



Sarvodaya Kelavani Samaj Managed
Shri Manibhai Virani & Smt. Navalben Virani Science College, Rajkot

(An autonomous College affiliated to Saurashtra University, Rajkot)

Reaccredited at the “A” Level (CGPA 3.28) by NAAC

“STAR” College Scheme & Status by MST-DBT

A College with Potential for Excellence – CPE (Phase - II) by UGC

Accredited at the G-AAA Highest Grade ‘A-1’ Level by KCG, Govt. of Gujarat

UGC-DDU KAUSHAL Kendra

GPCB-Government of Gujarat approved Environmental Audit Centre

SCHEME OF LEARNING AND EVALUATION
(In light of UGC’s LOCF and NEP-2020)

of

B. Sc. CHEMISTRY

(w.e.f. June 2021)

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

PEO₁	Core competency	Understand and apply the fundamental core of chemistry to a broad variety of chemical problems.
PEO₂	Breath of knowledge	Competent chemistry graduates with strong fundamental knowledge to cater the needs of GOs and NGOs related to chemical science domain.
PEO₃	Preparedness	Demonstrate ability to use necessary tools & techniques of applied chemistry domain.
PEO₄	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.
PEO₅	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:

PSO₁	Acquire knowledge on the fundamentals aspects of chemistry leading to functional understanding of emerging concepts and technologies in chemical sciences.
PSO₂	Able to pursue higher education and research in the institutes of national and international repute.
PSO₃	Apply conceptual knowledge of Chemistry to identify practical & innovative solutions for socio-economically relevant issues.
PSO₄	Demonstrate ability to skilfully utilize the chemical literature to identify existing problems and employ tools & techniques of applied chemistry for finding sustainable & ethical solutions.
PSO₅	Acquire the ability to engage in life- long learning in the broadest context of socio-technological changes.

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Department of Chemistry
B.Sc. CHEMISTRY
SCHEME OF LEARNING AND EVALUATION
For the students admitted from A.Y. 2021-2022 & onwards

Semester I									
Course Code	Course	Contact Hrs/ Week			SEE Duration (Hours)	Maximum Marks			Credits
		T	Tu	P		CIA	SEE	Total	
Part - I: Language course		T	Tu	P					
21ULCEN01	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
21UCHID101	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
21UCHID102	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 4 th 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 2 nd Semester			-
	AECC III: Human Values for Holistic Living	1	2*	-	-	Evaluation at the end of 2 nd 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.

B. Sc. Chemistry

SCHEME OF LEARNING AND EVALUATION For the students admitted from A.Y. 2021-2022 & onwards

Semester II									
Course Code	Course	Contact Hrs/ Week			SEE Duration (Hours)	Maximum Marks			Credits
		T	Tu	P		CIA	SEE	Total	
Part-I: Language course		T	Tu	P					
21ULCEN02	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
21UCHID201	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
21UCHID202	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
21AEVE201	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	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.

Department of Chemistry

B. Sc. Chemistry
SCHEME OF LEARNING AND EVALUATION
For the students admitted from A.Y. 2021-2022 & onwards

Semester III									
Course Code	Course	Contact Hrs/ Week			SEE Duration (Hours)	Maximum Marks			Credits
		T	Tu	P		CIA	SEE	Total	
Part-I: Language course		T	Tu	P					
21ULCEN03	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
	DSE-1-C1:##	3	-	-	-	40	60	100	3
21UCHCC304	Core Practical 3: Combined Practical (Core 5/6/7)	-	-	12	9	40	60	100	3
	DSE-1-C1 Practical 1##:			6	3	40	60	100	2
	Core Enrichment Course/Component 1: Concept to Practice	-	1	-		(20)	Evaluation at the end of 4th Semester		-
	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-C1: Discipline Specific Elective Course (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.

**## Discipline specific Elective-DSE-1 offered by the Department to the Cluster for all B.Sc.
Program Semester – III**

Course Code	Course	Contact Hrs/ week			SEE Duration (Hours)	Maximum Marks			Credit(s)
		T	Tu	P		CIA	SEE	Total	
Part II		T	Tu	P					
21UCHDE301	DSE-1 Conceptual Inorganic & Physical Chemistry (F)	3	-	-	3	40	60	100	3
21UCHDE302	DSE- 1:Practical: Conceptual Inorganic & Physical Chemistry (F)	-	-	6	3	40	60	100	2

B. Sc. Chemistry
SCHEME OF LEARNING AND EVALUATION
For the students admitted from A.Y. 2021-2022 & onwards

Semester IV									
Course Code	Course	Contact Hrs/ Week			SEE Duration (Hours)	Maximum Marks			Credits
		T	Tu	P		CIA	SEE	Total	
Part-I: Language course		T	Tu	P					
21ULCEN04	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: C-2##	3	-	-	-	40	60	100	3
	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-2: Practical##	-	-	6	3	40	60	100	2
	Core Enrichment Course/Component 1: Concept to Practice	-	1	-	-	40+60 [^]	-	100	1
	Part-II Total	17	1	18		430	420	850	24
Part-III: Ability Enhancement Courses									
	FS 3: Career Acceleration Program	-	2*	-		Cumulative evaluation at the end of Semester V			Audit course
	Part-III Total	-	2*	-					27
	Total (Part-I to Part-III)	20	2*	18		470	480	950	27
		38+2*				950			

* 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.

[^]60 Marks Carry over from Semester I to Semester III

Discipline specific Elective-DSE-1 offered by the Department to the Cluster for all B.Sc. Program Semester – IV

Course Code	Course	Contact Hrs/ week			SEE Duration (Hours)	Maximum Marks			Credit(s)
						CIA	SEE	Total	
Part II		T	Tu	P					
21UCHDE401	DSE-2 Conceptual Analytical & Physical Chemistry (F)	3	-	3	3	40	60	100	3
21UCHDE402	DSE- 2: Practical: Conceptual Analytical & Physical Chemistry (F)	-	-	6	3	40	60	100	2

TDE 1: Trans disciplinary Elective Course offered by the department to other departments for all B.Sc. Program – Sem-4

Course Code	Course	Contact Hrs/ week			SEE Duration (Hours)	Maximum Marks			Credit(s)
						CIA	SEE	Total	
Part II		T	Tu	P					
21UCHTD01	TDE 1: Chemical Hazard and Safety	2	-	-	-	100	-	100	2

Semester V									
Course Code	Course	Contact Hrs/ Week			SEE Duration (Hours)	Maximum Marks			Credits
		T	Tu	P		CIA	SEE	TOTAL	
Part-II: Discipline Specific Courses		T	Tu	P					
21UCHCC501	Core 10: Spectral and Separation Techniques (Ap)	4	-	-	3	30	70	100	4
21UCHCC502	Core 11: Synthetic Molecules (Ap)	4	-	-	3	30	70	100	4
21UCHCC503	Core 12: (Self-Study) Industrial Formulations (Ad)	1	-	-	3	30	70	100	4
21UCHCL501	Core Elective 2: Unit Operation & Processes / Surface Coating Techniques/Industrial Utility	4	-	-	3	30	70	100	4
21UCHCC504	Core 16: CRT for Core Courses of Semester I to IV	-	-	-	2	50	-	50	1
	TDE 2:	2	-	-		100	-	100	2
21UCHCC505	Core Practical 5: Combined Practical	-	-	12	6	40	60	100	4
21UCHCL502	Core Elective Practical 2:	-	-	3	3	40	60	100	1
	Core Enrichment Course/Component 3: Internship /Training	-	-	-	-	100	-	100	1
	Core Enrichment Course/Component 4: Minor Project/Dissertation / Review Article / Instrumental Training/Industrial visit report	-	-	4 [^]	-	#Evaluation at the end of Semester-6			-
	Part-II Total	15	-	15		450	400	850	25
Part-III: Ability Enhancement Courses									
	FS 3: CAP	-	2*	-		Remarks			Audit course
	FS 4: Community Engagement	-	2*	-		Remarks			Audit course
	Part-III Total								
	Total (Part-I to Part-III)	15	4*	15		450	400	850	
		30+4*				850			25

* Beyond academic Hours

#Evaluation at the end of semester VI for 100 marks.

Course Code	Course	Contact Hrs/ week			SEE Duration (Hours)	Maximum Marks			Credit(s)
		T	Tu	P		CIA	SEE	Total	
Part II		T	Tu	P					
21UCHTD01	TDE 2: Chemistry in Every day Life	2	-	-	-	100	-	100	2

Semester VI									
Course Code	Course	Contact Hrs/ Week			SEE Duration (Hours)	Maximum Marks			Credits
		T	Tu	P		CIA	SEE	Total	
Part- II: Discipline Specific Courses									
		T	Tu	P					
21UCHCC601	Core 13: Spectroscopic Techniques (Ap)	4	-	-	3	30	70	100	4
21UCHCC602	Core 14: Heterocyclic Chemistry (Ad)	4	-	-	3	30	70	100	4
21UCHCC603	Core 15: Chemistry of Natural Products (Ad)	4	-	-	3	30	70	100	4
21UCHCC604	Practical: Core 14 &15: Combined Practical:	-	-	18	6	80	120	200	6
	Core Enrichment 4:	-	-	-		100	-	100	4
	Total (Part-II)	12		18		270	330	600	22
		30				600			

Semester VI									
Course Code	Course	Contact Hrs/ Week			SEE Duration (Hours)	Maximum Marks			Credits
		T	Tu	P		CIA	SEE	Total	
Part- II: Discipline Specific Courses									
		T	Tu	P					
21UCHCC601	Core 13: Spectroscopic Techniques (Ap)	4	-	-	3	30	70	100	4
	Core Enrichment 4:	-	-	-		100	-	100	4
21UCHCC602	*Core Enrichment 5: Project / Skill training / Start-up	-	-	26	-	160	240	400	14
	Part-II Total								
	Total (Part-II)	4	-	26		290	310	600	22
		30				600			

* Students can opt for Core 13, Core 14, Core 15, Practical core 14 &15 and Core Enrichment 4 or Core 13, Core Enrichment 4 and Core Enrichment 5.

If students wish to continue their previous semesters project in Semester VI as a major project then students have to 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	FS V:	-	Any	Remarks	Audit

	semester from II to V	Indian & Foreign Languages		number of courses		course
	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			8+ Audit course+ Extra credit courses			

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:

- Attending class not mandatory.
- May be mentored by the course teacher.
- Preparation through self-study.
- CIA not mandatory; evaluated for total marks at the end of the semester.
- Indicates options to appear for the course through examination application and payment of examination fees of that course.
- 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

SN	PART	Total Marks	Total Credits
1.	PART I: Language Course	400	12
2.	PART II: Core, Core Elective, IDC, DSE, TDE, CBT	4000	128
3.	PART III: AECC-I, II & III SEC- I & II FS I, II, III & IV	Remarks	8+Credit Audit
TOTAL		4400	148

VALUE ADDED COURSES (VAC) OFFERED BY THE DEPARTMENT

SN	Course Code	Course Title	Course Duration	Credits
1	21AEVA02	Formulation of Detergent & Toiletries	40 hrs	1
2	21AEVA03	Soil & Water Analysis	40 hrs	1

CO-CURRICULAR COURSES (CoC) OFFERED BY THE DEPARTMENT

SN	Course Code	Course Title	Course Duration	Credits
1	21AECO10	Surface Coating Techniques	80/120	2

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, IDC, DSE, TDE	4000	128
3.	PART III: AECC-I, II & III SEC- I & II FS I, II, III & IV	Remarks	8+Credit Audit
TOTAL		4400	148

