



હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3,02) State University

પો.બો.નં.-૨૧, યુનિવર્સિટી રોડ, પાટણ (ઉ.ગુ.) ૩૮૪૨૬૫

ફોન: (૦૨૭૬૬) ૨૩૭૦૦૦

Email : rcpi@ngsu.ac.in

ફેક્સ : (૦૨૭૬૬) ૨૩૧૯૧૭

Website : www.ngsu.ac.in



રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦

પરિપત્ર નં.-૨૦૦/૨૦૨૩

વિષય: વિજ્ઞાન વિદ્યાશાખા હેઠળના સ્નાતક કક્ષાના સેમેસ્ટર-૧ અને ૨ના જૂન ૨૦૨૩-૨૪ થી ક્રમશઃ અમલમાં આવતા અભ્યાસક્રમ / પરિક્ષા સ્કીમ અંગે.

આ યુનિવર્સિટીના વિજ્ઞાન વિદ્યાશાખા અંતર્ગત વિષયોના સ્નાતક વિભાગો તથા સંલગ્ન વિજ્ઞાન વિદ્યાશાખાની તમામ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, એકેડેમિક કાઉન્સિલની તારીખ: ૧૪/૦૮/૨૦૨૩ની મળેલ સભાના નિર્દિષ્ટ ઠરાવોથી રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦ અંતર્ગત UGCની Guideline તથા રાજ્ય સરકારશ્રીના શિક્ષણ વિભાગના તારીખ: ૧૧/૦૭/૨૦૨૩ના ઠરાવ નં.કે.સી.જી./એડમીન/૨૦૨૩-૨૪/૦૬૦૭/ખ-૧ થી પ્રકાશિત કરેલ કોમન કરિક્યુલમ એન્ડ ક્રેડિટ ફ્રેમવર્ક હેઠળ ક્રેડિટ માળખું તથા પ્રકાશિત કરેલ સ્ટાન્ડર્ડ ઓપરેટીંગ પ્રોસિજર (S.O.P.) મુજબ વિજ્ઞાન વિદ્યાશાખા હેઠળના નીચેના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો શૈક્ષણિક વર્ષ: ૨૦૨૩-૨૪ થી ક્રમશઃ અમલમાં આવે તે રીતે મંજૂર કરેલ છે, જેનો અમલ કરવા સારૂ સંબંધિતો આ સાથે મોકલવામાં આવે છે.

ક્રમ નં	અભ્યાસક્રમ	ઠરાવ ક્રમાંક	સેમેસ્ટર
૧	બી.એસ.સી. (ગણિતશાસ્ત્ર)	૧૯	સેમેસ્ટર ૧ અને ૨
૨	બી.એસ.સી. (વનસ્પતિશાસ્ત્ર)	૨૦	સેમેસ્ટર ૧ અને ૨
૩	બી.એસ.સી. (બાયોટેકનોલોજી)	૨૧	સેમેસ્ટર ૧ અને ૨
૪	બી.એસ.સી. (ભૌતિકશાસ્ત્ર)	૨૨	સેમેસ્ટર ૧ અને ૨
૫	બી.એસ.સી. (ઝૂલોજી)	૨૩	સેમેસ્ટર ૧ અને ૨
૬	બી.એસ.સી. (રસાયણશાસ્ત્ર)	૩૨	સેમેસ્ટર ૧ અને ૨

સદર બાબતની જાણ આપના સ્તરેથી અધ્યાપકશ્રીઓ તથા વિદ્યાર્થીઓને કરવા વિનંતી છે.
નોંધ:

- (૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજના / ડિપાર્ટમેન્ટના ગ્રંથાલયમાં મૂકવાની રહેશે.
- (૨) આ પરિપત્ર યુનિવર્સિટીની વેબસાઇટ www.ngsu.ac.in પર પણ ઉપલબ્ધ કરવામાં આવેલ છે. આથી સંબંધિત કોલેજોને ડાઉનલોડ કરી ઉપયોગ કરવા સારૂ જણાવવામાં આવે છે.



(3) વિજ્ઞાન વિદ્યાશાખા વિદ્યાશાખા હેઠળના સ્નાતક કક્ષાના પ્રોગ્રામના અભ્યાસક્રમોનો પરિપત્ર
નં.૧૩૦/૨૦૨૩, તારીખ:૨૩/૦૬/૨૦૨૩ રદ કરવામાં આવે છે.

Patel
કા. કુલસચિવ

બિડાણ: ઉપરમુજબ

નં-એકે/અસ/૩૬૪/૨૦૨૩

તારીખ:૩૧/૦૮/૨૦૨૩

પ્રતિ,

૧. ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા તરફ.
૨. વિજ્ઞાન વિદ્યાશાખા હેઠળની કોલેજોના આચાર્યશ્રીઓ તરફ
૩. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૪. ગ્રંથપાલશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૫. માન.કુલપતિશ્રી/કુલસચિવશ્રીનું કાર્યાલય હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૬. સિસ્ટમ એનાલીસ્ટશ્રી, કોમ્પ્યુટર (રીઝલ્ટ સેન્ટર) હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ.(વેબસાઇટ પર મુકવા સારું)
૭. પ્રવેશ પ્ર-શાખા, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ
૮. મહેકમ શાખા, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ (૨ નકલ)

Patel
Principal

The H.N.S.B.Ltd Science College
Himatnagar-383 001.

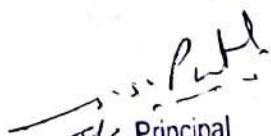


NAACA(3.02)StateUniversityPATAN-384265



Curriculum and Credit Framework For SEM I and II
Asper UGC Guideline
(According to NATIONAL EDUCATION POLICY (NEP) – 2020)

Submitted on 21st July 2023


Principal
The H.N.S.B Ltd Science College
Himatnagar-383 001.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC "A" (3.02) State University

PATAN - 384 265



भारत 2023 INDIA

वसुधैव कुटुम्बकम्

ONE EARTH • ONE FAMILY • ONE FUTURE



आज़ादी का
अमृत महोत्सव

FACULTY OF SCIENCE

B.Sc. (Honours) BOTANY

(With Research/without Research)

SCIUG103

Semesters: I and II

(with multiple entry & exit option)

SYLLABUS

Curriculum as per UGC Guideline

Framed according to National Education Policy (NEP) - 2020

With effect from June - 2023 (and thereafter)

Handwritten signature

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC "A" (3.02) State University

PATAN - 384 265



B.Sc. (Honours) Botany Programme

(With Research/without Research)

SCIUG103

NEP-2020

With effect from June - 2023 (and thereafter)

FACULTY OF SCIENCE

Subject: BOTANY

B. Sc. Semesters: I and II

Total Pages: 01 to 69

Submitted on

Date: /06/2023

Handwritten signature

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC "A" (3.02) State University

PATAN - 384 265



BOARD OF STUDIES (BOS) IN BOTANY

References: No. AK/AxS/2125/2020 Dt. 28/08/2020.

No. AK/AxS/2315/2020 Dt. 04/09/2020.

No. AK/AxS/3006/2020 Dt. 01/10/2020.

No.	Name of BoS Members	Designation
1.	Dr. NARENDRAKUMAR K. PATEL	CHAIRMAN
2.	Dr. YOGESHKUMAR B. DABGAR	MEMBER
3.	SHRI PRADIPKUMAR P. MEHTA	MEMBER
4.	Dr. JITENDRABHAI S. PATEL	MEMBER
5.	Dr. YOGESHKUMAR M. PATEL	MEMBER
6.	Dr. HAMIRBHAI M. ANT	MEMBER
7.	Dr. NITINKUMAR G. TRIVEDI	MEMBER
8.	Dr. ABBASHBHAI R. SELIYA	MEMBER
9.	Dr. NEETABEN B. GOL	MEMBER
10.	Dr. PURVESHBHAI B. BHARVAD	MEMBER
11.	Dr. VASANTBHAI A. PATEL	CO-OPT MEMBER
12.	Dr. MUKESHBHAI M. PRAJAPATI	CO-OPT MEMBER
13.	Dr. MADHUSUDAN S. JANGID	CO-OPT MEMBER
14.	Dr. JAGDISHBHAI N. PATEL	CO-OPT MEMBER

N. Patel

B.Sc. Semester I Courses :: BOTANY::

Theory Courses	Programme Code	Title (Course Code)	Practical Courses
Major (MJDSC) (credits: 4+4)	SCIUG103	MICROBIOLOGY AND PHYCOLOGY (SC23MJDSCBOT101) (credits: 4)	MICROBIOLOGY AND PHYCOLOGY (SC23PMJDSCBOT101) (GROUP A+ GROUP B) (credits: 2+2)
Minor (MiDSC) (credits: 2+2)	SCIUG103	MICROBES AND ALGAE (SC23MiDSCBOT102) (credits: 2)	MICROBES AND ALGAE (SC23PMiDSCBOT102) (credits: 2)
Multi/Inter Disciplinary(MDC) (credits: 2+2)	SCIUG103	PLANT IN EVERYDAY LIFE (SC23MDCBOT103) (credits: 2)	PLANT IN EVERYDAY LIFE (SC23PMDCBOT103) (credits: 2)
Ability Enhancement (AEC) (credits: 2)	SCIUG103	FROM POOL OF COURSE (SC23MDCBOT104) (credits: 2)	—
Indian Knowledge System (IKS) (credits: 2)	SCIUG103	FROM POOL OF COURSE (SC23IKSBOT105) (credits: 2)	—
Skill Enhancement (SEC) (credits: 2)	SCIUG103	HORTICULTURE (SC23SECBOT106) (credits: 2)	—

Botany

B.Sc. Semester II Courses :: BOTANY::

Theory Courses	Programme Code	Title (Course Code)	Practical Courses
Major (MJDCS) (credits: 4+4)	SCIUG103	BIOMOLECULES AND CELL BIOLOGY (SC23MJDCSBOT201) (credits:4)	BIOMOLECULES AND CELL BIOLOGY (SC23PMJDSCBOT201) (GROUP A+ GROUP B) (credits:2+2)
Minor (MiDSC) (credits: 2+2)	SCIUG103	ORGANIC MOLECULES AND CYTOLOGY (SC23MiDSCBOT202) (credits:2)	ORGANIC MOLECULES AND CYTOLOGY (SC23PMiDSCBOT202) (credits:2)
Multi/Inter Disciplinary(MDC) (credits: 2+2)	SCIUG103	FRUITS AND VEGETABLE PROCESSING (SC23MDCBOT203) (credits:2)	FRUITS AND VEGETABLE PROCESSING (SC23PMDCBOT203) (credits:2)
Ability Enhancement (AEC) (credits: 2)	SCIUG103	FROM POOL OF COURSE (SC23MDCBOT204) (credits:2)	—
Indian Knowledge System (IKS) (credits: 2)	SCIUG103	FROM POOL OF COURSE (SC23IKSBOT205) (credits:2)	—
Skill Enhancement (SEC) (credits: 2)	SCIUG103	NATURAL RESOURCE MANAGEMENT (SC23SECBOT206) (credits: 2)	—

Botany

CONTENTS

1. SUMMARY OF THE PROGRAMME	8
2. PREAMBLE.....	9
3. NEP-2020	11
4. APPROACH TO CURRICULUM PLANNING.....	11
5. NATURE AND EXTENT OF BACHELOR'S DEGREE PROGRAMME IN BOTANY (HONOURS)	12
6. AIMS	13
7. PROGRAM LEARNING OUTCOMES	14
PO 1: Knowledge	14
PO 2: Critical Thinking and problem solving ability.....	14
PO 3: Digitally equipped	14
PO 4: Ethical and Psychological strengthening	14
PO 5: Team Player.....	14
PO 6: Independent Learner	14
8. SALIENT FEATURES	15
• Academic Bank of Credits (ABC)	15
9. General framework	16
10. Semester wise weightage.....	17
11. Attendance.....	17
12. Medium of Instruction	17
13. Teaching Learning Process	17
14. Language of Question paper	18
15. Evaluation Methods	18
16. Nature and Objectives of various types of evaluation	19
17. MODELS OF EVALUATION.....	20
18. CERTIFIED JOURNAL.....	21
19. Study tour.....	21
20. COMPUTATION OF SGPA	22
21. Cumulative Grade Point Average (CGPA)	22
22. Framed according to National Education Policy (NEP) General Pattern	23
23. SEMESTER I	25
24. MAJOR DISCIPLINE SPECIFIC CORE COURSES:.....	25
SEM-I: SC23MJDSCBOT101: MICROBIOLOGY AND PHYCOLOGY.....	25
Programme specific Learning Outcomes	25



25. MINOR DISCIPLINE SPECIFIC CORE COURSES:	25
SEM-I: SC23MiDSCBOT102: MICROBES AND ALGAE	25
Programme specific Learning Outcomes	25
26. MULTI / INTER DISCIPLINARY COURSE	26
SEM-I: SC23MDCBOT103: PLANTS IN EVERYDAY LIFE	26
Programme specific Learning Outcomes	26
27. SKILL ENHANCEMENT COURSE	26
SEM-I: SC23SECBOT106: HORTICULTURE	26
Programme specific Learning Outcomes	26
28. MAJOR DISCIPLINE SPECIFIC CORE COURSE -THEORY (MJDSC).....	27
B.Sc. I: SC23MJDCBOT101:Microbiology and Phycology	27
Course outcomes	27
Suggested Readings	28
29. MAJOR DISCIPLINE SPECIFIC CORE COURSE -PRACTICAL (PMJDSC).....	29
30. B.Sc. I:SC23PMJDSCBOT101:Microbiology and Phycology.....	29
Course outcomes	29
Suggested Readings.....	30
31. B. SC. :: BOTANY Practical(MAJOR) :: SEMESTER-I	31
32. MICROBIOLOGY AND PHYCOLOGY_SC23PMJDSCBOT101(GROUP A & GROUP B)...	31
33. MINOR DISCIPLINE SPECIFIC CORE COURSE -THEORY (MIDSC)	32
B. Sc. I_SC23MiDSCBOT102_MICROBES AND ALGAE	32
Course outcomes	32
Suggested Readings.....	33
34. B.Sc. I_SC23PMiDSC_BOT102_MICROBES AND ALGAE	34
Course outcomes	34
Suggested Readings.....	35
35. B. SC. :: BOTANY Practical(MINOR) :: SEMESTER-I	36
MICROBES AND ALGAE_SC23PMiDSCBOT102.....	36
36. MULTI/INTER DISCIPLINARY COURSE-THEORY (MDSC).....	37
B.Sc. I_SC23MDSCBOT103_PLANTS IN EVERYDAY LIFE.....	37
Course outcomes	37
37. MULTI/INTER DISCIPLINARY COURSE-PRACTICAL (PMDSC).....	40
SC23PMDSCBOT103_PLANTS IN EVERYDAY LIFE	40
Course outcomes	40
Suggested Readings.....	41
B. Sc. :: BOTANY PRACTICAL :: SEMESTER-I (MULTI/INTER DISCIPLINARY COURSE)	43

Handwritten signature: N. Patel

PLANTS IN EVERYDAY LIFE_SC23PMDSCBOT103	43
38. SKILL ENHANCEMENT COURSE-THEORY (SEC).....	44
SC23SEC_BOT106_HORTICULTURE.....	44
Course outcomes	44
Suggested Readings.....	44
39. SEMESTER II	45
40. MAJOR DISCIPLINE SPECIFIC CORE COURSE	45
SEM- II: SC23MJDSCBOT201: BIOMOLECULES AND CELL BIOLOGY	45
Programme specific Learning Outcomes	45
41. MINOR DISCIPLINE SPECIFIC CORE COURSE.....	45
SEM- II: SC23MiDSCBOT202: ORGANIC MOLECULES AND CYTOLOGY	45
Programme specific Learning Outcomes	45
42. MULTI/INTER DISCIPLINARY COURSE	46
SEM- II: SC23MDSCBOT203: FRUITS AND VEGETABLE PROCESSING.....	46
Programme specific Learning Outcomes	46
43. SKILL ENHANCEMENT COURSE	46
SC23SECBOT206: NATURAL RESOURCE MANAGEMENT	46
Programme specific Learning Outcomes	46
44. MAJOR DISCIPLINE SPECIFIC CORE COURSE 1-THEORY (MJDSC)	47
45. B.Sc. II_SC23MJDSCBOT201_Biomolecules and Cell Biology.....	47
Course outcomes	47
Suggested Readings.....	49
46. MAJOR DISCIPLINE SPECIFIC CORE COURSE 1-PRACTICAL (PMJDSC)	50
SC23PMJDSCBOT201_Biomolecules and Cell Biology	50
Course outcomes	50
Suggested Readings.....	51
47. B. Sc. :: BOTANY (MAJOR) PRACTICAL:: SEMESTER-II	52
SC23PMJDSCBOT201	52
48. MINOR DISCIPLINE SPECIFIC CORE COURSE 1-THEORY (MiDSC).....	53
49. B.Sc. II_SC23MiDSCBOT_202_ORGANIC MOLECULES AND CYTOLOGY.....	53
Course outcomes	53
Suggested Readings.....	54
50. MINOR DISCIPLINE SPECIFIC CORE COURSE 1-PRACTICAL (MiDSC).....	55
SC23PMiDSCBOT201_ORGANIC MOLECULES AND CYTOLOGY	55
Course outcomes	55
Suggested Readings.....	56

Handwritten signature

51. B. Sc. :: BOTANY (MINOR) PRACTICAL:: SEMESTER-II	57
MOLECULES AND CYTOLOGY_SC23PMiDSCBOT202	57
52. MULTI/INTER DISCIPLINARY COURSE-THEORY (MDC).....	58
SC23MDCBOT203_FRUITS AND VEGETABLE PROCESSING.....	58
Course outcomes	58
Suggested Readings.....	59
SC23PMDCBOT203FRUITS AND VEGETABLE PROCESSING	60
Course outcomes	60
Suggested Readings.....	61
53. B. Sc. :: BOTANY (MULTI/INTER DISCIPLINARY)Practical :: SEMESTER-II	62
54. SKILL ENHANCEMENT COURSE-(THEORY)(SEC)	63
SC23SEC BOT206_NATURAL RESOURCE MANAGEMENT.....	63
Course outcomes	63
Suggested Readings.....	63
55. Format for Questions paper for 4 credit Course in Botany	64
56. Format for Questions paper for 2 credit Course in Botany	65

Botany

SUMMARY OF THE PROGRAMME

SYLLABUS DURATION	SEMESTER PATTERN I.E., SIX MONTHS (single major)
THEORY	
No. of Discipline Specific Major Core Courses (MJDSC)	01/Semester
<i>Credits per Discipline Specific Major Core Course (MJDSC)</i>	<i>04</i>
<i>Total credits for Discipline Core Major Course (MJDSC)</i>	04/Semester
<i>Theory lectures per Discipline Major Core Course (MJDSC)</i>	<i>04/week</i>
No. of Minor(MiDSC), Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC), Skill Enhancement Courses (SEC) & Value Added Course (VAC)/Indian Knowledge System (IKS)	01/Semester
<i>Credits per Minor(MiDSC), Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC), Skill Enhancement Courses (SEC) & Value Added Course (VAC)/ Indian Knowledge System (IKS)</i>	<i>02</i>
<i>Total credits for Minor(MiDSC), Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC) Skill Enhancement Courses (SEC) & Value Added Course (VAC)/ Indian Knowledge System (IKS)</i>	02/Semester
<i>Theory lectures per Minor(MiDSC), Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC) Skill Enhancement Courses (SEC) & Value Added Course (VAC)/ Indian Knowledge System (IKS)</i>	<i>02 /week</i>
PRACTICAL	
No. of Practical courses per Discipline Specific Major Core Courses (MJDSC)	01 (in each semester)
<i>Credits per Practical course</i>	04(GROUP A:2+GROUP B:2)
<i>Total Credits of Practical course</i>	<i>02+02/Semester</i>
<i>Total Practical lectures</i>	<i>08(04 +04/week/ batch)</i>
<i>No. of Practical course (in Uni. Exam.)</i>	01/Semester (GROUP A+GROUP B)
No. of Practical courses per Discipline Specific Minor (MiDSC) & Multi /Inter Disciplinary Courses (MDC / IDC)	01 (in each semester)
<i>Credits per Practical course</i>	02
<i>Total Credits of Practical course</i>	<i>02/Semester</i>
<i>Total Practical lectures</i>	<i>04/week/ batch</i>
<i>No. of Practical course (in Uni. Exam.)</i>	01/Semester
EVALUATION	
Examination (including Preparation - week)	5
<i>No. of Days per week</i>	6
<i>Week (days) available for Teaching</i>	15 (90)
<i>Duration of each lecture (minutes)</i>	55
<i>No. of students/batch</i>	20 (on approval of AC and Exam. Unit)

BT/etel

Framed according to National Education Policy (NEP) - 2020
Under Choice Based Credit System-Semester-Grading System pattern

UG (B. Sc.) Programme in Botany

Semester-I and II

PREAMBLE:

Over the past decades the higher education system of our country has undergone substantial structural and functional changes resulting in both quantitative and qualitative development of the beneficiaries. The upgradation of undergraduate programmes in the line of NEP, 2020 will play an extremely important role in promoting human as well as societal well-being and in developing India as envisioned in its Constitution - a democratic, just, socially conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all. A holistic and multidisciplinary education would aim to develop all capacities of human beings -intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner. Such an education will help develop well-rounded individuals that possess. Such changes will further result in learning outcome based curriculum in order to maximize the benefits of the newly designed curriculum. The learning outcome based curriculum in general and in Botany in particular will definitely help the teachers of the discipline to visualize the curriculum more specifically in terms of the learning outcomes expected from the students at the end of the instructional process. It is pertinent to mention here that the purpose of education is to develop an integrated personality of the individual and the educational system provides all knowledge and skills to the learner for this.

The template as developed has the provision of ensuring the integrated personality of the students in terms of providing opportunity for exposure to the students towards core courses, discipline specific courses, generic elective courses, ability enhancement courses and skill enhancement courses with special focus on technical, communication and subject specific skills through practical and other innovative transactional modes to develop their employability skills. The template of learning outcome based framework has categorically mentioned very well defined expected outcomes for the programme like core competency, communication skills, critical thinking, affective skills, problem-solving, analytical, reasoning, research-skills, teamwork, digital literacy, moral and

ethical awareness, leadership readiness and so on along with very specific learning course outcomes at the starting of each course. Therefore, this template on Learning Outcomes based Curriculum Framework (LOCF) for B.Sc. with Botany/ Botany Honours under the University will be in the line of NEP, 2020 – more flexible, multi-disciplinary, holistic and will definitely be a landmark in the field of outcome based curriculum construction.

Today plant science is a fusion of the traditional components with the modern aspects of biochemistry, molecular biology and biotechnology. Over the years, plant science (Botany) has shown enormous gain in information and applications owing to tremendous inputs from research in all its aspects. With global recognition of the need for conservation, field plant biologists have contributed significantly in assessing plant diversity. Taxonomists have explored newer dimensions for the classification of plants. New insights have been gained in functional and structural aspects of plant development by utilizing novel tools and techniques for botanical research. Challenging areas of teaching and research have emerged in ecology and reproductive biology. Concern for ever increasing pollution and climate change is at its highest than ever before. Keeping these advancements in view, a revision of the curriculum at the undergraduate level is perfectly timed. From the beginning of the session, the Botany students across Indian Universities shall have the benefit of a balanced, carefully-crafted course structure taking care of different aspects of plant science, namely plant diversity, physiology, biochemistry, molecular biology, reproduction, anatomy, taxonomy, ecology, economic botany and the impact of environment on the growth and development of plants. All these aspects have been given due weightage over the six semesters. It is essential for the undergraduate students to acquaint themselves with various tools and techniques for exploring the world of plants up to the sub- cellular level. A paper on this aspect is proposed to provide such an opportunity to the students before they engage themselves with the learning of modern tools and techniques in plant science. Keeping the employment entrepreneurship in mind, applied courses have also been introduced. These courses shall provide the botany students hands on experience and professional inputs. On the whole, the curriculum is a source of lot of information and is supported by rich resource materials. It is hoped that a student graduating in Botany with the new curriculum will be a complete botanist at Honours level.

NEP-2020:

NEP, 2020 aims at a new and forward-looking Vision for India's Higher Education System. This curriculum framework for the bachelor-level program in Botany is developed keeping in view of the student centric learning pedagogy, which is entirely multidisciplinary outcome-oriented and curiosity-driven. To avoid rote-learning approach and foster imagination, the curriculum is more leaned towards self-discovery of concepts. The curriculum framework focuses on pragmatist approach whereby practical application of theoretical concepts is taught with substantial coverage of practical and field works. The platform aims at equipping the graduates with necessary skills for botany-related careers, careers with general graduate-level aptitude and for higher education in Botany and allied subjects. Augmented in this framework are graduate attributes including critical thinking, basic psychology, scientific reasoning, moral ethical reasoning and so on, qualification descriptors that are specific outcomes pertinent to the discipline of botany, learning outcomes for the two programmes these frameworks have been developed, learning outcomes for individual courses, pedagogical methods and assessment methods. Looking at all these new concepts and progress, the detailed syllabus of B.Sc. (H) – Botany has been designed and decided to be implemented from the academic session from June 2023-24.

APPROACH TO CURRICULUM PLANNING:

While designing these frameworks, emphasis is given on the objectively measurable teaching-learning outcomes to ensure employability of the graduates. In line with recent trends in education section, these frameworks foster implementation of modern pedagogical tools and concepts such as flip-class, hybrid learning, MOOCs and other e-learning platforms. In addition, the framework pragmatic to the core; it is designed such a way to enable the learners implementing the concepts to address the real world problems. A major emphasis of these frameworks is that the curriculum focuses on issues pertinent to India and also of the west; for example, biodiversity and conservation of endemic and threatened species that are found in India, Indian climatological variables, Indian biodiversity and so on. Above all, these frameworks are holistic and aim to mould responsible Indian citizen who have adequate skills in reflective thinking, rational skepticism, scientific temper, digital literacy and so on such that they are equipped to fight immediate social issues apropos to Indian milieu, including corruption and inequity.

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications such as a Bachelor's Degree (Hons) programmes are earned and awarded on the basis of (a) demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and (b) academic standards expected of graduates of a programme of study.

Learning outcomes-based frameworks in any subject must specify what graduates completing a particular programme of study are (a) expected to know, (b) understand and (c) be able to do at the end of their programme of study. To this extent, LOCF in Botany is committed to allowing for flexibility and innovation in (i) programme design and syllabi development by higher education institutions (HEIs), (ii) teaching-learning process, (iii) assessment of student learning levels, and (iv) periodic programme review within institutional parameters as well as LOCF guidelines, (v) generating framework(s) of agreed expected graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes. HEIs, on their turn, shall address to the situations of their students by identifying relevant and common outcomes and by developing such outcomes that not only match the specific needs of the students but also expands their outlook and values.

NATURE AND EXTENT OF BACHELOR'S DEGREE PROGRAMME IN BOTANY

(HONOURS):

A bachelor's degree in Botany with Research or without Research is a 4 year degree course which is divided into 8 semesters.

Sl. No.	NCRF Credit Levels	Type of Award	Stage of Exit	Mandatory Credits to be secured for the Award
1	4.5	Certificate in the Discipline	After successful completion of 1st Year	44
2	5.0	Diploma in the Discipline	After successful completion of 1st and 2nd Years	88
3	5.5	B.Sc. Degree in Botany	After successful completion of 1st, 2nd and 3rd Years	132
4	6.0	B.Sc. (Honours with Research) / (without Research) in Botany	After successful completion of 1st, 2nd, 3rd and 4th Years	176

A student pursuing 4 years undergraduate programme with research in a specific discipline shall be awarded an appropriate Degree in that discipline on completion of 8th Semester if he/she secures 176 Credits. Similarly, for certificate, diploma and

degree, a student needs to fulfil the associated credits. An illustration of credits requirements in relation to the type of award is illustrated as above.

Bachelor's Degree (Honours) is a well-recognized, structured, and specialized graduate level qualification in tertiary, collegiate education. The contents of this degree are determined in terms of knowledge, understanding, qualification, skills, and values that a student intends to acquire to look for professional avenues or move to higher education at the postgraduate level.

Bachelor's Degree (Honours) programmes attract entrants from the secondary level or equivalent, often with subject knowledge that may or may not be directly relevant to the field of study/profession. Thus, B.Sc. (Honours) Course in Botany aims to equip students to qualify for joining a profession or to provide development opportunities in particular employment settings. Graduates are enabled to enter a variety of jobs or to continue academic study at a higher level.

AIMS:

1. To transform curriculum into outcome-oriented scenario.
2. To develop the curriculum for fostering discovery-learning.
3. To equip the students in solving the practical problems pertinent to India.
4. To adopt recent pedagogical trends in education including e-learning, flipped class, hybrid learning and MOOCs
5. To mold responsible citizen for nation-building and transforming the country towards the future.
6. To provide an environment that ensures cognitive development of students in a holistic manner. A dialogue about plants and its significance is fostered in this framework, rather than didactic monologues on mere theoretical aspects.
7. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A Botany graduate as envisioned in this framework would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.
8. To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.
9. To enable the graduate prepare for national as well as international competitive examinations, especially UGC-CSIR NET and UPSC Civil Services Examination.

PROGRAM LEARNING OUTCOMES:

The student graduating with the Degree B.Sc. (Honours) Botany should be able to acquire

PO 1: Knowledge: Students will acquire core competency in the subject Botany, and in allied subject areas. The student will be able to identify major groups of plants and compare the characteristics of lower (e.g. algae and fungi) and higher (angiosperms and gymnosperms) plants.

- Students will be able to use the evidence based comparative botany approach to explain the evolution of organism and understand the genetic diversity on the earth.
- The students will be able to explain various plant processes and functions, metabolism, concepts of gene, genome and how organism's function is influenced at the cell, tissue and organ level.
- Students will be able to understand adaptation, development and behavior of different forms of life.
- The understanding of networked life on earth and tracing the energy pyramids through nutrient flow is expected from the students.
- Students will be able to demonstrate the experimental techniques and methods of their area of specialization in Botany.

PO 2: Critical Thinking and problem solving ability: An increased understanding of fundamental concepts and their applications of scientific principles is expected at the end of this course. Students will become critical thinker and acquire problem solving capabilities.

PO 3: Digitally equipped: Students will acquire digital skills and integrate the fundamental concepts with modern tools.

PO 4: Ethical and Psychological strengthening: Students will also strengthen their ethical and moral values and shall be able to deal with psychological weaknesses.

PO 5: Team Player: Students will learn team workmanship in order to serve efficiently institutions, industry and society.

PO 6: Independent Learner: Apart from the subject specific skills, generic skills, especially in botany, the program outcome would lead to gain knowledge and skills for further higher studies, competitive examinations and employment. Learning outcomes based curriculum would ensure equal academic standards across the country and

broader picture of their competencies. The Bachelor program in Botany and Botany honours may be mono-disciplinary or multidisciplinary.

SALIENT FEATURES:

- B.Sc. (Honours) Botany in UG programme - **Semester I and II** shall be offered from the Academic year, June **2023**.
- Botany subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2023-24.
- A student will have to get enrolled a **Discipline Specific Core Course (DSC)** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting a **Multi/ Inter disciplinary Course (MDC/ IDC)**, **Ability Enhancement Course (AEC)**, **Skill Enhancement Course (SEC)** as well as **Value Added Course (VAC)/Indian Knowledge System (IKS)** from a pool of courses.
- **Academic Bank of Credits (ABC)** is an academic service mechanism as a digital/virtual/online entity established and managed by MOE/UGC. This will facilitate students to become its academic account holders and paving the way for seamless student mobility between or within degree-granting Higher Education Institutions (HEIs) through a formal system of credit recognition, credit accumulation, credit transfers and credit redemption to promote distributed teaching- learning from various recognized institutions, approved ODL and other sources to increase their knowledge, capacities and skills. ABC shall be established on the lines of "National Academic Depository" (NAD) as a Special Purpose Vehicle (SPV). It shall have a dynamic website providing all details of ABC, operational mechanism for the use of all stakeholders of higher education.
- Each course shall be assigned a specific number of **Credits**.
- Discipline Specific Core Course (**DSC**) is the course which should compulsorily be studied by a candidate as a Major and Minor requirement so as to get degree in a said discipline of study.
- There shall be a **Major (MJDC) Compulsory** course (Theory) with **4 credits** and their practical's with **4 (Group A: 2+ Group B: 2) credits**.
- One **Minor (MiDSC) Compulsory** course and **Multi/ Inter disciplinary Course (MDC/ IDC)** (Theory) each with **2 credits** in each semester and their practical's each with **2 credits**.

- In addition to the Major/Minor course, a student will have to choose **MDC/IDC, AEC, SEC** as well as **VAC/IKS** from a pool of courses.
- **AEC, SEC** and **VAC/IKS** courses shall have to be offered. The credit weight-age for **AEC, SEC, VAC/IKS** course shall be of **2 credits**.
- Each course shall have a unique Course code. The Discipline Specific Core Course, Inter/Multi-Disciplinary Course, Ability Enhancement Course, Value Added Course and Skill Enhancement Course shall be abbreviated respectively as **DSC, IDC/MDC, AEC, VAC/IKS and SEC**.
 1. Discipline Specific Core Course DSC- Major (**MJDSC**) & Minor (**MiDSC**)
Practical Discipline Specific Core Course **PDSC- PMJDSC & PMiDSC**.
 2. Multi/Inter Disciplinary Course **MDC/IDC**
Practical Multi/Inter Disciplinary Course **PMDC/PIDC**
 3. Ability Enhancement Course **AEC**
 4. Skill Enhancement Course **SEC**
 5. Value Added Course **VAC**
 6. Indian Knowledge System **IKS**
- Each Academic year shall consist of **two** semesters, each of **15 weeks** of teaching equivalent to **90 working days**. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.
- The theory course with **4 credits** shall be of **60 hrs** (15 weeks x 4 credits) duration and the course with **2 credits** shall be of **30 hrs** (15 weeks x 2 credits) duration.
- The **Practical** course with **4 credits** shall be of **120 hrs** (15 weeks x 8 hours) duration and the **Practical** course with **2 credits** shall be of **60 hrs** (15 weeks x 4 hours) duration.

GENERAL FRAMEWORK:

- *A general framework for Bachelor of Science (B. Sc.) with Honours programme with Research/without Research shall be as follows:*

Semester wise credits								Total credits of the Programme
I	II	III	IV	V	VI	VII	VIII	
22	22	22	22	22	22	22	22	176

SEMESTER WISE WEIGHTAGE:

- The semester wise weightage of major, minor, multi/inter disciplinary, AEC, SEC and VAC/IKS shall be as follows:

Academic year	Core Compulsory Courses	Multi/ Inter Disciplinary courses	Ability Enhancement Course	Skill Enhancement Course	Value Added Course
Semester I & II	8% to 46%	3% to 16 %	0% to 9%	0% to 9%	(IKS) 0% to 9%
Semester III	14% to 41%	3% to 15%	0% to 9%	0% to 9%	0% to 9%
Semester IV	17% to 56%	-	0% to 9%	0% to 9%	0% to 9%
Semester V	19% to 72%	-	-	0% to 9%	-
Semester VI	17% to 56%	-	0% to 9%	0% to 18%	-
Semester VII & VIII	Major	With Research or without Research (RP/OJT)			
	18% to 56%	0% to 26%			

ATTENDANCE:

The attendance rules as per the norms of Hemchandracharya North Gujarat University, Patan.

MEDIUM OF INSTRUCTION:

The Medium of Instruction shall be of **Gujarati medium**. Student is free to write answers either in **Gujarati** and/or **English** language.

TEACHING LEARNING PROCESS:

Teaching and learning in this programme involve classroom lectures as well tutorials. It allows-

- The tutorials allow a closer interaction between the students and the teacher as each student gets individual attention.
- Written assignments and projects submitted by students
- Project-based learning
- Group discussion
- Home assignments
- Quizzes and class tests
- PPT presentations, Seminars, interactive sessions
- Diversity survey
- Co-curricular activity etc.
- Industrial Tour or Field visit

LANGUAGE OF QUESTION PAPER:

Question paper should be drawn in **Gujarati** language and its **English** version should be given.

EVALUATION METHODS:

Academic performance in various courses *i.e.* **MJDSC, MiDSC, MDC/IDC, AEC, SEC, VAC/IKS** and **RP/OJT** are to be considered as parameters for assessing the achievement of students in the Botany subject. A number of appropriate assessment methods of Botany will be used to determine the extent to which students demonstrate desired learning outcomes.

Following assessment methodology should be adopted:

1. A student shall be evaluated through **Continuous and Comprehensive Evaluation (CCE)/ (Internal Evaluation)** and as well as the **Semester End Evaluation (SEE) (External Evaluation)**. The weightage of theory and practical is **25 marks per credit**. CCE shall be **50%**, whereas the weightage of the SEE shall be **50%**.

Sr. No.	Evaluation	4 credits subjects (Marks)	2 credits subjects (Marks)
1	CCE (50%) Classroom & Mid-Term Evaluation	50	25
2	SEE (50%)	50	25
	Total	100	50

2. In the **Continuous and Comprehensive Evaluation (CCE)/ (Internal Evaluation)** is spread through the duration of the course and is to be done by the Teacher teaching the course. BoS of the subjects will decide various criteria and their weight-age for CCE. The assessment is to be done by various means including:

Written Mode	Oral Mode	Practical Mode	Integrated Mode
1. Semester Exam 2. Class Test 3. Open book exam/test 4. Open note exam/test 5. Self-test/ Online test 6. Essay/Article writing 7. Quizzes/Objective test 8. Class assignment 9. Home assignment 10. Reports Writing 11. Research/Dissertation 12. Case Studies	1. Viva/Oral exam 2. Group Discussion 3. Role Play 4. Authentic Problem Solving 5. Quiz 6. Interview	1. Lab work 2. Computer simulation/ Virtual labs 3. Craft work 4. Co-curricular work	1. Paper presentation/ Seminar 2. Field Assignment 3. Poster presentation

NATURE AND OBJECTIVES OF VARIOUS TYPES OF EVALUATION:

Written Mode		
Evaluation Type	Nature	Objectives
Semester Exam	Traditionally essay type	For depth and planned preparation
Class test	Traditionally essay type	Fixed date forces students to learn
Open book test	Allowed choice of reference book	Measures what students can do with resources, less stress on
Open note test	To get used to the system	Encourage good note taking
Self-test	For subjective and objective items	Mastery learning occurs with proper feedback
Article/essay writing	Individual long written assignment	Individual expression and creativity
Quizzes/Objective test	Short duration structured test	Excellent validity as greater syllabus coverage
Class assignment	With defined time	Student's performance to make decision
Home assignment	With undefined time	Reinforce learning and facilitate mastery of specific skills
Reports Writing	On activities performed or event observed	Develop a key transferable skill
Research/Dissertation	Detailed research-based report	To judge creativity and research
Case Studies	Analyse a given case (real or fictional)	To assess thinking, value, and attitude

Oral Mode		
Evaluation Type	Nature	Objectives
Viva/Oral exam	Individually or in small group	Practical experience towards job interview situation
Group discussion	Small group of 2-5 members work on a joint task	Encourage teamwork
Role Play	Small group of 2-5 members work on a joint task	Develop personality
Authenticate problem solving	Small group of 2-5 members work on a joint task	Communication of ideas
Quiz	Small group of 2-5 members work on a joint task	Assess memory power
Interview	Individually	Judge the personal confidence level

Practical Mode		
Evaluation Type	Nature	Objectives
Lab work	Component of working with one's hand	Keep the students on the task
Computer simulation/virtua	Component of working with one's hand	To understand the practical exposure
Craft work	Component of working with one's hand	Encourage application of concepts learnt
Co-curricular work	Component of working with one's hand	For immediate feedback

Integrated Mode		
Evaluation Type	Nature	Objectives
Paper presentation/Seminar	Group or individual work	Learn from others presentation
Field Assignment	Field visit with report	Develop observation and recording skills
Poster presentation	Group or individual work	Develop research, creativity, and discussion skills

MODELS OF EVALUATION:

Based on the types of evaluation, various models of evaluation implementation are suggested for theory, practical, self-study and work-based learning. The focus of these models is to encourage the students to improve on skills and performance.

Model for Theory Courses	
CCE- 50% (100)	SEE- 50% (100)
Exam Pattern	Marks
Class Test (best 2 out of 3)	30
Quiz (Best 3 out of 4)	30
Active Learning	10
Home Assignment	10
Class Assignment	10
Attendance	10
Continuous and Comprehensive Evaluation(CCE)	100
Semester-End Evaluation (SEE)	100
Model for Project/Self Model for Project/Self-study course-study/ work	
Exam Pattern	Marks
Project Evaluation (Best 4 out of 5)	80
Participation in discussion	10
Attendance	10
Continuous and Comprehensive Evaluation(CCE)	100
Semester-End Evaluation(SEE)	100

13. CCE and SEE shall be of 2 ½ hours for 4 credits course and 2 hours in case of 2 credits courses.

14. **CERTIFIED JOURNAL:**

The End of Semester Examination will be conducted by the University. A **certified journal** of the respective practical course **must be produced** at the time of practical examination by the student.

15. It will be compulsory for a candidate to obtain **passing percentage** in both Internal as well as External Evaluation. The passing marks for each course shall be **40%** as decided by concern Board of Studies (BoS) in Botany.

16. Promotion, Re-Admission and Time for Completion of course, Procedure for awarding grades, Provision for appeal, etc. as decided by the **Hemchandracharya North Gujarat University**.

STUDY TOUR:

Botanical excursion/study tour may be arranged (by the concern faculty with prior permission of **HoD and/or Principal**) within state and/or outside the state to explore/study plant diversity in its natural habitats.

COMPUTATION OF SGPA:

SGPA is computed from the grades as a measure of the student's performance in each semester. It is the ratio of the sum of the product of the number of credits with the grade points and the sum of the number of credits. i.e.

$$\text{SGPA (Si)} = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

Where S_i is the SGPA for i th course, C_i is the number of credits of the i th course and G_i is the grade point scored by the student in the i th course.

CUMULATIVE GRADE POINT AVERAGE (CGPA)

The CGPA is based on the grades in all the courses taken after joining the programme of study. It is the ratio of the sum of the products of total credits scored in a particular semester with the SGPA scored by the student in that semester and the sum of the total number of credits of each semester. i.e.

$$\text{CGPA} = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

Where S_i is the SGPA of the i th semester and C_i is the total number of credits in that semester.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B.Sc. Honours Programme with 176 credits CBCS-Semester-Grading Pattern
FRAMED ACCORDING TO NATIONAL EDUCATION POLICY (NEP- 2020)w.e.f. June-2023
General Pattern/Scheme of study components along with credits for Science faculty.

CERTIFICATE COURSE								
Part/Class	Subject code	Study Components	Instruction Hrs/Week	Examination			Credits	Exam Duration (Hours)
				CCE	SEE	Total		
B.Sc. Semester -I	Semester-I							
	Discipline Specific Core Course(DSC)							
	SC23MJDCBOT101	Major Discipline Specific Core Courses (MJDC)	4	50	50	100	4	02:30
	SC23MiDCBOT102	Minor Discipline Specific Core Courses (MiDC)	2	25	25	50	2	02:00
	SC23MDCBOT103	Multi/Inter Disciplinary Courses (MDC/IDC)	2	25	25	50	2	02:00
	Practical Course(PDSC)							
	SC23PMJDCBOT101 (Group A+B)	Major Discipline Specific Core Courses (PMJDC)	8	50	50	100	4	05:00
	SC23PMiDCBOT102	Minor Discipline Specific Core Courses (PMiDC)	4	25	25	50	2	02:30
	SC23PMDCBOT103	Multi/Inter Disciplinary Courses (PMDC/PIDC)	4	25	25	50	2	02:30
	Ability Enhancement Course (AEC)							
	SC23AECBOT104	Ability Enhancement Courses (AEC) (Languages)	2	25	25	50	2	02:00
	Value Added Course (VAC)/ Indian Knowledge System (IKS)							
	SC23IKSBOT105	Indian Knowledge System (IKS)	2	25	25	50	2	02:00
	Skill Enhancement Course (SEC)							
	SC23SECBOT106	Skill Enhancement Course (SEC)	2	25	25	50	2	02:00
			30	275	275	550	22	
B.Sc. Semester -II	Semester-II							
	Discipline Specific Core Course(DSC)							
	SC23MJDCBOT201	Major Discipline Specific Core Courses (MJDC)	4	50	50	100	4	02:30
	SC23MiDCBOT202	Minor Discipline Specific Core Courses (MiDC)	2	25	25	50	2	02:00
	SC23MDCBOT203	Multi/Inter Disciplinary Courses (MDC/IDC)	2	25	25	50	2	02:00
	Practical Course(PDSC)							
	SC23PMJDCBOT201 (Group A+B)	Major Discipline Specific Core Courses (PMJDC)	8	50	50	100	4	05:00
	SC23PMiDCBOT202	Minor Discipline Specific Core Courses (PMiDC)	4	25	25	50	2	02:30
	SC23PMDCBOT203	Minor Discipline Specific Core Courses (PMiDC)	4	25	25	50	2	02:30
	Ability Enhancement Course (AEC)							
	SC23AECBOT204	Ability Enhancement Courses (AEC) (Languages)	2	25	25	50	2	02:00
	Value Added Course (VAC)/ Indian Knowledge System (IKS)							
	SC23VACBOT205	Value Added Courses (VAC)	2	25	25	50	2	02:00
	Skill Enhancement Course (SEC)							
	SC23SECBOT206	Skill Enhancement Course (SEC)	2	25	25	50	2	02:00
			30	275	275	550	22	

OPTION I BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)

NCrF Credit Level	Sem-ester	Major (Core) (72/116)	Minor (Electives) (32)	Multi/ Inter-disciplinary (10)	AEC (10)	SEC/ Internship (12)	VAC/ IKS (8)	RP/ OJT	Total Credits/ Sem. (144/176)	Qualification / Certificate
Level		100	100	1 course	1 course	1 course	1 or 2 course	-	-	UG Certificate
4.5 1 st Year	I	8	4	4	2	2 (SEC)	2 (IKS)	-	22	
	II	8	4	4	2	2 (SEC)	2 (VAC)	-	22	
1 st Year Total Credits		16	8	8	4	4	4	-	44	

Exit 1: Award of UG certificate in Major course with 44 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor course for next NCrF credit level

Level		200	(200&above)	1 course	1 course	1 course	1 or 2 course	-	-	UG Diploma
5.0 2 nd Year	III	12	-	4	2	2 (SEC)	2 (IKS)	-	22	
	IV	12	4	-	2	2 (SEC)	2 (VAC)	-	22	
2 nd Year Total Credits		40	12	12	8	8	8	-	88	

Exit 2: Award of UG Diploma in Major course with 88 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor course for next NCrF credit level

Level		300	(200&above)	-	1 course	1 course	-	-	-	UG Degree
5.5 3 rd Year	V	12	8	-	-	2 (SEC)	-	-	22	
	VI	12	4	-	2	4(Internship)	-	-	22	
3 rd Year Total Credits		64	24	12	10	14	8	-	132	

Award of UG Degree in Major course with 132 credits and Internship in core discipline OR continue with Major and Minor course for next NCrF credit level

Level		400	(300&above)							UG Honours Degree
6.0 4 th Year	VII	12	4	-	-	-	-	6 (OJT)	22	
	VIII	12	4	-	-	-	-	6 (OJT)	22	
4 th Year Total Credits		88	32	12	10	14	8	12	176	

Award of UG Honours Degree in Major (without Research)course with total 176 credits

OPTION II BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)

6.0 4 th Year	VII	12	4	-	-	-	-	6 (RP)	22	UG Honours with Research Degree
	VIII	12	4	-	-	-	-	6 (RP)	22	
4 th Year Total Credits		88	32	12	10	14	8	12	176	

Award of UG Honours with Research Degree in Major course with total 176 credits

SEMESTER I

MAJOR DISCIPLINE SPECIFIC CORE COURSES:

PROGRAMME CODE: SCIUG103

SEM-I: SC23MJDSBOT101: MICROBIOLOGY AND PHYCOLOGY

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Develop understanding on the concept of microbial nutrition.
- Classify viruses based on their characteristics and structures.
- Develop critical understanding of plant diseases and their remediation.
- Examine the general characteristics of bacteria and their cell reproduction/recombination.
- Increase the awareness and appreciation of human friendly viruses, bacteria, algae and their economic importance.
- Conduct experiments using skills appropriate to subdivisions.

MINOR DISCIPLINE SPECIFIC CORE COURSES:

PROGRAMME CODE: SCIUG103

SEM-I: SC23MiDSCBOT102: MICROBES AND ALGAE

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Develop understanding on the concept of microbial nutrition.
- Classify viruses based on their characteristics and structures.
- Develop critical understanding of plant diseases and their remediation.
- Examine the general characteristics of bacteria and their cell reproduction/recombination.
- Increase the awareness and appreciation of human friendly viruses, bacteria, algae and their economic importance.
- Conduct experiments using skills appropriate to subdivisions.

MULTI / INTER DISCIPLINARY COURSE:

PROGRAMME CODE: SCIUG103

SEM-I: SC23MDCBOT103: PLANTS IN EVERYDAY LIFE

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Understand core concepts of plants important and relate with environment, populations, communities, and ecosystems.
- Develop critical understanding on the evolution of concept of organization of apex.
- Increase the awareness and appreciation of plants & plant products encountered in everyday life.
- Appreciate the diversity of plants and the plant products in human use.

SKILL ENHANCEMENT COURSE:

PROGRAMME CODE: SCIUG103

SEM-I: SC23SECBOT106: HORTICULTURE

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Understand the different classifications of horticultural crops, nursery management, and use of technology in horticulture.
- Develop their competency on pre and post-harvest technology in horticultural crops.
- Analyze the different methods of weed control and harvest treatments of horticultural crops.
- Examine the economic implications of cultivation of tropical and sub-tropical vegetable crops.
- Evaluate the importance of floriculture and contribution spices and condiments on economy.

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MAJOR DISCIPLINE SPECIFIC CORE COURSE -THEORY (MJDSC)							
Programme Code: SCIUG103							
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	THEORY			
				Credits	Lectures	CCE	SEE
Certificate Course	B.Sc. I	SC23MJ DSCBOT 101	Microbiology and Phycology	4	60hrs	50 Marks	50 Marks
Course outcomes:	<p>After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"> 1. Develop understanding about the classification and diversity of different microbes including viruses & Algae and their economic importance. 2. Develop conceptual skill about identifying microbes and algae. 3. Gain knowledge about developing commercial enterprise of microbial products. 4. Learn host –pathogen relationship and disease management. 5. Learn Presentation skills (oral & writing) in Botany by usage of computer of computer & multimedia. 6. Gain Knowledge about uses of microbes in various fields. 7. Understand the structure and reproduction of certain selected bacteria and algae. 8. Gain Knowledge about the economic values of this lower group of plant community. 8. Gain laboratory skills such as microscopy, microbial cultures, staining, identification, preservation of microbes for their applications in research and industry. <p>Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</p>						
UNIT	TOPIC						NO. OF LECTURES (60hrs)
Unit 1	<p><u>VIRUSES AND BACTERIA</u></p> <ul style="list-style-type: none"> • Plant Viruses: Discovery, physiochemical and biological characteristics; classification (Baltimore), RNA virus (TMV). • Bacteria: General characteristics of Bacteria; Cell structure-Salient features; Types of Bacteria based on flagella, Nutritional types (Brief explanation with suitable example). • Reproduction: Vegetative, Asexual and Recombination (conjugation and transformation). 						15

	<ul style="list-style-type: none"> • Economic importance of Bacteria with reference to their role in agriculture, fermentation and medicine. 	
Unit 2	<p><u>ALGAE</u></p> <ul style="list-style-type: none"> • General characteristics of algae, occurrence, and range of thallus organization (included types in syllabus); Classification system of Fritsch (included types up to family). • Cell structure and components: cell wall, pigment system, reserve food. • Reproduction in algae: Vegetative and Asexual methods. • Role of algae in the environment, agriculture, biotechnology and industry. 	15
Unit 3	<p><u>CYANOPHYTA AND CHLOROPHYTA</u></p> <ul style="list-style-type: none"> • General characters of Cyanophyta and Chlorophyta. • Cell structure and components of <i>Chlamydomonas</i>. • Life history of <i>Nostoc</i> with reference to: <ul style="list-style-type: none"> ➤ Systematic position with reasons up to family ➤ Habit and Habitat, Vegetative structure and Reproduction • Life history of <i>Oedogonium</i> with reference to: <ul style="list-style-type: none"> ➤ Systematic position with reasons up to family ➤ Habit and Habitat, Vegetative structure and Reproduction 	15
Unit 4	<p><u>PHAEOPHYTA AND RHODOPHYTA</u></p> <ul style="list-style-type: none"> • General characteristics of Phaeophyta and Rhodophyta. • Life cycle types: Haplontic, Diplontic and Haplodiplontic. • Life history of <i>Ectocarpus</i> with reference to: <ul style="list-style-type: none"> ➤ Systematic position with reasons up to family ➤ Habit and Habitat, Vegetative structure and Reproduction • Life history of <i>Batrachospermum</i> with reference to: <ul style="list-style-type: none"> ➤ Systematic position with reasons up to family ➤ Habit and Habitat, Vegetative structure and Reproduction. 	15
<p><i>Suggested Readings:</i></p> <ol style="list-style-type: none"> 1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition. 2. Wiley, J.M., Sherwood, L.M. and Woolverton, C.J. (2013). Prescott's Microbiology. 9th Edition. McGrawHill International. 3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi. 4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi. 5. Campbell, N.A., Reece J.B., Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky, P.V., Jackson, R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition. 6. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi. 		

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

MAJOR DISCIPLINE SPECIFIC CORE COURSE -PRACTICAL (MJDCS)						
Programme Code: SCIUG103						
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	PRACTICAL		
				Credits	CCE	SEE
Certificate Course	B.Sc. I	SC23 PMJDSC BOT101	Microbiology and Phycology	4 (120 hrs)	50 Marks	50 Marks
Course outcomes:	<p>After the completion of the course the students will be able:</p> <ol style="list-style-type: none"> 1. Understand the instruments, techniques, lab etiquettes and good lab practices for working in a microbiology laboratory. 2. Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes. 3. Practical skills in the field and laboratory experiments in Microbiology & Pathology. 4. Learn to identify Algae. 5. Can initiate his own Plant & Seed Diagnostic Clinic and 6. Can start own enterprise on microbial products. <p>Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</p>					
PRACTICALS						NO. OF LECTURES (120 hrs)
GROUP A						
<ul style="list-style-type: none"> • To study Bacteria using electron micrographs/ Models/ charts: Types of Bacteria based on flagella. • To study cell structure of Chlamydomonas through chart/ permanent slide. • To study the Life history of Nostoc through: <ul style="list-style-type: none"> ➤ Mounting - Thallus ➤ Mountings - Reproductive structure. ➤ Permanent Slide - Thallus ➤ Permanent Slide - Reproductive structure(Heterocyst). • To study the Life history of Oedogonium through: <ul style="list-style-type: none"> ➤ Mounting - Thallus 						60

<ul style="list-style-type: none"> ➤ Mountings - Reproductive structure. ➤ Permanent Slide – Thallus, ➤ Permanent Slide – Cap cell, ➤ Permanent Slide – Sex organ - Oogonium. 	
GROUP B	
<ul style="list-style-type: none"> • To study viruses using electron micrographs/ Models/ charts: TMV. • To study the Life history of <i>Ectocarpus</i> through: <ul style="list-style-type: none"> ➤ Mounting - Thallus ➤ Mountings - Reproductive structure ➤ Permanent Slide– Thallus, ➤ Permanent Slide– <i>Ectocarpus unilocular</i> sporangia. ➤ Permanent Slide– <i>Ectocarpus plurilocular</i> sporangia. • To study the Life history of <i>Batrachospermum</i> through: <ul style="list-style-type: none"> ➤ Mounting - Thallus ➤ Mounting - Reproductive structure. ➤ Permanent Slide– Thallus ➤ Permanent Slide– Cystocarp. 	60
<p><i>Suggested Readings:</i></p> <ol style="list-style-type: none"> 1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition. 2. Wiley JM, Sherwood LM and Woolverton CJ. (2013). Prescott's Microbiology. 9th Edition. McGrawHill International. 3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi. 4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi. 5. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition. 6. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi. 	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2023-24 UNDER NEP-2020)

B. SC. :: BOTANY PRACTICAL(MAJOR) :: SEMESTER-I

Programme Code: SCIUG103

MICROBIOLOGY AND PHYCOLOGY

SC23PMJDSCBOT101

(GROUP A & GROUP B)

Date:

Place:

Time: 5 Hrs

Total Marks: 50

Instructions: Strictly follow the instructions given by examiner(s).

GROUP A

1. Identify and classify giving reasons up to family of given specimen A. **06**
2. Make a temporary slide of the reproductive organ from the given specimen B. **06**
Draw the labelled diagram of it and show your slide to the examiner.
3. Identify and describe as per given instructions: **06**
 - I) Specimens – C: Electron micrographs/Models/charts/permanent slide
(Types of Bacteria based on flagella/Chlamydomonas). (5 minute)
 - II) Specimens – D: Electron micrographs/Models/charts/permanent slide
(Algae: Nostoc & Oedogonium). (5 minute)
4. a. *Viva-voce* **03**
b. Journal **04**

GROUP B

1. Identify and classify giving reasons up to family of given specimen E. **06**
2. Make a temporary slide of the reproductive organ from the given specimen F.
Draw the labelled diagram of it and show your slide to the examiner. **06**
3. Identify and describe as per given instructions: **06**
 - I) Specimen – G: Electron micrographs/Models/charts (TMV). (5 minute)
 - II) Specimen – H: Electron micrographs/Models/charts/permanent slide
(Algae: Ectocarpus & Batrachospermum). (5 minute)
4. a. *Viva-voce* **03**
b. Journal **04**

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MINOR DISCIPLINE SPECIFIC CORE COURSE -THEORY (MIDSC)							
Programme Code: SCIUG103							
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	THEORY			
				Credits	Lectures	CCE	SEE
Certificate Course	B. Sc. I	SC23MIDSC BOT102	MICROBES AND ALGAE	2	30hrs	25 Marks	25 Marks
Course outcomes:	<p>After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"> 1. Develop understanding about the classification and diversity of different microbes including viruses and their economic importance. 2. Develop conceptual skill about identifying microbes. 3. Gain knowledge about developing commercial enterprise of microbial products. 4. Learn host –pathogen relationship and disease management. 5. Learn Presentation skills (oral & writing) in Botany by usage of computer of computer & multimedia. 6. Gain Knowledge about uses of microbes in various fields. 7. Understand the structure and reproduction of certain selected bacteria. 8. Gain Knowledge about the economic values of this lower group of plant community. 8. Gain laboratory skills such as microscopy, microbial cultures, staining, identification, preservation of microbes for their applications in research and industry. <p>Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</p>						
UNIT	TOPIC						NO. OF LECTURES (30hrs)
Unit 1	<p><u>VIRUSES AND BACTERIA</u></p> <ul style="list-style-type: none"> • Plant Viruses: Discovery, physiochemical and biological characteristics; classification (Baltimore), RNA virus (TMV). • Bacteria: General characteristics of Bacteria; Cell structure- Salient features; Types of Bacteria based on flagella, Nutritional types (Brief explanation with suitable example). 						10

	<ul style="list-style-type: none"> • Reproduction: Vegetative, Asexual and Recombination (conjugation and transformation). • Economic importance of Bacteria with reference to their role in agriculture, fermentation and medicine. 	
Unit 2	<p><u>ALGAE</u></p> <ul style="list-style-type: none"> • Life history of <i>Nostoc</i> with reference to: <ul style="list-style-type: none"> ➤ Systematic position with reasons up to family ➤ Habit and Habitat, Vegetative structure and Reproduction • Life history of <i>Oedogonium</i> with reference to: <ul style="list-style-type: none"> ➤ Systematic position with reasons up to family ➤ Habit and Habitat, Vegetative structure and Reproduction • Life history of <i>Ectocarpus</i> with reference to: <ul style="list-style-type: none"> ➤ Systematic position with reasons up to family ➤ Habit and Habitat, Vegetative structure and Reproduction 	20
<p><i>Suggested Readings:</i></p> <ol style="list-style-type: none"> 1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition. 2. Wiley, J.M., Sherwood, L.M. and Woolverton, C.J. (2013). Prescott's Microbiology. 9th Edition. McGrawHill International. 3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi. 4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi. 5. Campbell, N.A., Reece J.B., Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky, P.V., Jackson, R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition. 6. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi. 		

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

(Effective from June 2023-24 UNDER NEP-2020)

MINOR DISCIPLINE SPECIFIC CORE COURSE -PRACTICAL (PMiDSC) Programme Code: SCIUG103						
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	PRACTICAL		
				Credits	CCE	SEE
Certificate Course	B.Sc. I	SC23PMiDSC BOT102	MICROBES AND ALGAE	2 (60hrs)	25 Marks	25 Marks
Course outcomes:	<p>After the completion of the course the students will be able:</p> <ol style="list-style-type: none"> 1. Understand the instruments, techniques, lab etiquettes and good lab practices for working in a microbiology laboratory. 2. Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes. 3. Practical skills in the field and laboratory experiments in Microbiology & Pathology. 4. Can initiate his own Plant & Seed Diagnostic Clinic and Can start own enterprise on microbial products. <p>Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</p>					
UNIT	TOPIC					NO. OF LECTURES (60hrs)
Unit 1	<ul style="list-style-type: none"> • To study viruses using electron micrographs/ Models/ charts: TMV. • To study Bacteria using electron micrographs/ Models/ charts: Types of Bacteria based on flagella. 					20
Unit 2	<ul style="list-style-type: none"> • To study the Life history of Nostoc through: <ul style="list-style-type: none"> ➤ Mounting - Thallus ➤ Mountings - Reproductive structure. ➤ Permanent Slide - Thallus ➤ Permanent Slide – Reproductive structure(Heterocyst). • To study the Life history of Oedogonium through: <ul style="list-style-type: none"> ➤ Mounting - Thallus ➤ Mountings - Reproductive structure. 					40

	<ul style="list-style-type: none"> ➤ Permanent Slide – Thallus, ➤ Permanent Slide – Cap cell, ➤ Permanent Slide – Sex organ - Oogonium. • To study the Life history of <i>Ectocarpus</i> through: <ul style="list-style-type: none"> ➤ Mounting - Thallus ➤ Mountings - Reproductive structure ➤ Permanent Slide– Thallus, ➤ Permanent Slide– <i>Ectocarpus: unilocular</i> sporangia. ➤ Permanent Slide– <i>Ectocarpus: plurilocular</i> sporangia. 	
--	--	--

Suggested Readings:

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Wiley JM, Sherwood LM and Woolverton CJ. (2013). Prescott's Microbiology. 9th Edition. McGrawHill International.
3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
5. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
6. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2023-24 UNDER NEP-2020)

B. SC. :: BOTANY PRACTICAL(MINOR) :: SEMESTER-I

Programme Code: SCIUG103

MICROBES AND ALGAE

SC23PMiDSCBOT102

Date:

Place:

Time: 02:30 Hrs

Total Marks: 25

Instructions: Strictly follow the instructions given by examiner(s).

1. Identify and classify giving reasons up to family of given specimen **A.** **05**
2. Make a temporary slide of the reproductive organ from the given specimen **B.**
Draw the labelled diagram of it and show your slide to the examiner. **06**
3. Identify and describe as per given instructions: **06**
 - I) Specimen – **C:** Electron micrographs/Models/charts (5 minute)
(TMV/Types of Bacteria based on flagella)
 - II) Specimen – **D:** Electron micrographs/Models/charts (5 minute)
(Algae: Nostoc, Oedogonium & Ectocarpus)
5. a. *Viva-voce* **04**
- b. Journal **04**

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MULTI/INTER DISCIPLINARY COURSE-THEORY (MDSC)							
PROGRAMME CODE: SCIUG103							
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	THEORY			
				Credits	Lectures	CCE	SEE
Certificate Course	B.Sc. I	SC23MDSC BOT103	PLANTS IN EVERYDAY LIFE	2	30hrs	25 Marks	25 Marks
Course outcomes:	<p>After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"> 1. This course is designed to give an overview of how plants are indispensable to humans. It gives a broad exposure to the various aspects of plant resource & its utilization. 2. Recall various economically and medicinally important plant species used in day-to-day life. 3. Explain the uses of economically important plants and illustrate the processing of various plant parts. 4. Analyze the utilization of various plant resources in day-to-day life. <p>Apply theoretical knowledge in utilization, and report generation of economical and medicinal plants. Create awareness on conservation of medicinal plants and use of natural plant products as alternatives to synthetic products.</p> <p>Pedagogy: Lectures/ Tutorials/Assignments/Presentation / Demonstration/Field visit/Team based learning.</p>						
UNIT	TOPIC						NO. OF LECTURES (30hrs)
Unit 1	<p><u>COMMON WILD PLANTS AND THEIR UTILIZATION:</u></p> <ul style="list-style-type: none"> • Identification and utilization of following plants: <ul style="list-style-type: none"> ➤ Herde (<i>Terminalia chebula</i>) ➤ Behda (<i>Terminalia bellirica</i>) ➤ Amla (<i>Phyllanthus emblica</i>) ➤ Shimlo (<i>Bombax ceiba</i>) 						15

	<p><u>GRANDMA'S HERBAL POUCH:</u></p> <ul style="list-style-type: none"> • Following plants to be studied with respect to botanical source, part of the plant used, and medicinal uses: <ul style="list-style-type: none"> ➤ Tulsi (<i>Ocimum sanctum</i>) ➤ Ardushi (<i>Adhatoda vasica</i>) ➤ Aadu (<i>Zingiber officinale</i>) ➤ Haldar (<i>Curcuma longa</i>) 	
Unit 2	<p><u>PLANT RESOURCES AND UTILIZATION:</u></p> <ul style="list-style-type: none"> • Including brief description of plants and/or plant parts used of: <ul style="list-style-type: none"> ➤ Cereals: Rice and Wheat. ➤ Millets: Jowar and Bajra. ➤ Legumes: Green gram, Chickpea. ➤ Cash crops: Cashew, Sugarcane. 	15
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. Billings S and Collingwood S (2013). The Big book of home remedies. Lulu.com publisher. 2. Buckley, C (2020). Plant Magic: Herbalism in Real Life. Roost Books Publishers, New York. 3. Chrispeels, MJ and Sadava, DE (1994). Plants, Genes and Agriculture. Jones & Bartlett Publishers. 4. Fuller, KW and Gallon, JA (1985). Plant Products and New Technology. Clarendon Press, Oxford, New York. 5. Hill, AF (1952). Economic Botany: A Textbook of Useful Plants and Plant Products. McGraw Hill Publishing Company Ltd., New Delhi. 6. Kochhar, SL (2012). Economic Botany in the Tropics. MacMillan India Ltd., New Delhi. 7. Purohit, SS and Vyas, SP (2008). Medicinal Plant Cultivation: A Scientific Approach. Agrobios, India. 8. Rao, RS (1985-1986). Flora of Goa, Diu, Daman & Nagar-Haveli. 2 Volumes. Botanical Survey of India. 9. Shailesh, R (2019). Everyday Ayurveda: The complete book of Ayurvedic home remedies. Notion Press, India. 		

10. Sambamurty AVSS and Subramanyam NS (1989). A Textbook of Economic Botany. Wiley Eastern Ltd., New Delhi.
11. Sen, S (2009). Economic Botany. NCBA Publishers, New Delhi.
12. Sharma, OP (1996). Hill's Economic Botany. Tata McGraw Hill Publishing Company Ltd., New Delhi.
13. Simpson BB and Conner-Ogorzaly M (1986). Economic Botany - Plants in Our World. McGraw Hill, New York.
14. Singh V, Pande PC and Jain DK (2009). A Text Book of Economic Botany. Rastogi Publications, Uttar Pradesh.
15. Trivedi, PC (2006). Medicinal Plants: Ethnobotanical Approach. Agrobios, India.
16. Upadhyay, R (2023). Botany for B.Sc. students, Economic Botany, Ethnomedicine and phytochemistry/Commercial Botany and phytochemical Analysis. S. Chand and Company Ltd. Publishers, India.
17. Wickens, GE (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MULTI/INTER DISCIPLINARY COURSE-PRACTICAL (PMDSC)						
PROGRAMME CODE: SCIUG103						
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	PRACTICAL		
				Credits	CCE	SEE
Certificate Course	B.Sc. I	SC23PMD SCBOT103	PLANTS IN EVERYDAY LIFE	2 (60hrs)	25 Marks	25 Marks
Course outcomes:	<p>After the completion of the course the students will be able to:</p> <ol style="list-style-type: none">1. This course is designed to give an overview of how plants are indispensable to humans. It gives a broad exposure to the various aspects of plant resource & its utilization.2. Recall various economically and medicinally important plant species used in day-to-day life.3. Explain the uses of economically important plants and illustrate the processing of various plant parts.4. Analyze the utilization of various plant resources in day-to-day life. <p>Apply theoretical knowledge in utilization, and report generation of economical and medicinal plants. Create awareness on conservation of medicinal plants and use of natural plant products as alternatives to synthetic products.</p> <p>Pedagogy: Lectures, Tutorials, Assignments, Demonstrations, live specimens, Herbarium specimens, Videos, Team based learning, Field visit and report writing.</p>					
UNIT	TOPIC					NO. OF LECTURES (60hrs)
Unit 1	<u>COMMON WILD PLANTS AND THEIR UTILIZATION:</u> <ul style="list-style-type: none">• Identification, Local and Botanical Name, Family, Useful Parts, Chemical constituents and utilization of following plants:<ul style="list-style-type: none">➤ Harde (<i>Terminalia chebula</i>)➤ Behda (<i>Terminalia bellirica</i>)➤ Amla (<i>Phyllanthus emblica</i>)➤ Shimlo (<i>Bombax ceiba</i>)					30

	<p><u>GRANDMA'S HERBAL POUCH:</u></p> <ul style="list-style-type: none"> • Following plants to be studied with respect to Identification, Local and Botanical Name, Family, Useful Parts, Chemical constituents and utilization of <ul style="list-style-type: none"> ➤ Tulsi (<i>Ocimum sanctum</i>) ➤ Ardushi (<i>Adhatoda vasica</i>) ➤ Aadu (<i>Zingiber officinale</i>) ➤ Haldar (<i>Curcuma longa</i>) 	
<p>Unit 2</p>	<p><u>PLANT RESOURCES AND UTILIZATION:</u></p> <ul style="list-style-type: none"> • Identification, Local and Botanical Name, Family, Useful Parts, Chemical constituents and utilization of following plants: <ul style="list-style-type: none"> ➤ Cereals: Rice and Wheat ➤ Millets: Jowar and Bajra ➤ Legumes: Green gram and Chickpea. ➤ Cash crops: Cashew and Sugarcane. 	<p>30</p>
<p><i>Suggested Readings:</i></p> <ol style="list-style-type: none"> 1. Billings, S. and Collingwood, S. (2013). The Big book of home remedies. Lulu.com publisher. 2. Buckley, C (2020). Plant Magic: Herbalism in Real Life. Roost Books Publishers, New York. 3. Chrispeels, MJ and Sadava, DE (1994). Plants, Genes and Agriculture. Jones & Bartlett Publishers. 4. Fuller, KW and Gallon, JA (1985). Plant Products and New Technology. Clarendon Press, Oxford, New York. 5. Rao, RS (1985-1986). Flora of Goa, Diu, Daman & Nagar-Haveli. 2 Volumes. Botanical Survey of India. 6. Shailesh, R (2019). Everyday Ayurveda: The complete book of Ayurvedic home remedies. Notion Press, India. 		

7. Sen, S (2009). Economic Botany. NCBA Publishers, New Delhi.
8. Sharma, OP (1996). Hill's Economic Botany. Tata McGraw Hill Publishing Company Ltd., New Delhi.
9. Simpson, BB and Conner-Ogorzaly M (1986). Economic Botany - Plants in Our World. McGraw Hill, New York.
10. Singh, V, Pande ,PC and Jain, DK (2009). A Text Book of Economic Botany. Rastogi Publications, Uttar Pradesh.
11. Trivedi, PC (2006). Medicinal Plants: Ethnobotanical Approach. Agrobios, India.
12. Upadhyay, R (2023). Botany for B.Sc. students, Economic Botany, Ethnomedicine and phytochemistry/Commercial Botany and phytochemical Analysis. S. Chand and Company Ltd. Publishers, India.
13. Wickens, GE (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2023-24 UNDER NEP-2020)

B. Sc. :: BOTANY PRACTICAL :: SEMESTER-I

(MULTI/INTER DISCIPLINARY COURSE)

Programme Code: SCIUG103

PLANTS IN EVERYDAY LIFE

SC23PMDSCBOT103

Date:

Place:

Time: 02:30 Hrs

Total Marks: 25

Instructions: Strictly follow the instructions given by examiner(s).

1. Identify and write local name, botanical name, family, useful part, economic important (from unit 1). 10
 - Specimen A & B
2. Identify and write local name, botanical name, family, useful part, economic important (from unit 2). 10
 - Specimen C & D
3. a. *Viva-voce* 02
b. Journal 03

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

SKILL ENHANCEMENT COURSE-THEORY (SEC)							
PROGRAMME CODE: SCIUG103							
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	THEORY		CCE	SEE
				Credits	Lectures		
Certificate Course	B.Sc. I	SC23SEC BOT106	HORTICULTURE	2	30hrs	25 Marks	25 Marks
Course outcomes:	After the completion of the course the students will be able: 1. To gain knowledge of gardening, cultivation, multiplication, raising of seedlings of garden plants. 2. To get knowledge of new and modern techniques of plant propagation. 3. To develop interest in nature and plant life. Pedagogy: Lectures, Tutorials, Assignments, Demonstrations, live specimens, Videos, Team based learning, Garden visit and report writing.						
UNIT	TOPIC						NO. OF LECTURES (30 hrs)
Unit 1	<u>HORTICULTURE-I</u> 1. Introduction: Aims, Objectives and Scope of Horticulture 2. Plant Propagation-Vegetative, Asexual and Sexual reproduction 3. Nursery Management 4. Ornamental Plants						15
Unit 2	<u>HORTICULTURE-II</u> 1. Landscape: Principles, Types and Planning 2. Floriculture and its implements 3. Bonsai 4. Important Horticulture crops of Gujarat						15
Suggested Readings: 1. C.R. Adams (2018). Principles of Horticulture. Amsterdam. Boston. 2. Michael A. Dirr (2009). Manual of Woody and land Plants. Stipes Pub . 3. Salaria and Salaria (2013).A2Z Solutions Horticulture at a glance Vol.I. Jain Bros. 4. Chadha K. L. (2003).Handbook of Horticulture. Indian Council of Agricultural Research.							

SEMESTER II

MAJOR DISCIPLINE SPECIFIC CORE COURSE:

PROGRAMME CODE: SCIUG103

SEM- II: SC23MJDSCBOT201: BIOMOLECULES AND CELL BIOLOGY

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Develop understanding on chemical bonding among molecules.
- Identify the concept that explains chemical composition and structure of cell wall and membrane.
- Classify the enzymes and explain mechanism of action and structure.
- Compare the structure and function of cells & explain the development of cells.
- Describe the relationship between the structure and function of biomolecules.

MINOR DISCIPLINE SPECIFIC CORE COURSE:

PROGRAMME CODE: SCIUG103

SEM- II: SC23MiDSCBOT202: ORGANIC MOLECULES AND CYTOLOGY

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Develop understanding on chemical bonding among molecules.
- Identify the concept that explains chemical composition and structure of plant.
- Classify the enzymes and explain mechanism of action and structure.
- Describe the relationship between the structure and function of biomolecules.

MULTI/INTER DISCIPLINARY COURSE:

PROGRAMME CODE: SCIUG103

SEM- II: SC23MDSCBOT203: FRUITS AND VEGETABLE PROCESSING

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Understand the different classifications of horticultural crops, nursery management, and use of technology in horticulture.
- Develop their competency on pre and post-harvest technology in horticultural crops.
- Analyze the different methods of weed control and harvest treatments of horticultural crops
- Examine the economic implications of cultivation of tropical and sub-tropical vegetable crops
- Evaluate the importance of floriculture and contribution spices and condiments on economy.

SKILL ENHANCEMENT COURSE:

PROGRAMME CODE: SCIUG103

SC23SECBOT206: NATURAL RESOURCE MANAGEMENT

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Understand the concept of different natural resources and their utilization.
- Critically analyze the sustainable utilization land, water, forest and energy resources.
- Evaluate the management strategies of different natural resources.
- Reflect upon the different national and international efforts in resource management and their conservation.

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MAJOR DISCIPLINE SPECIFIC CORE COURSE 1-THEORY (MJDSC)							
PROGRAMME CODE: SCIUG103							
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	THEORY			
				Credits	Lectures	CCE	SEE
Certificate Course	B.SC. II	SC23MJDS CBOT201	Biomolecules and Cell Biology	4	60 hrs	50 Marks	50 Marks
Course outcomes :	<p>After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"> 1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged. 2) This will provide inside into the organization of cell, its features and regulation at different levels. 3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life. <p>Pedagogy: Lectures, Tutorials, Assignments, Demonstrations, Videos, Team based learning.</p>						
UNIT	TOPIC						NO. OF LECTURES (60hrs)
Unit 1	<p>Biomolecules- I</p> <ul style="list-style-type: none"> • Carbohydrates: <ul style="list-style-type: none"> ➤ Definition, classification and significance. ➤ Structure and functions of Monosaccharides (trioses, pentoses and hexoses). ➤ Structure and functions of Disaccharides (maltose and sucrose). ➤ Structure and functions of Polysaccharides (cellulose). • Lipids: <ul style="list-style-type: none"> ➤ Definition, classification and significance ➤ Structure and functions of Fatty acids: Saturated and Unsaturated 						15

	<ul style="list-style-type: none"> ➤ Essential fatty acids ➤ Simple and Conjugated Lipids: Structure and functions of Triglycerides and waxes. Conjugated lipids with examples. 	
Unit 2	<p>Biomolecules - II</p> <ul style="list-style-type: none"> • Amino acids: <ul style="list-style-type: none"> ➤ Definition and classification (based on polarity) ➤ Properties of amino acids. Peptide bond, Dipeptide and polypeptide. • Proteins: <ul style="list-style-type: none"> ➤ Definition, classification and significance ➤ General (Physical) properties of Proteins. Levels of protein structure-primary and secondary. • Nucleic acids: <ul style="list-style-type: none"> ➤ Definition, classification and significance. ➤ Structure of nitrogenous bases; Structure and function of nucleotides. ➤ Structure of DNA (Watson and Crick's model); Types of RNA. 	15
Unit 3	<p>Cell Biology - I</p> <ul style="list-style-type: none"> • Cell: as a basic unit of structure and function, Characteristics and comparison of Prokaryotic and Eukaryotic cell. • Cell wall: Ultrastructure, chemical composition and functions. • Plasma membrane: Ultrastructure, chemical composition and functions, sandwich and fluid mosaic model. • Nucleus: Structure-nuclear envelope, nuclear lamina, molecular organization of chromatin. 	15
Unit 4	<p>Cell Biology - II</p> <ul style="list-style-type: none"> • Chloroplast: Structural organization and Functions. • Mitochondria: Structural organization and Functions. 	15

	<ul style="list-style-type: none"> • Endoplasmic Reticulum: Structural organization and Functions. • Cell division: Eukaryotic Cell Cycle, Mitosis, Meiosis and their significance 	
--	--	--

Suggested Readings:

1. Campbell, MK (2012) Biochemistry, 7th ed., Published by Cengage Learning
2. Campbell, PN and Smith AD (2011) Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone
3. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman
4. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company
5. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
6. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
7. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
8. Cooper, G.M. and Hausman, R.E. 2009 The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MAJOR DISCIPLINE SPECIFIC CORE COURSE 1-PRACTICAL (PMJDSC)							
PROGRAMME CODE: SCIUG103							
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	PRACTICAL			
				Credits	Lectures	CCE	SEE
Certificate Course	B.Sc. II	SC23PMJDS CBOT201	Biomolecules and Cell Biology	4(2+2) (GROUP: A+ B)	120hrs	50 Marks	50 Marks
Course outcomes:	After the completion of the course the students will be able to: 1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged. 2) This will provide inside into the organization of cell, its features and regulation at different levels. 3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life. Pedagogy: Lectures, Tutorials, Assignments, Demonstrations, Videos, Team based learning.						
PRACTICALS						NO. OF LECTURES (120 hrs)	
GROUP A							
1) Preparation of solutions and plant juices to determine their pH using Universal indicator/pH meter. 2) Estimation of Free Fatty acids by titration method. 3) Bio-Molecules: Tests for detection of Carbohydrates: The following tests are to be performed to detect the nature of carbohydrates available in the supplied sample (Glucose, Fructose, Maltose & Sucrose). 1. Molisch's test, 2. Benedict's test, 3. Barfoed's test, 4. Seliwanoff's test, 5. Iodine test, 6. Cobalt chloride test. 4) Akaryota - Bacteriophage, Prokaryota - Cyanophycean cell & Eukaryota - typical Animal & Plant cell.						60	

GROUP B

1) Tests for detection of Lipids <i>i.e.</i> , Fats and Oils: Micro-chemical tests on sections of Plant materials- Sudan III stain, Solubility test. 2) Tests for detection of Proteins: Biuret test/Xanthoprotic test. 3) Study of mitosis from onion root tip using squash method. 4) To study the various types of cell organelles through micrographs / charts (As per theory syllabus). 5) Study of different stages of meiosis, structure of DNA (Watson and Crick's model) and Types of RNA (Chart/Permanent Slides).	60
--	-----------

Suggested Readings:

1. Campbell, M.K. (2012). Biochemistry, 7th ed., Published by Cengage Learning.
2. Campbell, P.N. and Smith, A.D. (2011). Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone.
3. Tymoczko, J.L., Berg, J.M. and Stryer, L. (2012). Biochemistry: A short course, 2nd ed., W.H.Freeman.
4. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2011). Biochemistry, W.H. Freeman and Company.
5. Nelson, D.L. and Cox, M.M. (2008). Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
6. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
7. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
8. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2023-24 UNDER NEP-2020)

B. SC. :: BOTANY (MAJOR) PRACTICAL:: SEMESTER-II

PROGRAMME CODE: SCIUG103

BIOMOLECULES AND CELL BIOLOGY

SC23PMJDSCBOT201

Date:

Time: 5 Hrs

Place:

Total Marks: 50

Instructions: Strictly follow the instructions given by examiner(s).

GROUP A

1. Measure the pH of the given sample **A**. Mention its nature and show it to the examiner. **04**
2. Perform tests for detection of organic molecule (Carbohydrates) in given solution **B**. Show your result to the examiner. **08**
3. Identify and describe as per given instructions: **06**

Specimen – **C**: Type of Cell: Prokaryotic/Eukaryotic-Chart/Permanent Slide.

(5 minute)

Specimen – **D**: Sandwich model/Fluid Mosaic Model – Chart. (5 minute)

4. a. *Viva-voce* **03**
- b. Journal **04**

GROUP B

1. Perform tests for detection of organic molecule (Lipid/Protein) in given solution **E**. Show your result to the examiner. **06**
2. Prepare a temporary mounting of Mitosis from given material **F**. Using squash method. Show stage(s) of cell division to the examiner with diagram(s). **06**
3. Identify and describe as per given instructions: **06**

1) Specimen – **G**: Cell wall/ ER/Nucleus/ Chloroplast/Mitochondria- Chart/PS.
(5 minute)

2) Specimen – **H**: DNA Model/types of RNA/ any stage of meiosis. (5 minute)

4. a. *Viva-voce* **03**
- b. Journal **04**

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MINOR DISCIPLINE SPECIFIC CORE COURSE 1-THEORY (MiDSC)							
PROGRAMME CODE: SCIUG103							
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	THEORY			
				Credits	Lectures	CCE	SEE
Certificate Course	B.SC. II	SC23MiD SCBOT 202	ORGANIC MOLECULES AND CYTOLOGY	2	30 hrs	25 Marks	25 Marks
Course outcomes :	<p>After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"> 1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged. 2) This will provide inside into the organization of cell, its features and regulation at different levels. 3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life. <p>Pedagogy: Lectures, Tutorials, Assignments, Demonstrations, Videos, Team based learning.</p>						
UNIT	TOPIC						NO. OF LECTURES (30hrs)
Unit 1	<ul style="list-style-type: none"> • Carbohydrates: <ul style="list-style-type: none"> ➤ Definition, classification and significance. ➤ Structure and functions of Monosaccharides (trioses, pentoses and hexoses). ➤ Structure and functions of Disaccharides (maltose and sucrose). ➤ Structure and functions of Polysaccharides (cellulose). • Lipids: <ul style="list-style-type: none"> ➤ Definition, classification and significance ➤ Structure and functions of Fatty acids: Saturated and unsaturated 						15

	<ul style="list-style-type: none"> ➤ Essential fatty acids ➤ Simple and Conjugated Lipids: Structure and functions of Triglycerides and waxes. Conjugated lipids with examples. 	
Unit 2	Cell Biology – II <ul style="list-style-type: none"> • Chloroplast: Structural organization and Functions. • Mitochondria: Structural organization and Functions. • Endoplasmic Reticulum: Structural organization and Functions. • Cell division: Eukaryotic Cell Cycle, Mitosis, Meiosis and their significance 	15

Suggested Readings:

1. Campbell, MK (2012) Biochemistry, 7th ed., Published by Cengage Learning
2. Campbell, PN and Smith AD (2011) Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone
3. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman
4. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company
5. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
6. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
7. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
8. Cooper, G.M. and Hausman, R.E. 2009 The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MINOR DISCIPLINE SPECIFIC CORE COURSE 1-PRACTICAL (MiDSC)							
PROGRAMME CODE: SCIUG103							
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	PRACTICAL			
				Credits	Lectures	CCE	SEE
Certificate Course	B.Sc. II	SC23PMiDS CBOT201	ORGANIC MOLECULES AND CYTOLOGY	2	60hrs	25 Marks	25 Marks
Course outcomes:	<p>After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"> 1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged. 2) This will provide inside into the organization of cell, its features and regulation at different levels. 3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life. <p>Pedagogy: Lectures, Practicals, Tutorials, Assignments, Demonstrations, Videos, Team based learning.</p>						
UNIT	TOPIC						NO. OF LECTURES (60 hrs)
Unit 1	<ol style="list-style-type: none"> 1) Preparation of solutions and plant juices to determine their pH using Universal indicator/pH meter. 2) Estimation of Free Fatty acids by titration method. 3) Bio-Molecules: Tests for detection of Carbohydrates: The following tests are to be performed to detect the nature of carbohydrates available in the supplied sample (Glucose, Fructose, Maltose & Sucrose). 1. Molisch's test, 2. Benedict's test, 3. Barfoed's test, 4. Seliwanoff's test, 5. Iodine test, 6. Cobalt chloride test. 						30

	4) Tests for detection of Lipids <i>i.e.</i> , Fats and Oils: Micro-chemical tests on sections of Plant materials- Sudan III stain, Solubility test.	
Unit 2	1) To study the various types of cell organelles through micrographs / charts (As per theory syllabus). 2) Study of mitosis from onion root tip using squash method. 3) Study of different stages of meiosis (Chart/Permanent Slides).	30

Suggested Readings:

1. Campbell, M.K. (2012). Biochemistry, 7th ed., Published by Cengage Learning.
2. Campbell, P.N. and Smith, A.D. (2011). Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone.
3. Tymoczko, J.L., Berg, J.M. and Stryer, L. (2012). Biochemistry: A short course, 2nd ed., W.H.Freeman.
4. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2011). Biochemistry, W.H. Freeman and Company.
5. Nelson, D.L. and Cox, M.M. (2008). Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
6. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
7. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
8. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2023-24 UNDER NEP-2020)

B. Sc. :: BOTANY (MINOR) PRACTICAL:: SEMESTER-II

PROGRAMME CODE: SCIUG103

MOLECULES AND CYTOLOGY

SC23PMiDSCBOT202

(CREDIT 2)

Date:

Place:

Time: 02:30 Hrs

Total Marks: 25

Instructions: Strictly follow the instructions given by examiner(s).

1. Measure the pH of the given sample **A**. Mention its nature and show it to the examiner. **03**
2. Perform tests for detection of organic molecule (Carbohydrates/Lipid) in given solution **B**. Show your result to the examiner. **05**
3. Prepare a temporary mounting of Mitosis from given material **C**. Using squash method. Show stage(s) of cell division to the examiner with diagram(s). **05**
4. Identify and describe as per given instructions: **06**
 - 1) Specimen – **D**: ER/Nucleus/ Chloroplast/Mitochondria– Chart/PS. (5 minute)
 - 2) Specimen – **E**: Any one stage of meiosis – Chart/PS. (5 minute)
5. a. *Viva-voce* **03**
 - b. Journal **03**

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MULTI/INTER DISCIPLINARY COURSE-THEORY (MDC)							
PROGRAMME CODE: SCIUG103							
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	THEORY			
				Credits	Lectures	CCE	SEE
Certificate Course	B.Sc. II	SC23MDC BOT203	FRUITS AND VEGETABLE PROCESSING	2	30hrs	25 Marks	25 Marks
Course outcomes:	After the completion of the course the students will be able to: 1) This course is designed to give an overview of different types of fruits and vegetables, their composition and methods used in processing and preservation. 2) The practical component of this course deals with imparting skills in preparation of various processed products. Pedagogy: Lectures, Practicals, Assignment, Presentations, Field visit.						
UNIT	TOPIC						NO. OF LECTURES (30hrs)
Unit 1	<ul style="list-style-type: none">• Fruits and Vegetables: Methods of processing and processed products<ul style="list-style-type: none">➤ Fruits - Definition, types of fruits (fleshy and dry) with examples.➤ Vegetables - Definition, types of vegetables (leafy, stem, root, flower and fruit) with examples.• Principles of processing and preservation.<ul style="list-style-type: none">➤ Methods of processing: Drying, pickling, fermentation, freezing and dehydration, canning.➤ Scope and importance of processing and preservation.						15
Unit 2	<ul style="list-style-type: none">• Preparation of the following products:<ul style="list-style-type: none">➤ Frozen vegetables - Carrots (<i>Daucus carota</i>) - Pea (<i>Pisum sativum</i>).➤ Dehydrated products - Potato (<i>Solanum tuberosum</i>) chips and Garlic (<i>Allium sativum</i>) powder.						15

- | | | |
|--|---|--|
| | <ul style="list-style-type: none"> ➤ Preparation of pickles from fruits - Mango and Lemon. ➤ Juices & Squashes - Amla (<i>Phyllanthus emblica</i>) juice, Kokum (<i>Garcinia indica</i>) juice. | |
|--|---|--|

Suggested Readings:

1. Ashraf, SM (2008). Handbook of Fruit and Vegetable products. Agrobios, India.
2. Cruess, WV (2004). Commercial Fruit and Vegetable Products. Agrobios, India.
3. Dubey, RC (1993). A Textbook of Biotechnology. S. Chand & Company Pvt. Ltd., New Delhi.
4. Frazier, WC and Westhoff, DC (2008). Food Microbiology. Tata Mc. Graw Hill Education Private Limited, New Delhi.
5. Lal G, Siddappa, GS & Tandon, GL (2019). Preservation of fruits & Vegetables. ICAR, New Delhi.
6. Manay, SN and Shadaksharaswamy, M (2008). Foods: Facts and Principles. New Age International, Bengaluru.
7. Narang, RK (2010). Fruit and Vegetable Preservation Techniques. APH Publishing Corporation, Delhi.
8. Potter, NN and Hotchkiss, HJ (1996). Food Science. CBS Publishers & Distributors, New Delhi.
9. Rahman, MS (2020). Handbook of food preservation (3rd Edition). CRC-press, United States.
10. Ranganna, S (1986). Handbook of analysis and quality control for fruits and vegetable products (2nd Edition). Tata Mc Graw-Hill Publishing Company Limited, New York.
11. Saldanha, E (2010). Successful Goan home wines. Rajhauns Vitaran, Goa.
12. Srilakshmi, B (2007). Food Science. New Age International (P) Limited, New Delhi.
13. Srivastava, RP and Kumar, S (2017). Fruit and Vegetable Preservation- Principles and Practices (3rd edition). CBS publishers and distributors Pvt Ltd., India.
14. Thompson, AK (2003). Fruit and Vegetables - Harvesting, Handling and Storage (2nd Edition). Blackwell Publishing Ltd., US.
15. Verma, LR and Joshi, VK (2000). Post harvest technology of Fruits and vegetables- handling, processing, fermentation, and waste management. Vol I & II, Indus Publishing, New Delhi.
16. Wolff, IA (1982). CRC Handbook of Processing and Utilization in Agriculture. CRC series in Agriculture, Vol II, part-I, CRC press, California.

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MULTI / INTER DISCIPLINARY COURSE-PRACTICAL(PMDC)							
PROGRAMME CODE: SCIUG103							
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	PRACTICAL			
				Credits	Lectures	CCE	SEE
Certificate Course	B.Sc. II	SC23PM DCBOT 203	FRUITS AND VEGETABLE PROCESSING	2	60hrs	25 Marks	25 Marks
Course outcomes:	After the completion of the course the students will be able to: On completion of this course students will be able to: 1) Recall the types of fruits and vegetables used for processing. 2) Explain the principles of fruits and vegetable processing. 3) Analyse the different methods used in processing of fruits and vegetables. 4) Apply the skills in preparation of various processed products for entrepreneurial opportunity. Pedagogy: Lectures, Practicals, Assignment, Presentations, Field visit.						
UNIT	TOPIC						NO. OF LECTURES (60hrs)
Unit 1	1. Study of fruits (banana, mango, papaya, pineapple, cashew), their composition and use in value-added products. 2. Study of Vegetables (Cucumber, tomato, ladyfinger, radish and brinjal), their composition and use in value-added products. 3. Determination of pH of any Citrus fruit. 4. Preparation of any one type of pickle. 5. Preparation of fruit juice and squash.						30
Unit 2	1. Preparation of tutti fruity from raw papaya. 2. Preservation of green peas and carrots by freezing. 3. Preparation of amla and ginger candy. 4. Preparation of chutney from fruit and vegetable. 5. Field visit to a distillation unit or a food processing unit.						30

Suggested Readings:

1. Ashraf, SM (2008). Handbook of Fruit and Vegetable products. Agrobios, India.
2. Cruess, WV (2004). Commercial Fruit and Vegetable Products. Agrobios, India.
3. Dubey, RC (1993). A Textbook of Biotechnology. S. Chand & Company Pvt. Ltd., New Delhi.
4. Frazier, WC and Westhoff, DC (2008). Food Microbiology. Tata Mc. Graw Hill Education Private Limited, New Delhi.
5. Lal G, Siddappa, GS & Tandon, GL (2019). Preservation of fruits & Vegetables. ICAR, New Delhi.
6. Manay, SN and Shadaksharaswamy, M (2008). Foods: Facts and Principles. New Age International, Bengaluru.
7. Narang, RK (2010). Fruit and Vegetable Preservation Techniques. APH Publishing Corporation, Delhi.
8. Potter, NN and Hotchkiss, HJ (1996). Food Science. CBS Publishers & Distributors, New Delhi.
9. Rahman, MS (2020). Handbook of food preservation (3rd Edition). CRC-press, United States.
10. Ranganna, S (1986). Handbook of analysis and quality control for fruits and vegetable products (2nd Edition). Tata Mc Graw-Hill Publishing Company Limited, New York.
11. Saldanha, E (2010). Successful Goan home wines. Rajhauns Vitaran, Goa.
12. Srilakshmi, B (2007). Food Science. New Age International (P) Limited, New Delhi.
13. Srivastava, RP and Kumar, S (2017). Fruit and Vegetable Preservation- Principles and Practices (3rd edition). CBS publishers and distributors Pvt Ltd., India.
14. Thompson, AK (2003). Fruit and Vegetables - Harvesting, Handling and Storage (2nd Edition). Blackwell Publishing Ltd., US.
15. Verma, LR and Joshi, VK (2000). Post harvest technology of Fruits and vegetables- handling, processing, fermentation, and waste management. Vol I & II, Indus Publishing, New Delhi.
16. Wolff, IA (1982). CRC Handbook of Processing and Utilization in Agriculture. CRC series in Agriculture, Vol II, part-I, CRC press, California.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2023-24 UNDER NEP-2020)

B. SC. :: BOTANY (MULTI/INTER DISCIPLINARY) PRACTICAL :: SEMESTER-II

PROGRAMME CODE: SCIUG103

FRUITS AND VEGETABLE PROCESSING

SC23PMDCBOT203

Date:

Place:

Time: 02:30hrs

Total Marks: 25

Instructions: Strictly follow the instructions given by examiner(s).

1. Determination of pH of any Citrus fruit from given sample **A**. Mention its nature and show it to the examiner. **05**
 2. Identify and write information of given sample **B**. (their composition and use in value-added products). **04**
 3. Preparation of fruit juice and squash from given sample **C**. **04**
 4. Write method of preparation of any one type of pickle/chutney/ tutti fruity (as per syllabi). **03**
 5. Write method of Preservation of green peas / carrots by freezing. **03**
 6. a. *Viva-voce* **03**
b. Journal **03**
-

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

SKILL ENHANCEMENT COURSE-(THEORY)(SEC)							
PROGRAMME CODE: SCIUG103							
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	THEORY			
				Credits	Lectures	CCE	SEE
Certificate Course	B.Sc. II	SC23SEC BOT206	NATURAL RESOURCE MANAGEMENT	2	30 hrs	25 Marks	25 Marks
Course outcomes:	After the completion of the course the students will be able: 1. Understand the importance, benefits and services of biodiversity. 2. To learn the strategies for the conservation of biodiversity. 3. This knowledge is critical in evolving strategies for sustainable natural resource management and biodiversity conservation. Pedagogy: Lectures, Practicals, Assignment, Presentations, Field visit.						
UNIT	TOPIC						NO. OF LECTURES (30 hrs)
Unit 1	<u>NATURAL RESOURCE MANAGEMENT - I</u>						15
	<ul style="list-style-type: none"> Natural Resource: Definition, types and management. Sustainable utilization: Concept, approaches (economic, ecological and socio-cultural). Land Utilization: (agricultural, pastoral, horticultural, silvicultural). Soil degradation and management. 						
Unit 2	<u>NATURAL RESOURCE MANAGEMENT - II</u>						15
	<ul style="list-style-type: none"> Fresh water: rivers, lakes, groundwater, aquifers, watershed. Marine Water: Estuarine; Wetlands. Forests: Definition, Cover and its significance (with special reference to India). Major and minor forest products; Depletion; Management. 						
Suggested Readings:							
1. Vasudevan, N. (2006). Essentials of Environmental Science. Narosa Publishing House, New Delhi. 2. Singh, J. S., Singh, S.P. and Gupta, S. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications, New Delhi. 3. Rogers, P.P., Jalal, K.F. and Boyd, J.A. (2008). An Introduction to Sustainable Development. Prentice Hall of India Private Limited, New Delhi.							

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc Programme (CBCS - Semester - Grading Pattern)

(Effective from June 2023-24 UNDER NEP-2020)

B. Sc.: BOTANY :: SEMESTER END EXAMINATION

PROGRAMME CODE: SCIUG103

FORMAT FOR QUESTIONS PAPER FOR **4 CREDITS** COURSE IN BOTANY

(B.Sc. Sem. - I & II)

The university examination paper consists of four questions.

- First question is of 12 marks and will be from Unit - I.
- Second question is of 13 marks and will be from Unit - II.
- Third question is of 12 marks and will be from Unit - III.
- Fourth question is of 13 marks and will be from Unit - IV.

No. of Printed Pages: ___

Name of Subject : BOTANY		Paper Code : MJDSCBOT-101 & 201
Name of Paper :		
Total Hours : 02:30 Hrs		Total Marks : 50
Instructions: (1) This question paper contains four questions. All questions are compulsory. (2) Figures at right side indicate the marks of question. (3) Illustrate your answer with labelled diagram.		
Que.1 (A)	Describe in detail:(any one) (1) (2)	08
(B)	Describe in short:(any one) (1) (2)	04
Que.2 (A)	Describe in detail:(any one) (1) (2)	09
(B)	Describe in short:(any one) (1) (2)	04
Que.3 (A)	Describe in detail:(any one) (1) (2)	08
(B)	Describe in short:(any one) (1) (2)	04
Que.4(A)	Describe in detail:(any one) (1) (2)	09
(B)	Describe in short:(any one) (1) (2)	04

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc Programme (CBCS - Semester - Grading Pattern)

(Effective from June 2023-24 UNDER NEP-2020)

B. Sc.:: BOTANY :: SEMESTER END EXAMINATION

PROGRAMME CODE: SCIUG103

FORMAT FOR QUESTIONS PAPER FOR **2 CREDITS** COURSE IN BOTANY

(B.Sc. Sem. - I & II)

The university examination paper consists of three questions.

- First question is of **10** marks and will be from **Unit - I**.
- Second question is of **10** marks and will be from **Unit - II**.
- Third question is of **05** marks and will be from **Unit - I & II**.

No. of Printed Pages: _____

Name of Subject : BOTANY	Paper Code : MiDSCBOT-102 & 202 MDCBOT- 103 & 203 AEC -104 & 204 VAC/IKS- 105 & 205 SECBOT- 106 & 206
--------------------------	--

Name of Paper :

Total Hours : 02:00 Hrs

Total Marks : 25

- Instructions:** (1) This question paper contains three questions.
(2) All questions are compulsory.
(3) Figures at right side indicate the marks of question.
(4) Illustrate your answer with labelled diagram.

		Marks
Que.1(A)	Describe in Detail (any one). (1) (2)	06
(B)	Write short note (any one). (1) (2)	04
Que.2(A)	Describe in Detail (any one). (1) (2)	06
(B)	Write short note (any one). (1) (2)	04
Que.3	Do as direct (any five from seven). (1) (2) (3) (4) (5) (6) (7)	05



Important Notifications and Guidelines released from UGC & Ministry of Education, Government of India for reference.

1. NEP-2020-English: From page No. 33-Major problems faced by the higher education system and key changes required in current education system (https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pd)
2. Gujarati version of NEP-2020 (https://www.education.gov.in/sites/upload_files/mhrd/files/nep/2020/GUIARATI.pdf)
3. IKS in Higher Education Curricula: Details of course and curriculum of IKS which will be integral part of current education system (https://www.ugc.gov.in/pdfnews/6436045_Guidelines- IKS-in-HE-Curricula.pdf)
4. Training of faculty on IKS: Need and process of training of faculties on IKS ([https://www.ugc.gov.in/pdfnews/3746302_Guidelines-for-TrainingOrientation-of-Faculty- on-Indian-Knowledge-System-\(IKS\).pdf](https://www.ugc.gov.in/pdfnews/3746302_Guidelines-for-TrainingOrientation-of-Faculty- on-Indian-Knowledge-System-(IKS).pdf))
5. Multiple Entry and Exit Options: The mechanism to adopt flexibility of multiple entry and exit in all HEIs to facilitate the students during academic cycle (<https://www.ugc.gov.in/e-book/GL%20Multiple%20Entry%20Exit.pdf>)
6. Apprenticeship/Internship: Objective, process and roles of HEIs and Industries to implement internship/apprenticeship ([https://www.ugc.gov.in/pdfnews/9105852_ugc-guidelines ApprenticeshipInternship.pdf](https://www.ugc.gov.in/pdfnews/9105852_ugc-guidelines_ApprenticeshipInternship.pdf))
7. Open and Distance Learning (ODL): Guideline, process, and eligible institutes to provide the ODL mode of learning. (https://www.ugc.gov.in/pdfnews/7421799_Current-Regulations.pdf)
8. Curriculum and Credit Framework: Suggestive points by UGC to design the course curriculum and define the credit structure (https://www.ugc.gov.in/pdfnews/7193743_FYUGP.pdf)
9. Academic Bank of Credits: Objective, function and implementation methodology of Academic Bank of Credits into HEIs (https://www.ugc.gov.in/pdfnews/9327451_Academic-Bank-of-Credits-in-Higher-Education.pdf)
10. Transforming Higher Education: Objective, approach and readiness of the institution to transform into multidiscipline institutions (https://www.ugc.gov.in/pdfnews/5599305_Guidelines-for-Transforming-Higher-Education- Institutions-into-Multidisciplinary-Institutions.pdf)
11. National Credit Framework: Assignment of credits, Implementation, and operationalization of credit framework through ABC (https://www.ugc.gov.in/pdfnews/9028476_Report-of-National-Credit-Framework.pdf)
12. National Higher Education Qualification Framework: NHEQF level qualification specification and Course Learning Outcome (https://www.ugc.gov.in/pdfnews/9028476_Report-of-National-Credit-Framework.pdf)
13. Blended mode of Learning: Infrastructure readiness at HEIs, implementation process, assessment and evaluation and suggested framework for blended mode of learning. (https://www.ugc.gov.in/pdfnews/6100340_Concept-Note-Blended-Mode-of-Teaching-and- Learning.pdf)

[Signature]
I/c. Principal
The H. N. S. B. Ltd. Science College
Himatnagar-383001, S.K.