



UNIVERSITY OF CALICUT

Abstract

General and Academic - Faculty of Science - Syllabus of BSc Chemistry Programme under CBCSS UG Regulations 2019 with effect from 2019 Admission onwards - Implemented - Orders Issued

G & A - IV - J

U.O.No. 9082/2019/Admn

Dated, Calicut University.P.O, 09.07.2019

*Read:-*1. U.O.No. 4368/2019/Admn dated 23.03.2019

2. Item No. 1 of the minutes of the combined meeting of the Boards of Studies in Chemistry UG, Polymer Chemistry and Industrial Chemistry held on 27.05.2019

3. Item No. 1.16 of the minutes of the meeting of Faculty of Science held on 27.06.2019

ORDER

The Regulations for Choice Based Credit and Semester System for Under Graduate (UG) Curriculum 2019 (CBCSS UG Regulations 2019) for all UG Programmes under CBCSS-Regular and SDE/Private Registration w.e.f. 2019 admission has been implemented vide paper read first above.

The combined meeting of the Boards of Studies in Chemistry UG, Polymer Chemistry and Industrial Chemistry on 27.05.2019 has approved the Syllabus of BSc Chemistry Programme in tune with the new CBCSS UG Regulations with effect from 2019 Admission onwards, vide paper read second above.

The Faculty of Science at its meeting held on 27.06.2019 has approved the minutes of the combined meeting of the Boards of Studies in Chemistry UG, Polymer Chemistry and Industrial Chemistry on 27.05.2019 vide paper read third above.

Under these circumstances, considering the urgency, the Vice Chancellor has accorded sanction to implement the Scheme and Syllabus of BSc Chemistry Programme in accordance with the new CBCSS UG Regulations 2019, in the University with effect from 2019 Admission onwards, subject to ratification by the Academic Council.

The Scheme and Syllabus of BSc Chemistry Programme in accordance with CBCSS UG Regulations 2019, is therefore implemented in the University with effect from 2019 Admission onwards.

Orders are issued accordingly. (Syllabus appended)

Biju George K

Assistant Registrar

To

The Principals of all Affiliated Colleges

Copy to: PS to VC/PA to PVC/ PA to Registrar/PA to CE/JCE I/JCE IV/DoA/EX and EG Sections/GA I F/CHMK Library/Information Centres/SF/DF/FC

Forwarded / By Order

Section Officer



UNIVERSITY OF CALICUT

B.Sc. DEGREE PROGRAMME IN CHEMISTRY

(CBCSSUG 2019)

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

SCHEME AND SYLLABI

2019 ADMISSION ONWARDS

<i>Sl. No.</i>	<i>CONTENTS</i>	<i>Page No.</i>
UNDERGRADUATE PROGRAMME – AN OVERVIEW		
UNDERGRADUATE PROGRAMME IN CHEMISTRY		
1	Preamble	1
2	Aims	1
3	Broad Objectives	2
4	Programme Structure	3
5	Credit and Mark Distribution in Each Semesters	5
CORE COURSE		
SYLLABUS FOR CORE COURSE		
6	Core Course Structure	7
7	Core Course I: Theoretical and Inorganic Chemistry- I	8
8	Core Course II: Theoretical and Inorganic Chemistry- II	14
9	Core Course III: Physical Chemistry-I	17
10	Core Course IV: Organic Chemistry-I	22
11	Core Course V : Inorganic Chemistry Practical-I	28
12	Core Course VI: Inorganic Chemistry-III	31
13	Core Course VII: Organic Chemistry-II	36
14	Core Course VIII: Physical Chemistry-II	42
15	Core Course IX: Inorganic Chemistry-IV	48
16	Core Course X: Organic Chemistry-III	53
17	Core Course XI: Physical Chemistry-III	58
18	Core Course XII: Advanced and Applied Chemistry	63
19	Core Course XIII: Elective 1. Industrial Chemistry	69
20	Core Course XIII: Elective 2. Polymer Chemistry	73
21	Core Course XIII: Elective 3. Medicinal and Environmental Chemistry	76
22	Core Course XIV: Physical Chemistry Practical	79
23	Core Course XV: Organic Chemistry Practical	82
24	Core Course XVI: Inorganic Chemistry Practical-II	85
25	Core Course XVII: Inorganic Chemistry Practical-III	87
26	Core Course XVIII: Project Work	88
EVALUATION SCHEME FOR CORE COURSES		89
27	Core Course Theory: Evaluation Scheme	90
28	Core Course Practical: Evaluation Scheme	91
29	Core Course Project: Evaluation Scheme	96
COMPLEMENTARY COURSE		
SYLLABUS FOR COMPLEMENTARY COURSE		
30	Complementary Course Structure	99
31	Complementary Course I: General Chemistry	100
32	Complementary Course II: Physical Chemistry	103
33	Complementary Course III: Organic Chemistry	106
34	Complementary Course IV: Physical and Applied Chemistry	110
35	Complementary Course V: Chemistry Practical	114

EVALUATION SCHEME FOR COMPLEMENTARY COURSES		116
36	Complementary Theory: Evaluation Scheme	117
37	Complementary Practical: Evaluation Scheme	118
OPEN COURSE		
SYLLABUS FOR OPEN COURSE		120
38	Open Course Structure	121
39	Open Course 1: Environmental Chemistry	122
40	Open Course 2: Chemistry in Daily Life	126
41	Open Course 3: Food Science and Medicinal Chemistry	130
EVALUATION SCHEME FOR OPEN COURSE		135
MODEL QUESTION PAPERS FOR CORE COURSES		
42	Core Course I: Theoretical and Inorganic Chemistry- I	137
43	Core Course II: Theoretical and Inorganic Chemistry- II	138
44	Core Course III: Physical Chemistry-I	140
45	Core Course IV: Organic Chemistry-I	142
46	Core Course V : Inorganic Chemistry Practical-I	144
47	Core Course VI: Inorganic Chemistry-III	145
48	Core Course VII: Organic Chemistry-II	146
49	Core Course VIII: Physical Chemistry-II	147
50	Core Course IX: Inorganic Chemistry-IV	148
51	Core Course X: Organic Chemistry-III	149
52	Core Course XI: Physical Chemistry-III	150
53	Core Course XII: Advanced and Applied Chemistry	152
54	Core Course XIII: Elective 1. Industrial Chemistry	153
55	Core Course XIII: Elective 2. Polymer Chemistry	154
56	Core Course XIII: Elective 3. Medicinal and Environmental Chemistry	155
57	Core Course XIV: Physical Chemistry Practical	156
58	Core Course XV: Organic Chemistry Practical	157
59	Core Course XVI: Inorganic Chemistry Practical-II	158
60	Core Course XVII: Inorganic Chemistry Practical-III	159
MODEL QUESTION PAPERS FOR COMPLEMENTARY COURSES		
61	Complementary Course I: General Chemistry	160
62	Complementary Course II: Physical Chemistry	161
63	Complementary Course III: Organic Chemistry	162
64	Complementary Course IV: Physical and Applied Chemistry	163
65	Complementary Course V: Chemistry Practical	164
MODEL QUESTION PAPERS FOR OPEN COURSES		
66	Open Course 1: Environmental Chemistry	165
67	Open Course 2: Chemistry in Daily Life	166
68	Open Course 3: Food Science and Medicinal Chemistry	167

UNDERGRADUATE PROGRAMME – AN OVERVIEW

Programme means the entire course of study and examinations for the award of a degree. **Duration** of an undergraduate programme is six semesters distributed in a period of 3 years. An **academic week** is a unit of five working days in which distribution of work is organized from Monday to Friday with five contact periods of one hour duration on each day. A sequence of 18 such weeks (16 instructional weeks and two weeks for examination) constitutes a **semester**.

Course means a segment of subject matter to be covered in a semester. The undergraduate programme includes 5 types of courses, *viz.*, common courses, core courses, complementary courses, open course and audit course. **Common courses** include English and additional language courses. Every undergraduate student shall undergo 10 common courses [6 English courses and 4 additional language courses] for completing the programme. **Core courses** comprise compulsory course in a subject related to a particular degree programme offered by the parent department. There are 18 core courses including a project work. **Complementary courses** cover two disciplines that are related to the core subject and are distributed in the first four semesters. There shall be one **open course** in the 5th semester. Students can opt one open course of their choice offered by any department in the institution other than their parent department. **Audit courses** are courses which are mandatory for a programme but not conducted for the calculation of SGPA or CGPA. There shall be one audit course each in the first 4 semesters. Audit courses are not meant for class room study. The students can attain only pass (Grade P) for these courses. At the end of each semester there shall be examination conducted by the college from a pool of questions (Question Bank).

Each course shall have certain credits. **Credit** is a unit of academic input measured in terms of weekly contact hours/course contents assigned to a course. A student is required to acquire a minimum of 140 credits for the completion of the UG programme, of which 120 credits are to be acquired from class room study and shall only be counted for SGPA and CGPA. Out of the 120 credits, 38 (22 for common (English) courses + 16 for common languages other than English) credits shall be from common courses, 55 credits for core courses (including 2 credits each for project work and Elective), 24 credits for complementary courses (12 credits each) and 3 credits for the open course. Audit courses shall have 4 credits per course and a total of 16 credits in the entire programme.

Extra credits are mandatory for the programme. Extra credits will be awarded to students who participate in activities like NCC, NSS and Swatch Bharath. Those students who could not join in any of the above activities have to undergo Calicut University Social Service Programme (CUSSP). Extra credits are not counted for SGPA or CGPA. The maximum credit acquired under extra credit shall be 4. If more Extra credit activities are done by a student that may be mentioned in the Grade card.

Each course shall have a unique alphanumeric **code number**, which includes abbreviation of the subject in three letters, the semester number (1 to 6) in which the course is offered, the code of the course (A: Common course, B: Core course, C: Complementary course, D: Open course and E: Audit course) and the serial number of the course (01, 02, *etc.*). For example, CHE5B06 represents a core course of serial number 06 offered in 5th semester in B.Sc. Chemistry Programme.

UNDERGRADUATE PROGRAMME IN CHEMISTRY

PREAMBLE

Science education is central to the development of any society. This can be achieved only by revamping the undergraduate programme to make it effective and meaningful. The development of scientific temper in society necessitates proper education and guidance. In order to achieve this, one must update the developments in the field of science. An effective science education can be imparted at the undergraduate level only by revamping the present curriculum. To achieve this goal, the curriculum should be restructured by emphasising various aspects such as the creativity of students, knowledge of current developments in the discipline, awareness of environmental impacts due to the development of science and technology, and the skills essential for handling equipments and instruments in laboratories and industries.

Chemistry, being an experimental science, demands testing theories through practical laboratory experiences for a thorough understanding of the subject. Nowadays, chemistry laboratories in academic institutions use large amounts of chemicals. The awareness and implementation of eco-friendly experiments becomes a global necessity. It is essential to ensure that laboratory chemicals are used at a minimal level without affecting the skill and understanding aimed through laboratory sessions. This creates an environmental awareness among the students and pollution free atmosphere in the campus.

During the preparation of the syllabus, the existing syllabus, the syllabi of XIth & XIIth standards, UGC model curriculum and the syllabi of other universities have been referred. Care has been taken to ensure that the syllabus is compatible with the syllabi of other universities at the same level. Sufficient emphasis is given in the syllabus for training in laboratory skills and instrumentation.

The units of the syllabus are well defined. The number of contact hours required for each unit is given which excludes prerequisites. The pre requisites provided at the beginning of the units guides the students to what he/she should know before exploring the topic. This can be assessed by the teacher either before delivering the particular topic or as a bridge course at the beginning of each semester. **These shall not be considered for external evaluation.** A list of references and further readings are provided at the end of each unit.

AIMS

This curriculum has been prepared with the objective of giving sound knowledge and understanding of chemistry to undergraduate students. The goal of the syllabus is to make the study of chemistry stimulating, relevant and interesting. It has been prepared with a view to equip students with the potential to contribute to academic and industrial environments. This curriculum will expose students to various fields in chemistry and develop interest in related disciplines. Chemistry, being a border science to biology, physics and engineering, has a key role to play in the understanding of these disciplines. The updated syllabus is based on an interdisciplinary approach to understand the application of the subject in daily life.

BROAD OBJECTIVES

To enable the students

- To understand basic facts and concepts in chemistry.
- To apply the principles of chemistry.
- To appreciate the achievements in chemistry and to know the role of chemistry in nature and in society.
- To familiarize with the emerging areas of chemistry and their applications in various spheres of chemical sciences and to apprise the students of its relevance in future studies.
- To develop skills in the proper handling of instruments and chemicals.
- To familiarize with the different processes used in industries and their applications.
- To develop an eco-friendly attitude by creating a sense of environmental awareness.
- To be conversant with the applications of chemistry in day-to-day life.

PROGRAMME STRUCTURE

Semester	Common course		Core course	Complementary course		Open course	Total
	English	Additional Language		Mathematics	Physics		
II	4+3	4	2	3	2	-	18
III	4	4	3	3	2	-	16
IV	4	4	3+4*	3	2+4*	-	24
V	-	-	3+3+3	-	-	3	12
VI	-	-	3+3+3+3+2 [#] +4*+4*+4*+ 4*+2**	-	-	-	32
Total	22	16	55	12	12	3	120

*Practical **Project #Elective

Mark and Indirect Grading System

Mark system is followed instead of direct grading for each question. After external and internal evaluations marks are entered in the answer scripts. All other calculations, including grading, will be done by the university using the software. Indirect Grading System in 10 point scale is followed. Each course is evaluated by assigning marks with a letter grade (O, A⁺, A, B⁺, B, C, P, F, I or Ab) to that course by the method of indirect grading.

Mark Distribution

Sl. No.	Course	Marks
1	English	550
2	Additional Language	400
3	Core course: Chemistry	1475
4	Complementary course: Mathematics	300
5	Complementary course: Physics/Food Science/Computer science	400
6	Open Course	75
	Total Marks	3200

Ten point Indirect Grading System

<i>% of Marks (Both Internal & external put together)</i>	<i>Grade</i>	<i>Interpretation</i>	<i>Grade Point Average</i>	<i>Range of Grade points</i>	<i>Class</i>
95 and above	O	Outstanding	10	9.5 - 10	First Class with distinction
85 to below 95	A ⁺	Excellent	9	8.5 - 9.49	
75 to below 85	A	Very good	8	7.5 – 8.49	
65 to below 75	B ⁺	Good	7	6.5 – 7.49	First Class
55 to below 65	B	Satisfactory	6	5.5 – 6.49	
45 to below 55	C	Average	5	4.5 – 5.49	Second Class
35 to below 45	P	Pass	4	3.5 – 4.49	Third class
Below 35	F	Failure	0	0	Fail
Incomplete	I	Incomplete	0	0	Fail
Absent	Ab	Absent	0	0	Fail

CREDIT AND MARK DISTRIBUTION IN EACH SEMESTER

Total Credits: 120

<i>Semester</i>	<i>Course</i>	<i>Credit</i>	<i>Mark</i>
I	Common course: English	4	100
	Common course: English	3	75
	Common course: Additional Language	4	100
	Core Course I: Theoretical and Inorganic Chemistry- I	2	75
	Complementary course: Mathematics	3	75
	Complementary course: Physics	2	75
	Total	18	500
II	Common course: English	4	100
	Common course: English	3	75
	Common course: Additional Language	4	100
	Core Course II: Theoretical and Inorganic Chemistry- II	2	75
	Complementary course: Mathematics	3	75
	Complementary course: Physics	2	75
	Total	18	500
III	Common course: English	4	100
	Common course: Additional Language	4	100
	Core Course III: Physical Chemistry-I	3	75
	Complementary course: Mathematics	3	75
	Complementary course: Physics	2	75
	Total	16	425
IV	Common course: English	4	100
	Common course: Additional Language	4	100
	Core Course IV: Organic Chemistry-I	3	75
	Core Course V: Inorganic Chemistry Practical-I	4	100
	Complementary course: Mathematics	3	75
	Complementary course: Physics	2	75
	Complementary course: Physics Practical	4	100
	Total	24	625
V	Core Course VI: Inorganic Chemistry-III	3	75
	Core Course VII: Organic Chemistry-II	3	75
	Core Course VIII: Physical Chemistry-II	3	75
	Open course	3	75
	Total	12	300
VI	Core Course IX: Inorganic Chemistry-IV	3	75
	Core Course X: Organic Chemistry-III	3	75
	Core Course XI: Physical Chemistry-III	3	75
	Core Course XII: Advanced and Applied Chemistry	3	75
	Core Course XIII: Elective	2	75
	Core Course XIV: Physical Chemistry Practical	4	100
	Core Course XV: Organic Chemistry Practical	4	100
	Core Course XVI: Inorganic Chemistry Practical-II	4	100
	Core Course XVII: Inorganic Chemistry Practical-III	4	100
	Core Course XVIII: Project Work	2	75
	Total	32	850