domain.
PEO_3	**Preparedness**	Demonstrate ability to use necessary tools & techniques of applied chemistry domain.
PEO_4	**Professionalism**	Graduates who can work individually or in teams to interpret chemical literature and propose solutions for problems significant to industries and society as a whole.
PEO_5	**Learning environment**	Inculcate the aptitude to engage in life- long learning from social, economic, and scientific activities of the time.

PROGRAM OUTCOMES:

After successful completion of the programme the Graduate will be able to :		
PO 1	**:**	**Domain knowledge:** Demonstrate an understanding of concepts, principles and applications of chemistry in various fields. Conduct experiments and analyze data, while maintaining responsible and ethical scientific conduct.
PO 2	**:**	**Problem analysis:** Employ critical thinking and efficient problem-solving skills in the basic areas of chemistry.
PO 3	**:**	**Design/development of solutions:** Using appropriate tools and techniques as well as approaches to arrive at viable conclusions/solutions pertaining to Chemical Science.
PO 4	**:**	**Conduct investigations of complex problems:** Cultivate the skills to Employ modern library search tools to locate and retrieve scientific information about a problem relating to Chemistry.
PO 5	**:**	**Modern tool usage:** Ability to handle/Use appropriate chemistry experiments using tools/techniques/ basic laboratory equipment with an understanding of the standard operating procedures, safety aspects/limitations.
PO 6	**:**	**The Chemistry Professional and society:** Understand own's role in scientific developments for society and act in an honest and consistent manner based on a strong sense of self and personal values
PO 7	**:**	**Environment and sustainability:** Understand complex environmental issues and their interrelationships and requirement of interdisciplinary domains for sustainable development
PO 8	**:**	**Ethics:** Commitment to professional ethics and responsibilities.
PO 9	**:**	**Individual and team work:** Able to function effectively as individual and as a member or leader in multidisciplinary settings.
PO 10	**:**	**Communication:** Communicate effectively using different modes (viz. written, verbal and digital) not only with scientific community but also with the society at large
PO 11	**:**	**Project management and finance:** Understand the principles of management of finance and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**:**	**Life-long learning:** Able to recognize the need to undertake life-long learning and acquire the capacity to do so

PROGRAM SPECIFIC OUTCOMES (PSO): B.Sc. Chemistry After successful completion of the program the Graduate will be:	
PSO_1	Acquire knowledge on the fundamentals aspects of chemistry leading to functional understanding of emerging concepts and technologies in chemical sciences.
PSO_2	Able to pursue higher education and research in the institutes of national and international repute.
PSO_3	Apply conceptual knowledge of Chemistry to identify practical & innovative solutions for socio-economically relevant issues.
PSO_4	Demonstrate ability to skilfully utilize the chemical literature to identify existing problems and employ tools & techniques of applied chemistry for finding sustainable & ethical solutions.
PSO_5	Acquire the ability to engage in life- long learning in the broadest context of socio-technological changes.

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Semester I									
Course Code	**Course**	**Contact Hrs/ Week**			**SEE Duration (Hours)**	**Maximum Marks**			**Credits**
						CIA	**SEE**	**Total**	
Part - I: Language course		**T**	**Tu**	**P**					
21ULCEN101	Development of Functional English	3	-	-	3	40	60	100	3
	Part-I Total	**3**	**-**	**-**		**40**	**60**	**100**	**3**
Part- II: Discipline Specific Courses									
21UCHCC101	**Core 1:** Introductory Inorganic and Analytical Chemistry (F)	4	-	-	3	30	70	100	4
21UCHCC102	**Core 2:** Introductory Organic and Physical Chemistry (F)	4	-	-	3	30	70	100	4
21UCHIC101	**IDC 1:** Physics: Electricity & Modern Physics (F)	3	-	-	3	30	70	100	3
21UCHCC103	**Core Practical 1:** Combined Practical	-	-	12	6	40	60	100	4
21UCHIC102	**IDC Practical 1:** Physics: Electricity & Modern Physics (F)	-	-	6	3	40	60	100	3
	Core Enrichment Course/Component 1: Concept to Practice	-	1	-	-	(20)	Evaluation at the end of 4th Semester		-
	Part-II Total	**11**	**1**	**18**		**170**	**330**	**500**	**18**
Part-III: Ability Enhancement Courses									
21AESD101	**AECC I :** Introduction to SDG (online course)	-	-	-	-	Remarks			Audit course
	AECC II: Environmental Conservation and Sustainable Development	1	-	-	-	Evaluation at the end of 2nd Semester			-
	AECC III: Human Values for Holistic Living	1	2*	-	-	Evaluation at the end of 2nd Semester			-
	FS 3: Career Acceleration Program	2*	-	-	-	Cumulative evaluation at the end of Semester V			-
	Part-III Total	**2**	**2***	**-**			**-**		**-**
	Total (Part-I to Part-III)	**16**	**1+2***	**18**		**210**	**390**	**600**	**21**
		35+4*				**600**			

* Beyond academic Hours

( ) Final evaluation for 100 marks be made at the end of Semester IV, Which includes 20 marks CIA in Semester I, II, II each and 40 marks in Semester IV.

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Semester II									
Course Code	**Course**	**Contact Hrs/ Week**			**SEE Duration (Hours)**	**Maximum Marks**			**Credits**
						CIA	**SEE**	**Total**	
Part-I: Language course		**T**	**Tu**	**P**					
21ULCEN201	Functional English	3	-	-	3	40	60	100	3
	Part-I Total	**3**	**-**	**-**	**3**	**40**	**60**	**100**	**3**
Part-II: Discipline Specific Courses									
21UCHCC201	**Core 3:** Conceptual Inorganic and Analytical Chemistry (F)	4	-	-	3	30	70	100	4
21UCHCC202	**Core 4:** Conceptual Organic and Physical Chemistry (F)	4	-	-	3	30	70	100	4
21UCHIC201	**IDC 2:** Physics: Electronics and radiation Physics	3	-	-	3	30	70	100	3
21UCHCC203	**Core Practical 2:** Combined Practical	-		12	6	40	60	100	4
21UCHIC202	**IDC Practical 2:** Physics: Electronics and radiation Physics	-		6	3	40	60	100	3
	Core Enrichment Course/Component 1: Concept to Practice	-	1	-	-	(20)	Evaluation at the end of 4th Semester		-
	Part-II Total	**11**	**1**	**18**		**170**	**330**	**500**	**18**
Part-III: Ability Enhancement Courses									
21AEES201	**AECC II:** Environmental Conservation and Sustainable Development	1	-	-	-	Remarks			2
21AEVE202	**AECC III:** Human Values for Holistic Living	1	2*	-	-	Remarks			3
	FS 3: Career Acceleration Program	2*	-	-	-	Cumulative evaluation at the end of Semester V			
	Part-III Total	**2**	**2***	**-**		**-**	**-**	**-**	**5**
	Total (Part-I to Part-III)	**16 +2 ***	**1+2***	**18**		**210**	**390**	**600**	**26**
		35+4*				**600**			

* Beyond academic Hours

( ) Final evaluation for 100 marks be made at the end of Semester IV, Which includes 20 marks CIA in Semester I, II, II each and 40 marks in Semester IV.

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Semester III									
Course Code	**Course**	**Contact Hrs/ Week**			**SEE Duration (Hours)**	**Maximum Marks**			**Credits**
						CIA	**SEE**	**Total**	
Part-I: Language course		**T**	**Tu**	**P**					
21ULCEN301	Advanced English & Correspondence	3	-	-	3	40	60	100	3
	Part-I Total	**3**	**-**	**-**	**3**	**40**	**60**	**100**	**3**
Part-II: Discipline Specific Courses									
21UCHCC301	**Core 5:** Inorganic Chemistry (Ad)	4	-	-	3	30	70	100	4
21UCHCC302	**Core 6:** Analytical Chemistry (Ad)	4	-	-	3	30	70	100	4
21UCHCC303	**Core 7:** Petrochemicals and Polymers (Ad)	4	-	-	3	30	70	100	4
21UCHDE301	**DSE-1-C1:**##	**3**	-	-	-	40	60	100	**3**
21UCHCC304	**Core Practical 3:** Combined Practical (Core 5/6/7)	-	-	12	9	40	60	100	3
21UCHDE301	**DSE-1-C1 Practical 1##:**			4/6	3	40	60	100	2
	Core Enrichment Course/Component 1: Concept to Practice	-	1	-		(20)	Evaluation at the end of 4th Semester		-
21UCHCR301	**Core Enrichment Course/Component 2:** **Internship/Training/Mini Project –1 (Industrial/Social Immersion)**	-	1	-	-	100	-	100	1
	Part-II Total	**15**	**2**	**16**		**310**	**390**	**700**	**21**
Part-III: Ability Enhancement Courses									
	FS 3: Career Acceleration Program	-	2*	-		-	-	-	Audit course
	Part-III Total	**-**	2*	**-**					
	Total (Part-I to Part-III)	**18**	**2+2***	**16**		**350**	**450**	**800**	**24**
		36+2*				**800**			

* Beyond academic Hours

**Minimum one month internship pertaining to learning for concept to practice/prototype or product development for start-up/mini and final semester project/skilling in the summer vacation/combination of semester break and summer vacation in industry/premier research institute/NGO, etc.

DSE-1-C1: Discipline Specific Elective Course 1 (T & P) From cluster 1 in semester III

( ) Final evaluation for 100 marks be made at the end of Semester IV, Which includes 20 marks CIA in Semester I, II, II each and 40 marks in Semester IV.

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Semester IV									
Course Code	**Course**	**Contact Hrs/ Week**			**SEE Duration (Hours)**	**Maximum Marks**			**Credits**
						CIA	**SEE**	**Total**	
Part-I: Language course		**T**	**Tu**	**P**					
21ULCEN 401	Effective Communicative Skills	3	-	-	3	40	60	100	3
	Part-I Total	**3**	-	-	**3**	**40**	**60**	**100**	**3**
Part-II: Discipline Specific Courses									
21UCHCC401	**Core 8:** Organic Chemistry (Ad)	4	-	-	3	30	70	100	4
21UCHCC402	**Core 9:** Physical Chemistry (Ad)	4	-	-	3	30	70	100	4
21BCHCL401	**Core Elective 1:** Green Methods in Chemistry/Soil Analysis (Ad)	4	-	-	3	30	70	100	4
	DSE-1-C2:##	**3**	-	-	-	40	60	100	**3**
21UCHTE 401	**TDE 1:**	2	-	-	3	100	-	100	2
21UCHCC403	**Core Practical 4:** Combined Practical	-	-	9	9	40	60	100	3
21BCHCL402	**Core Elective Practical 1:**	-	-	3	3	20	30	50	1
	DSE-C Practical 2:			4/6	3	40	60	100	2
21UCHCR 401	**Core Enrichment Course/Component 1:** Concept to Practice	-	1	-	-	40+60^	-	100	1
	Part-II Total								
Part-III: Ability Enhancement Courses									
	FS 3: Career Acceleration Program	-	2*	-		Cumulative evaluation at the end of Semester V			Audit course
	Part-III Total								
	Total (Part-I to Part-III)								

* Beyond academic Hours

**Minimum one month internship pertaining to learning for concept to practice/prototype or product development for start-up/mini and final semester project/skilling in the summer vacation/combination of semester break and summer vacation in industry/premier research institute/NGO etc.

DSE cluster -1 & 2: Mathematics for Chemist/Life molecules/ Industrial chemistry/ Statistics

^60 Marks Carry over from Semester I to Semester III

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Semester V									
Course Code	**Course**	**Contact Hrs/ Week**			**SEE Duration (Hours)**	**Maximum Marks**			**Credits**
						CIA	**SEE**	**TOTAL**	
Part-II: Discipline Specific Courses		**T**	**Tu**	**P**					
	Core 10: (Ad)								
	Core 11: (Ad)								
	Core 12: (Self-Study) (Ap)								
	Core 13: CRT								
	Core Elective 2: (Ap)								
	TDE 2:								
	Core Practical 5: Combined Practical								
	Core Elective Practical 2:								
	Core Enrichment Course/Component 3: Internship/Training/ Industrial visit/Mini Project 2:								
	Core Enrichment Course/Component 4: Minor Project/Dissertation / Review Article / Instrumental Training								
	Part-II Total								
Part-III: Ability Enhancement Courses									
	FS 3: Career Acceleration Program								
	Part-III Total								
	Total (Part-I to Part-III)								

* Beyond academic Hours

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Semester VI									
Course Code	**Course**	**Contact Hrs/ Week**			**SEE Duration (Hours)**	**Maximum Marks**			**Credits**
						CIA	**SEE**	**Total**	
Part- II: Discipline Specific Courses									
		T	**Tu**	**P**					
	Core 14: (Ap)								
	Core 15: (Ad)								
	Core 16: (Ad)								
	Practical: Skill Training /start up Practical								
	***Core Enrichment Course/Component 5:** Project / Skill training / Start-up (Ap)								
	Part-II Total								
	Total (Part-II)								

***** Students can opt for Core 15, Core 16 and practical 6 **or** Core Enrichment 4.

If students wish to continue their previous semesters project in Semester VI as a major project then they have to must select Core enrichment 4 instead of advance papers.

Formation of Part-III

Course Code	Semester	Course / Component	Contact Hrs	No. of Courses	Credit/ Course	Total Credits
A. Ability Enhancement Course (AEC)						
(i) Ability Enhancement Compulsory Course (AECC)						
	I	**AECC I :** Introduction to SDG (online course)	-	1	Remarks	Audit Course
	I & II	**AECC II:** Environmental Conservation and Sustainable Development	1 Hr / Week / Semester	1	1+1	2
	I & II	**AECC III:** Human Values for Holistic Living	1 T + 2 Tu /Week /Semester	1	1+1+1	3
					Sub Total	**5 + Audit course**
(ii) ***Skill Enhancement Course (SEC)***						
As per common list	Any Semester between II – V	**SEC-I** *Value Added Courses	40 Hrs	1	1	1
	Any Semester between III – V	**SEC-II** **Co-Curricular Course	80 to 120 Hrs	1	2	2
					Sub Total	**3**
B. Finishing School						
		FS I *to* FS IV *Compulsory to Earn Degree.*				
	I	**FS I:** Student Induction Program	3 weeks Phase 1, Phase 2, Phase 3	-	Remark	Audit course
	Across I & II Semesters	**FS II:** Fundamentals of Design Thinking (Online/Offline)#	40 to 60 Hrs	1	Remark	Audit course
	Semesters I to V	**FS III:** Career Acceleration Program	2 Hrs / Week /Semester	As per syllabus	Remarks	Audit course
	Semester V	**FS IV:** Community Engagement	Twice a month	1	Remarks	Audit course
		FS V *to* FS VIII *Options for Advanced Learners*				
	Any semester	**FS V:** Indian & Foreign	-	Any number of	Remarks	Audit course

	from II to V	Languages		courses		
	Any semester from II to V	**FS VI:** Any number of Online course(s) from select MOOC platforms	-	Any number of courses	Remarks	Credit as per provider/audit course
	Any semester from III to V	**FS VII:** Advanced Design Thinking	-	1	Remarks	Audit course
	Any semester from I to VI	**FS VIII: #Extra Credit Course** Any number of courses from any UG program across the College	Self study	Any number of courses	As per course offered	As per credit(s) earned across all courses opted
					Grand Total	

Part of Core Enrichment Course/Component 1,2: Concept to Practice

***Value Added Courses** - Option to student to choose at least 1 from a list of courses offered by any department across the College.

****Co-Curricular Courses** - Option to students to choose 1 from a list of courses offered by any department across the College.

Student may opt for any course of the odd/even prevailing semester from any UG program across the College with the following guidelines:

a. Attending class not mandatory.
b. May be mentored by the course teacher.
c. Preparation through self-study.
d. CIA not mandatory; evaluated for total marks at the end of the semester.
e. Indicates options to appear for the course through examination application and payment of examination fees of that course.
f. Credits earned through each course indicated in the consolidated mark sheet as extra credits; not included for CGPA, percentage marks and classification.

TOTAL MARKS & CREDIT DISTRIBUTION TO EARN THE DEGREE

S. No	PART	Total Marks	Total Credits
1.	**PART I:** Language Course	400	12
2.	**PART II:** Core, Core Elective, IDC, DSE, TDE, CBT	4100	128
3.	**PART III:** AECC-I, II & III SEC- I & II FS I, II, III & IV	Remarks	8+Credit Audit
	TOTAL	**4500**	**148**

VALUE ADDED COURSES (VAC) OFFERED BY THE DEPARTMENT

Sr. No.	Course Code	Course Title	Course Duration	Credits
1		Formulation of detergent & toiletries	40 hrs	1
2		Surface Coating	40 hrs	1

CO-CURRICULAR COURSES (CoC) OFFERED BY THE DEPARTMENT

Sr. No.	Course Code	Course Title	Course Duration	Credits
1		Quantitative aptitude and logical reasoning for government and bank exam	160 hrs	2

Discipline Specific Elective (DSE 1) Cluster

Sr.	Track / Cluster	Offering Department	Course Name	Course Code
1				
2				
3				
4				
5				
6				
7				
8				