



# હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

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ફોન: (૦૨૭૬૬) ૨૩૭૦૦૦

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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 સંબંધિતોને 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.ngu.ac.in](http://www.ngu.ac.in) પર પણ ઉપલબ્ધ કરવામાં આવેલ છે. આથી સંબંધિત કોલેજોને ડાઉનલોડ કરી ઉપયોગ કરવા સારૂ જણાવવામાં આવે છે.



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

*(Signature)*  
કા. કુલસચિવ

બિડાણ: ઉપરમુજબ

નં-એકે/અસ/૩૩૪/૨૦૨૩

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)



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

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Submitted on 21<sup>st</sup> July 2023

## Introduction:

The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters.

The UGC has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Higher Educational Institutions (HEIs) in India. The academic reforms recommended by the UGC in the recent past have led to overall improvement in the higher education system. However, due to lot of diversity in the system of higher education, there are multiple approaches followed by universities towards examination, evaluation and grading system. While the HEIs must have the flexibility and freedom in designing the examination and evaluation methods that best fit the curriculum, syllabi and teaching-learning methods, there is a need to devise a sensible system for awarding the grades based on the performance of students.

*The National Education Policy (NEP) 2020* (hereafter referred to as NEP or Policy) recognizes that higher education plays 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. It notes that “given the 21st-century requirements, quality higher education must aim to develop good, thoughtful, well-rounded, and creative individuals”. In accordance with the NEP 2020, the UGC has formulated a new student-

centric “Curriculum and Credit Framework for Undergraduate Programmes (CCFUP)” incorporating a flexible choice-based credit system, multidisciplinary approach, and multiple entry and exit options. This will facilitate students to pursue their career path by choosing the subject/field of their interest. The grading system is considered to be better than the conventional marks system and hence it has been followed in the top institutions in India and abroad. So it is desirable to introduce uniform grading system. This will facilitate student mobility across institutions within and across countries and also enable potential employers to assess the performance of students. To bring in the desired uniformity in grading system and method for computing the cumulative grade point average (CGPA) based on the performance of students in the examinations, the UGC has formulated these guidelines.

### 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 PHYSICS 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 PHYSICS-



related careers, careers with general graduate-level aptitude and for higher education in PHYSICS. Augmented in this framework are graduate attributes including critical thinking, basic psychology, scientific reasoning, moral ethical reasoning and soon.

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.(Honours)–PHYSICS has been designed and decided to be implemented from the academic session from June 2023-24.

## **PROGRAMME SPECIFIC OUTCOMES TO BE ATTAINED AT THE END OF THE PROGRAMME**

According to Guideline of NEP 2020, the Board of Studies in Physics recognizes that curriculum, course content and assessment of scholastic achievements play important roles in shaping education. The committee is of the view that assessments should support and encourage the broad instructional goals such as basic knowledge of the discipline of Physics including phenomenology, theories and techniques, concepts and general principles. This should also support the ability to ask subjective questions and to obtain its solutions by use of qualitative and quantitative reasoning and by experimental investigation. With this in mind, we aim to provide a firm foundation in every aspect of Physics ranging from a broad spectrum of modern trends in Physics to experimental, computational and mathematical skills of students. Hence, the UG (B.Sc.) syllabi has been framed in such a way that it bridges the gap between the plus two and PG (M.Sc.) levels of Physics by providing a more comprehensive and logical framework in almost all areas of basic Physics.

### **Aims of the Programme:**

- To make students eligible for Higher Studies and professional courses.
- To develop the skills required to gather information from resources and use them.
- To develop the abilities to read, understand and interpret physical information – verbal, mathematical and graphical.
- To provide an intellectually stimulating environment to develop skills and enthusiasm of students to the best of their potential.
- To give need based education in physics of the highest quality at the undergraduate level.
- To offer courses to the choice of the students.
- To enable students to perform experiments and interpret the results of observation, including an assessment of experimental uncertainties.
- To make students eligible for government job.

### **Objectives of Programme:**

By the end of the first year (2nd semester), the students should have attained a common level in basic physics to complement the core for their future courses and developed their experimental and data analysis skills through experiments at laboratories.

## **OUTLINE OF CHOICE BASED CREDITS SYSTEM**

1. **Major Course (MJDSC):** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a **Major Discipline specific course**.
2. **Minor discipline (MiDSC)** helps a student to gain a broader understanding beyond

the major discipline.

3. **Multidisciplinary Course (MDSC):** Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.
4. **Interdisciplinary Course (IDSC) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).
5. **Ability Enhancement Courses (AEC):** Environmental Science, English Communication/MIL Communication are mandatory for all disciplines.
6. **Skill Enhancement Courses (SEC):**  
These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based instruction.
7. **Value Added Courses (VAC):**  
These courses may be chosen from a pool of courses designed to provide value-based education course instruction.  
The Proposed new course in chemistry for under graduate classes are reassigned in accordance to semester/CBCS/Grading system with new education policy. The new course is based on model curriculum of the university grants commission.

#### **COURSES/ACTIVITIES UNDER THE PROGRAM:**

1. **Lecture courses:** Courses involving lectures relating to a field or discipline by an expert or qualified personnel in a field of learning, work/vocation, or professional practice.
2. **Tutorial courses:** Courses involving problem-solving and discussions relating to a field or discipline under the guidance of qualified personnel in a field of learning, work/vocation, or professional practice.
3. **Practicum or Laboratory work:** A course requiring students to participate in a project or practical or lab activity that applies previously learned/studied principles/theory related to the chosen field of learning, work/vocation, or professional practice under the supervision of an expert or qualified individual in the field of learning, work/vocation or professional practice.
4. **Seminar:** A course requiring students to participate in structured discussion/conversation or debate focused on assigned tasks/readings, current or historical events, or shared experiences guided or led by an expert or qualified personnel in a field of learning, work/vocation, or professional practice.
5. **Internship:** A course requiring students to participate in a professional activity or work experience, or cooperative education activity with an entity external to the education institution, normally under the supervision of an expert of the given external entity. A key aspect of the internship is induction into actual work situations. Internships involve working with local industry, government or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in on-site experiential learning.
6. **Studio activities:** Studio activities involve the engagement of students in creative or artistic

activities. Every student is engaged in performing a creative activity to obtain a specific outcome. Studio-based activities involve visual- or aesthetic focused experiential work.

7. **Field practice/projects:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity.
8. **Community engagement and service:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity. The curricular component of 'community engagement and service' will involve activities that would expose students to the socio-economic issues in society so that the theoretical learning can be supplemented by actual life experiences to generate solutions to real-life problems.

### SILENT FEATURES:

- B.Sc. (Honours) Physics in UG Programme - Semester I and II shall be offered from the Academic year, June 2023.
- Physics 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 an Inter/Multidisciplinary Course (IDC/MDC), Ability Enhancement Course (AEC), Skill Enhancement Course (SEC) as well as Value Added Course (VAC) from a pool of courses.
- 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 One Major (MDSC) and Minor (MiDSC) Compulsory course (Theory) each with 3 credit each semester and their practical's each with 2 credit.
- One IDC/MDC course shall have to be offered. The credit weight-age for MD shall be of 2 credit each semester and their practical's each with 2 credit.
- In addition to the Major/Minor course, a student will have to choose IDC/MDC, AEC, SEC as well as VAC from a pool of courses.
- SEC and VAC courses shall have to be offered. The credit weight-age for SEC shall be of 2 credits and VAC courses shall be of 2 credit.
- One AEC (Languages) course shall have to be offered. The credit weight-age for Ability Enhancement Course (AEC) shall be of 02 credit.
- 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 Courses shall be abbreviated respectively as **DSC (Major/Minor)**, **IDC/MDC**, **AEC**, **VAC** and **SEC**.
  1. Discipline Specific Core Course **DSC (Major/Minor)**, Practical Discipline Specific Core Course **PDSC**
  2. Inter/Multi-Disciplinary Course **IDC/MDC**, Practical Inter/Multi-Disciplinary Course **PIDC/PMDC**
  3. Ability Enhancement Course (Languages) **AEC**
  4. Value Added Course **VAC**
  5. Skill Enhancement Course **SEC**
- 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 course with **4 credit** shall be of **60 Hours** (15 weeks x 4 credits) duration,
- The course with **3 credit** shall be of **45 Hours** (15 weeks x 3 credits) duration and

- The course with **2 credit** shall be of **30 Hours** (15 weeks x 2 credits) duration.
- **Practical with 2 Credit** shall be of **60 Hours** (15 weeks x 4 hours) duration.
- **Practical with 4 Credit** shall be of **120 Hours** (15 weeks x 8 hours) duration.

#### 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 answer either in **Gujarati** and/or **English** language.

#### TEACHING LEARNING PROCESS:

Teaching and learning in this programme involve classroom lectures as well as 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 papers should be drawn in **Gujarati** language and its **English** versions should be given.

#### EVALUATION METHOD :

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

#### Following assessment methodology should be adopted:

- Theoral and written examinations (Scheduled and surprise tests),
- Closed-book and open-book tests,
- Problem-solving exercises,
- Practical assignments and laboratory reports,
- Observation of practical skills,
- Individual and group project reports,
- Efficient delivery using seminar presentations,
- Vivavoce interviews are majorly adopted as assessment methods for this curriculum.
- The computerized adaptive testing, literature surveys and evaluations, peers and self-assessment, outputs from individual and collaborative work are also other important approaches for assessment purposes.
- A student shall be evaluated through Comprehensive Continuous Assessment (**CCA**) / (**Internal Evaluation**) as well as the **End of Semester Examination** (SEE **External Evaluation**). The weightage of **CCA** shall be 50%, whereas the weight-



age of the Semester end examinations shall be 50%. There will be no internal evaluation in practical courses.

- In Semester assessment (CCA)/(Internal Evaluation) is spread through the duration of the course and is to be done by the Teacher teaching the course. Both of the subjects will decide various criteria and their weightage for CCA. The assessment is to be done by various means including:

- Written Tests, MCQs based Tests/Quiz
- Presentations/Seminars
- Group discussions/Group activities
- Assignment etc., Project work/Fieldwork

Sr No	Assessment	4 Credit Course Marks	2 Credit Course Marks
1	CCE (50%) Classroom and Internal Evaluation	50	25
2	SEE Semester End Exam (50%)	50	25
Total		100	50

- The distribution of Internal Evaluation CEE is given as per criteria given below for 15 Marks.

Written Test/Weekly (2 Test Best out of 3)	20 Marks
Quiz (2 Test Best out of 3)	10 Marks
Active Learning During whole Term	10 Marks
Home Assignments	05 Marks
Attendance-Regularity in Learning, Written Test and Activity	05 Marks
Total CEE	50 Marks

- **SCHEME OF ASSESSMENT in Uni. Examination for Each Practical**

No.	Name of the head	Marks
1.	Understanding and approach to the experiment, circuit layout, use of apparatus	05
2.	Tabulation with correct units and accuracy of reading, which is read and noted by the student and verified by examiner.	05
3.	Oral questions Regarding the experiment (Viva)	07
4.	Calculations by correct formula and graph with scale.	05
5.	Accuracy of the results as judged by comparing the student's results with those supplied by expert assistant who has set the experiment.	01
6.	Marks for journal.	02
Total		25

There will be two group of practical each of 2 credit and 1 credit = 25 Marks, Total Marks of both Group will be 100. Students have must attend both group of practical in practical examination.

- The End of Semester examination (**External Evaluation**) shall have an assessment based upon following perspective with respect to all the courses:
  - Evaluation with respect to Knowledge,
  - Evaluation with respect to Understanding,
  - Evaluation with respect to Skill,

- Evaluation with respect to Application and
  - Higher Order Thinking Skills.
- With respect to all the above components, there shall be following types of Questions from each unit of the course.
  - ❖ MCQs/Fill in the blanks/Match the pairs, etc
  - ❖ Short answer questions
  - ❖ Medium answer questions
  - ❖ Long answer questions, Examples/Problems, etc.
- **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.
- 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 the concerned Board of Studies in Physics.
- 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.

### **Awarding Certificates, Diplomas and Degrees:**

#### **Certificate in Science:**

Students who opt to exit after completion of the first year and have secured 48 credits will be awarded the Certificate in Science with the three disciplines chosen by student in the first year. Thus, for example, if a student of B.Sc. program with Physics as the Major discipline and Maths as the minor disciplines and Chemistry as interdisciplines opt to exit after successful completion of the first year, the student will be awarded “Certificate in Science with Physics, Maths and Chemistry”.

#### **Diploma of Science:**

Students who opt to exit after completion of the second year and have secured 92 credits will be awarded the Diploma of Science in the principal discipline. Thus, for example, if a student of B.Sc. program with Physics as the Major discipline opt to exit after successful completion of two years, the student will be awarded “Diploma of Science in Physics”.

#### **Bachelor of Science:**

Students who opt to exit after completion of the third year and have secured 132 credits will be awarded the Bachelor of Science in the Major (principal) discipline.

#### **Bachelor of Science (Honors):**

Students of 4-

year B.Sc. program who successfully complete 4 years, without a rigorous research project/ dissertation will be awarded the Bachelor of Science (Honors) in the Major discipline (principal discipline).

#### **Bachelor of Science (Honors with Research):**

Students of 4-year B.Sc. program who successfully complete 4 years, with a rigorous

research project/dissertation will be awarded the Bachelor of Science (Honors with research) in the Major discipline (principal discipline).

- **Note:** During the preparation of this curriculum, ample care is taken for consideration of the following:
  - (a) NEP-2020
  - (b) Model curriculum of U.G.C.
  - (c) National Credit Framework Report of UGC, 2023
  - (d) Concept of continuous evaluation
  - (e) CGPA (Cumulative Grade Point Average Credit)
  - (f) CBCS (Choice Based Credit System)
  - (g) Semester approach
  - (h) Revised rules and regulation of Hemchandracharya North Gujarat University, Patan.

There shall be coverage of maximum 30% syllabus through online mode of teaching. As per directives of UGC.

Arrangement of credit Distribution Framework for three/four years Honours/Honours with Research Degree Programme with Multiple Entry and Exits options for all the institutions:



OPTION I BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)										
NCrF Credit Level	Semester	Major (Core) (68/88)	Minor (Electives ) (32)	Multi/Inter-disciplinary (12)	AEC (10)	SEC/ Internship (12)	VAC/ IKS (8)	RP/ OJT	Total Credit/ Sem. (144/176)	Qualification / Certificate
4.5 1 <sup>st</sup> Year	I	8	4	4	2	2 (SEC)	2 (IKS)	-	22	UG Certificate
	II	8	4	4	2	2 (SEC)	2	-	22	
First Year Total Credits		16	8	8	4	4	4	-	44	
Exit1: Award of UG certificate in Major course with 44 credits with additional 4credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor										
5.0 2 <sup>nd</sup> Year	III	12	-	4	2	2 (SEC)	2 (IKS)	-	22	UG Diploma
	IV	12	4	-	2	2 (SEC)	2 (VAC)	-	22	
Second 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										
5.5 3 <sup>rd</sup> Year	V	12	8	-	-	2 (SEC)	-	-	22	UG Degree
	VI	12	4	-	2	4(Internship)	-	-	22	
Third 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										
6.0 4 <sup>th</sup> Year	VII	12	4	-	-	-	-	6 (OJT)	22	UG Honours Degree
	VIII	12	4	-	-	-	-	6 (OJT)	22	
Fourth 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	VII	12	4	-	-	-	-	6 (RP)	22	UG Honours with Research Degree
	VIII	12	4	-	-	-	-	6 (RP)	22	
Fourth 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										

**Abbreviation:** AEC -Ability Enhancement Course, IKS-Indian Knowledge System,  
 NCrF-National Credit Framework OJT-On-the-Job Training,  
 VAC-Value Added Course, SEC-Skills Enhancement Course, RP- Research Project

**General Credit-Subject Structure and Examination Pattern /Marking Scheme of study components along with 22 credits in B.Sc. PHYSICS SEM – 1 and 2 are as below.**

Sr · N o.	Course Code	StudyComponents	Instructi onHrs/ on	Examination			Credit	Exam Durati on(Ho
				Internal	Uni Ex ag	Total		
SEMESTER-I PROGRAMCODE:SCIUG101								
TheoryCourse(DSC)								
1	SC23MJDSCPHY101	Major-1:DisciplineSpecificCoreCourse	04	50	50	100	4	02:30
2	SC23MIDSCPHY102	Minor:DisciplineSpecificCore Course	02	25	25	50	2	02:00
3	SC23MDCPHY103	Inter/MultiDisciplinary Courses	02	25	25	50	2	02:00
PracticalCourse(PDSC)								
4	SC23PMJDSCPHY101(A)	Major:DisciplineSpecificCoreCourses	04	25	25	50	2	2:30
5	SC23PMJDSCPHY101(B)	Major:DisciplineSpecificCoreCourse	04	25	25	50	2	2:30
6	SC23PMIDSCPHY102	Minor: Discipline SpecificCoreCourse	04	25	25	50	2	2:30
7	SC23PMDCPHY103	Inter/MultiDisciplinary Course	04	25	25	50	2	2:30
AbilityEnhancementCourses(AEC)								
8	SC23AECPHY104	(AEC)(Languages)	02	25	25	50	2	1:30
ValueAdded Course(VAC)								
09	SC23VACPHY105	ValueAddedCourses(VAC)	02	25	25	50	2	1:30
SkillEnhancementCourse								
10	SC23SECPHY106 &106(A)	SkillEnhancementCourse(SEC)	02	25	25	50	2	1:30
Total			30	275	275	550	22	

**SEMESTER-II PROGRAMME CODE : SCIUG101**

Sr No.	CourseCode	StudyComponents	Instructi onHrs/w	Examination			Credit	Exam Durati on(Ho
				Internal	Uni Ex	Total		
SEMESTER- II PROGRAMCODE:SCIUG101								
TheoryCourse(DSC)								
1	SC23MJDSCPHY201	Major-1:DisciplineSpecificCoreCourse	04	50	50	100	4	02:30
2	SC23MIDSCPHY202	Minor:DisciplineSpecificCore Course	02	25	25	50	2	02:00
3	SC23MDCPHY203	Inter/MultiDisciplinary Courses	02	25	25	50	2	02:00
PracticalCourse(PDSC)								
4	SC23PMJDSCPHY201(A)	Major:DisciplineSpecificCoreCourses	04	25	25	50	2	2:30
5	SC23PMJDSCPHY201(B)	Major:DisciplineSpecificCoreCourse	04	25	25	50	2	2:30
6	SC23PMIDSCPHY202	Minor: Discipline SpecificCoreCourse	04	25	25	50	2	2:30
7	SC23PMDCPHY203	Inter/MultiDisciplinary Course	04	25	25	50	2	2:30
AbilityEnhancementCourses(AEC)								
8	SC23AECPHY204	(AEC)(Languages)	02	25	25	50	2	1:30
ValueAdded Course(VAC)								
9	SC23VACPHY205	ValueAddedCourses(VAC)	02	25	25	50	2	1:30
SkillEnhancementCourse								
10	SC23SECPH206 &206(A)	SkillEnhancementCourse(SEC)	02	25	25	50	2	1:30
Total			30	275	275	550	22	

Note: A student will allow to switch over minor to major course after finishing second semester. For that He/She must earn credits equal to credits of major subject during first two semesters simultaneously.  
B Sc Sem I and II PHYSICS Syllabi June 2023 under NEP 2020

First Year B Sc Sem I & II Credit and Theory –Practical Distribution							
Semester	Discipline Specific Core Courses		Inter/Multi Disciplinary Course (4)	Ability Enhancement Course (Languages ) (2)	Value Added Course (2)	Skill Enhancement Course (2)	Total Credit
	Major (8)	Minor (4)					
	Theory+ Practical Credit	Theory+ Practical Credit	Theory+ Practical Credit	Credit	Credit	Credit	
I	4 T + 4 P = 8 [In Practical 2 of Group A and 2 of Group B]	2 T + 2 P = 4	2 T + 2 P = 4	2 T	2 T	2 T	22
II	4 T + 4 P = 8 [In Practical 2 of Group A and 2 of Group B]	2 T + 2 P = 4	2 T + 2 P = 4	2 T	2 T	2 T	22



# HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

## B.Sc. PHYSICS-SEMESTER-I

### TYPE OF COURSE: MAJOR DISCIPLINE SPECIFIC COURSE

PROGRAMME CODE: SCIUG101

COURSE CODE: SC23MJDSCPHY101

COURSE NAME: Mathematical, Thermodynamics, Waves-Sound and Electronics

(Effective from June 2023 Under NEP-2020)

Total Credits: 04	Theory	External Marks-50
Teaching Hours per Week: 04 Teaching Hours per Semester: 60		Internal Marks-50

#### Course Objective:

1. To Understand the concepts and significance of Scalar and Vector Fields, operations with operator  $\nabla$  and Gauss's Theorem, Stoke's Theorem
2. To Understand the application of laws of Thermodynamics & the concepts of entropy.
3. To teach how to calculate changes in various Thermodynamic processes.
4. To develop knowledge about theory of resonator and its application, ultrasonic waves, its production and application
5. To develop knowledge about basic concepts, working of various rectifier and Filter circuits.

#### Course Outcome:

After the successful completion of the course students will be able to

1. Understands the concepts and significance of Scalar and Vector Fields as well as operations of operator  $\nabla$ , Gauss's Theorem and Stoke's Theorem.
2. Understands the Thermodynamics, Carnot's theorem and concepts of entropy.
3. Learns about Ultrasonics, production and its applications.
4. Will get sufficient knowledge of sound and theory of resonator.
5. Learns sufficient knowledge of various rectifier, Filter circuits and applications of them.

### Syllabus

Unit No.	Content	Credit	Lect. Hrs 60
Unit-1	<p><b>Mathematical Physics:</b> <b>Vector Algebra and Vector Analysis:</b></p> <p>Dyadic (1.10), Scalar Triple product (1.11), Reciprocal vectors (1.12), Vector Triple product (1.13), Pseudovectors and Pseudo Scalars (1.16), Some Important Definition about Vectors, Integration of vector: Line Integration, Surface Integration and Volume Integration (2.3a,b), Partial differentiation (2.4), Gradient of a scalar point function (2.5), Divergence of vector (2.6), Curl of a vector (2.8), More about the Vector differential Operator <math>\nabla</math> (2.9), Multiple <math>\nabla</math> Operations (2.11), Some useful identities (2.13), Gauss's Theorem (2.14), Stokes Theorem (2.17). (Related Examples &amp; Problems)</p> <p><b>Basic Reference:</b> Introduction to Classical Mechanics by R.G. Takwale &amp; P.S. Puranik (Tata McGraw-Hill Publishing Company Ltd.)</p>	1	15

Unit-2	<p><b>Thermodynamics:</b>  <b>Thermodynamics of Refrigerator:</b> Second Law of Thermodynamics (2.8), Carnot's Theorem (2.9), Thermodynamic absolute Scale of temperature (2.10), Thermodynamics of Refrigeration (4.2)  <b>Entropy:</b> Introduction of Entropy (2.13), Change of Entropy in a Reversible Process (2.14), change of entropy in an Irreversible process (2.15), Principle of Increase of Entropy of Degradation of Energy (2.16), Formulation of the Second law in terms of Entropy (2.17), Entropy and second law (2.18), Third law of Thermodynamics (Nernst's Heat Theorem) (2.19) (<i>Related Examples &amp; Problem</i>)</p> <p><b>Basic Reference:</b> <i>Thermodynamics and Statistical Physics by Dr. J.P. Agarwal and Satya Prakash (Pragati Prakashan)</i></p>	1	15
Unit-3	<p><b>Waves and Sound:</b>  <b>Wave:</b> Theory of Resonator (6.16), Dependence of the Frequency of resonator on the size and shape of the mouth (6.17), Velocity of Transverse waves along a stretched string (7.1), law's of Transverse Vibration of Strings (7.3), Melde's Experiment (7.5), Kundt's Tube (7.13) (<i>Related Examples &amp; Problem</i>)  <b>Ultrasonic waves:</b> Ultrasonics (11.23), Production of Ultrasonics (11.24), Magneto-Striction Effect (11.24.2), Piezo-Electric Effect Method-Oscillator (11.24.3), Detection of Ultrasonic Waves (11.25), Applications of Ultrasonic waves (11.27) (<i>Related Examples &amp; Problem</i>)  <b>Basic Reference:</b> <i>Waves And Oscillations by N. Subhramanyam &amp; Brijlal (Vikas Publishing House Pvt. Ltd., -2<sup>nd</sup> Revised Edition.</i></p>	1	15
Unit-4	<p><b>Electronics:</b>  <b>Rectifier and Power Supply:</b> The Half Wave Rectifier (4.1)-[Average or D.C. output Voltage, Average or D.C. output current, RMS value of output current, Rectifier efficiency (Ratio of Rectification), Ripple factor, Voltage Regulation, Peak inverse voltage (PIV), Transformer Utilization Factor (TUF)],  The Full Wave Rectifier (4.2)- [Average or D.C. output current, RMS value of output current, Average or D.C. output Voltage, Rectifier efficiency (Ratio of Rectification), Ripple factor, Voltage Regulation, Peak Inverse Voltage (PIV), Transformer Utilization Factor (TUF)], Comparison of Half and Full Wave Rectifiers Circuit (4.3), The Bridge Rectifier (4.4),  <b>Filter Circuits:</b> The Half Wave Rectifier with Series Inductor Filter (4.7.1) and with capacitor filter (4.7.2), The Full Wave Rectifier with Series Inductor Filter (4.7.3), Choke Input Filter or L-section Filter (L-C Filter) (4.7.4), Capacitor Input Filter (C-L-C Filter or <math>\pi</math>-Filter), [Comparison of L and <math>\pi</math>-section filter circuits]  <b>Basic Reference:</b> <i>Handbook of Electronics by Gupta and Kumar</i></p>	1	15

	<p align="center"><b>: Further Reading – Other References :</b></p> <ol style="list-style-type: none"> <li>1) Mathematical Method in physical sciences by M.L. Boas (John Wiley &amp; Sons)</li> <li>2) Mathematical Physics by B.D. Gupta (4<sup>th</sup> Edition)</li> <li>3) Mathematical Physics by H. K. Das</li> <li>4) Vector analysis by Prof. R.N. Desai (University Grants Commission, Gujarat)</li> <li>5) Heat and Thermodynamics by Zemansky</li> <li>6) University Physics by Sears, Zemansky and Young (Narosa Publishing House)</li> <li>7) Heat and Thermodynamics by Richard H. Dittman &amp; Mark W. Zemansky (TMH)</li> <li>8) Heat and Thermodynamics by A.B. Gupta and H.P. Roy (New Central Book)</li> <li>9) Electronic Device &amp; Circuits by Allen Mottershead, (PHI Pvt. Ltd.)</li> <li>10) Electronics and Radio Engineering by M.L. Gupta. -</li> <li>11) Basic Electronics and Linear Circuits by Bhargava Kulshreshtha &amp; Gupta (TMH Edition)</li> <li><b>12) Elements of Electronics by Bagde &amp; Singh</b></li> </ol>
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# HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

## B.Sc. PHYSICS-SEMESTER-I

TYPE OF COURSE: MINOR DISCIPLINE SPECIFIC COURSE

PROGRAMME CODE: SCIUG101

COURSE CODE: SC23MIDSCPHY102

COURSE NAME: Mathematical Physics and Heat - Thermodynamics

(Effective from June 2023 Under NEP-2020)

Total Credits: 02	Theory	External Marks-25
Teaching Hours per Week: 02		Internal Marks-25
Teaching Hours per Semester: 30		

### Course Objective:

- To Understand the concepts and significance of Scalar and Vector Fields, operations with operator  $\nabla$  and Gauss's Theorem, Stoke's Theorem
- To Understand the application of laws of Thermodynamics & the concepts of entropy.
- To teach how to calculate changes in various Thermodynamic processes.

### Course Outcome:

After the successful completion of the course students will be able to

- Understands the concepts and significance of Scalar and Vector Fields as well as operations of operator  $\nabla$ , Gauss's Theorem and Stoke's Theorem.
- Understands the Thermodynamics, Carnot's theorem and concepts of entropy.
- Calculate changes in various Thermodynamic processes.

### Syllabus

Unit No.	Content	Credit	Lect. Hrs
Unit-1	<p><b>Mathematical Physics:</b>  <b>Vector Algebra and Vector Analysis:</b> Dyadic (1.10), Scalar Triple product (1.11), Reciprocal vectors (1.12), Vector Triple product (1.13), Pseudovectors and Pseudo Scalars (1.16), Some Important Definition about Vectors, Integration of vector: Line Integration, Surface Integration and Volume Integration (2.3a, b), Partial differentiation (2.4), Gradient of a scalar point function (2.5), Divergence of vector (2.6), Curl of a vector (2.8), More about the Vector differential Operator <math>\nabla</math> (2.9), Multiple <math>\nabla</math> Operations (2.11), Some useful identities (2.13), Gauss's Theorem (2.14), Stokes Theorem (2.17). (Related Examples &amp; Problems)</p> <p><b>Basic Reference:</b> Introduction to Classical Mechanics by R. G. Takwale &amp; P. S. Puranik (Tata McGraw-Hill Publishing Company Ltd.)</p>	1	15

Unit-2	<p><b>Thermodynamics:</b>  <b>Thermodynamics of Refrigerator:</b> Second Law of Thermodynamics (2.8), Carnot's Theorem (2.9), Thermodynamic absolute Scale of temperature (2.10), Thermodynamics of Refrigeration (4.2)  <b>Entropy:</b> Introduction of Entropy (2.13), Change of Entropy in a Reversible Process (2.14), change of entropy in an Irreversible process (2.15), Principle of Increase of Entropy of Degradation of Energy (2.16), Formulation of the Second law in terms of Entropy (2.17), Entropy and second law (2.18), Third law of Thermodynamics (Nernst's Heat Theorem) (2.19) <i>(Related Examples &amp; Problem)</i></p> <p><b>Basic Reference:</b> <i>Thermodynamics and Statistical Physics</i> by Dr. J.P. Agarwal and Satya Prakash (Pragati Prakashan)</p>	1	15
	<p><b>: Further Reading – Other References :</b></p> <p>3) Mathematical Method in physical sciences by M.L. Boas (John Wiley &amp; Sons)  4) Mathematical Physics by B.D. Gupta (4<sup>th</sup> Edition)  3) Mathematical Physics by H. K. Das  5) Vector analysis by Prof. R.N. Desai (University Grants Commission, Gujarat)  5) Heat and Thermodynamics by Zemansky  6) University Physics by Sears, Zemansky and Young (Narosa Publishing House)  7) Heat and Thermodynamics by Richard H. Dittman &amp; Mark W. Zemansky (TMH)  8) Heat and Thermodynamics by A.B. Gupta and H.P. Roy (New Central Book)</p>		

**HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN**  
**B.Sc.PHYSICS-SEMESTER-I**  
**TYPE OF COURSE: INTER/MULTIDISCIPLINESPECIFICCOURSE**

**PROGRAMME CODE: SCIUG101**

**COURSE CODE: SC23MDSCPHY103**

**COURSE NAME: Waves-Sound and Electronics**

(Effective from June 2023 Under NEP-2020)

Total Credits: 02	Theory	External Marks-25
Teaching Hours per Week: 2		Internal Marks-25
Teaching Hours per Semester: 30		

**Course Objective:**

- To develop knowledge about the theory of resonator and its application, ultrasonic waves, its production and application
- To develop knowledge about basic concepts, working of various rectifier and Filter circuits.

**Course Outcome:**

After the successful completion of the course students will be able to

- Learns about Ultrasonics, production and its applications.
- Will get sufficient knowledge of sound and theory of resonator.
- Learns sufficient knowledge of various rectifier, Filter circuits and applications of them

Unit-1	<p><b>Waves and Sound:</b>  <b>Wave:</b> Theory of Resonator (6.16), Dependence of the Frequency of resonator on the size and shape of the mouth (6.17), Velocity of Transverse waves along a stretched string (7.1), Law's of Transverse Vibration of Strings (7.3), Melde's Experiment (7.5), Kundt's Tube (7.13) (<i>Related Examples &amp; Problem</i>)  <b>Ultrasonic waves:</b> Ultrasonics (11.23), Production of Ultrasonics (11.24), Magneto-Striction Effect (11.24.2), Piezo-Electric Effect Method-Oscillator (11.24.3), Detection of Ultrasonic Waves (11.25), Applications of Ultrasonic waves (11.27) (<i>Related Examples &amp; Problem</i>)  <b>Basic Reference:</b> <i>Waves And Oscillations</i> by N. Subhramanyam &amp; Brijlal (Vikas Publishing House Pvt. Ltd., -2<sup>nd</sup> Revised Edition.</p>	1	15
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Unit-2	<p><b>Electronics:</b>  <b>Rectifier and Power Supply:</b> The Half Wave Rectifier (4.1)-[Average or D.C. output Voltage, Average or D.C. output current, RMS value of output current, Rectifier efficiency (Ratio of Rectification), Ripple factor, Voltage Regulation, Peak inverse voltage (PIV), Transformer Utilization Factor (TUF)],  The Full Wave Rectifier (4.2)-  [Average or D.C. output current, RMS value of output current, Average or D.C. output Voltage, Rectifier efficiency (Ratio of Rectification), Ripple factor, Voltage Regulation, Peak Inverse Voltage (PIV), Transformer Utilization Factor (TUF)], Comparison of Half and Full Wave Rectifiers Circuit (4.3), <b>The Bridge Rectifier</b> (4.4),  <b>Filter Circuits:</b>  The Half Wave Rectifier with Series Inductor Filter (4.7.1) and with capacitor filter (4.7.2), The Full Wave Rectifier with Series Inductor Filter (4.7.3), Choke Input Filter or L-section Filter (L-C Filter) (4.7.4), Capacitor Input Filter (C-L-C Filter or <math>\pi</math>-Filter), [Comparison of L and <math>\pi</math>-section filter circuits]  <b>Basic Reference:</b> <i>Handbook of Electronics by Gupta and Kumar</i></p>	1	15
<p style="text-align: center;"><b>: Further Reading – Other References :</b></p> <ul style="list-style-type: none"> <li>• University Physics by Sears, Zeemansky and Young (Norosa Publishing House)</li> <li>• A Text Book On Oscillations, Wave and Acoustics by M. Ghosh &amp; D. Bhattacharya (S. Chand Co)</li> <li>• Vibration, Waves &amp; Heat by Sears and Zeemansky</li> <li>• Electronic Device &amp; Circuits by Allen Mottershead, (PHI Pvt. LTD)</li> <li>• Electronics and Radio Engineering by M.L. Gupta.</li> <li>• Basic Electronics and Linear circuits by Bhargava Kulshreshtha &amp; Gupta TMH Edition</li> <li>• Elements of Electronics by Bagde &amp; Singh</li> </ul>			

# HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

## B.Sc.PHYSICS-SEMESTER –I (PRACTICALCOURSE)

PROGRAMMECODE:SCIUG101  
(EffectivefromJune2023UnderNEP–2020)

TYPE OFCOURSE	CREDIT	COURSECODE
MajorDisciplineCoreCourse(MJDSCP)	2 (Group A)	SC23MJDSC P PHY101(A)
MajorDisciplineCoreCourse(MJDSCP)	2 (Group B)	SC23MJDSC P PHY101(B)
MinorDisciplineCoreCourse(MIDSCP)	2	SC23MIDSC P PHY102
Inter-DisciplineCoreCourse(MDCP)	2	SC23MDSC P PHY103

### TeachingHours

TeachingHoursperWeek:08 Hours for 4 Credit practical (120 Hours per Semester)  
TeachingHoursperWeek:04 Hours for 2 Credit practical (60 Hours per Semester)

### CourseObjectives:

- To gain practical knowledge by applying the experimental method to correlate with the Physics theory.
- To provide hands on experience with the equipments such as, spectrometer, Pendulum, Flywheel and electronic circuits.
- To learn the usage of electrical and optical systems of various measurements.
- To impart practical knowledge by performing experiments based on the principles of theory courses.
- To provide training how to analyze the experimental data and graphical analysis.
- To develop intellectual communications skills and discuss the basic principles of scientific concepts in the group.

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### EXPERIMENTS FOR MAJOR COURSE 2 Credit for Group A COURSECODE: SC23MJDSC P PHY101(A)

- Determine a Damping coefficient, Relaxation and quality factor in the damped motion of a simple Pendulum.
- Study of Resonator: Verification of relation  $n^2(V + kv) = \text{constant}$  and determine the frequency of unknown fork.
- Determination of angular acceleration ( $\alpha$ ) and find MI of a Flywheel using plot  $\alpha$  versus Torque
- Arrangement of Spectrometer for parallel rays using Schuster method and to find Angle of Prism
- Calibration of the Spectrometer and determine the wavelength of unknown line of Hg-spectrum.
- To Find Refractive index of liquid using convex lens.
- Analysis of error.
- Verification of Stefan Boltzmann's fourth power law using A.C./D.C. Source
- Melde's Experiment: (i) To prove  $P/L$  constant and (ii)  $P^2T$  constant
- Least square Method
- Study of Travelling Microscope, To determine Gauz element, Diameter of tube, width of auxiliary slit
- To find the Young's Modulus of the material of a Rectangular Bar by Bending. (Y by cantilever)

**LABORATORY EXPERIMENTS**  
**For**  
**MAJOR COURSE (2 Credit for Group B)**  
**COURSE CODE: SC23MJDSC P PHY101(B)**

1. V-I characteristics of Zener diode
2. Study of Zener Diode as a voltage Regulator.
3. Study of the Series Resonance with Frequency Variation. (**C** constant)
4. Determination of the capacitance 'C' of a condenser.
5. P-N Junction diode as Half Wave Rectifier Without filter. Calculation of Percentage of Regulation.
6. P-N Junction diode as Half Wave Rectifier (i) With Series Inductor Filter  
(ii) With Shunt Capacitor Filter. Calculation of Percentage of Regulation.
7. Verification of Thevenin's Theorem.
8. Study of Logic Gates: AND, OR and NOT. Verification of Truth table and giving understanding of voltage level for "0" and "1" level.
9. Experimental Measurements of Power Supply, Resistor, Diode, Transistor by Multimeter
10. Study of Step Up Transformer. To determine Turn Ratio, % of Efficiency, Energy loss due to copper loss for a given transformer.
11. Study of Bridge Rectifier (i) Without filter (ii) With Series Inductor Filter  
(iii) With Shunt Capacitor Filter. Calculation of Percentage of Regulation.
12. Study of Maximum Power transfer Theorem

**Course Outcome: Learning Outcomes**

By the end of the course, the students will be able to understand.

- The basic principles of Physics related to their courses in the practical way.
- The operational details of spectrometer, electronic circuit etc.
- The experimental design aspects to determine various properties of like gravity, quality factor, Refractive index, determination of Cauchy's Constants, analysis of spectra, Analysis of error, determine value of unknown frequency etc.
- The process to analyze the observations and infer the outcome of the experiments.
- How to analyze the experimental data and graphical analysis.

# HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

## B.Sc.PHYSICS-SEMESTER –I (PRACTICALCOURSE)

PROGRAMMECODE:SCIUG101  
(EffectivefromJune2023UnderNEP–2020)

TYPE OFCOURSE	CREDIT	COURSECODE
MinorDisciplineCoreCourse(MIDSCP)	2	SC23MIDSC P PHY102

TeachingHoursperWeek:04 Hours for 2 Credit practical and TeachingHoursperSemester: 60 Hours

### Minor Discipline Core Course(MIDSCP) Practical

1. Melde's Experiment: (i) To prove  $P/L$  constant and (ii)  $P^2T$  constant
2. StudyofResonator:Verificationofrelation $n^2(V+kv)=\text{constant}$ anddeterminethe frequencyofunknownfork.
3. Determinationof angular acceleration ( $\alpha$ ) and find MI of aFlywheel using plot  $\alpha$  verses Torque.
4. Least square Method
5. ArrangementofSpectrometerforparallelraysusingSchustermethod
6. StudyoftheSeriesResonancewithFrequencyVariation, Fix Capacitor.
7. Determinationofthecapacitance 'C' ofacondenser.
8. Study of Maximum Power transfer Theorem
9. Study of Step Up Transformer: To determine Turn Ratio, % of Efficiency, energy loss due to copper loss for a given transformer.
10. P-NJunctiondiodeasHalfWaveRectifierWithoutfilter. CalculationofPercentageofRegulation.
11. VerificationofThevenin'sTheorem.
12. Calibrationofthe SpectrometeranddeterminesthewavelengthofunknownlineofHg-spectrum.



# HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

## B.Sc. PHYSICS-SEMESTER –I (PRACTICAL COURSE)

PROGRAMME CODE: SCIUG101  
(Effective from June 2023 Under NEP-2020)

TYPE OF COURSE	CREDIT	COURSE CODE
Multidisciplinary Core Course (MDSCP)	2	SC23MIDSC P PHY103

Teaching Hours per Week: 04 Hours for 2 Credit practical and Teaching Hours per Semester: 60 Hours

### Multi Discipline Core Course (MIDSCP) Practical

1. Determine a Damping coefficient, Relaxation and quality factor in the damped motion of a simple Pendulum.
2. Study of Resonator: Verification of relation  $n^2(V + kv) = \text{constant}$  and determine the frequency of unknown fork.
3. Determination of angular acceleration ( $\alpha$ ) and find MI of a Flywheel using plot  $\alpha$  versus Torque
4. To Find Refractive index of liquid using convex lens.
5. Verification of Stefan Boltzmann's fourth power law using A.C./D.C. Source
6. Study of Travelling Microscope, To determine Gauss element, Diameter of tube, width of auxiliary slit
7. V-I Characteristics of Zener diode and Determine Breakdown voltage
8. Study of Zener Diode as a voltage Regulator.
9. P-N Junction diode as Half Wave Rectifier (i) Without filter. Calculation of Percentage of Regulation.
10. P-N Junction diode as Full Wave Rectifier (i) With Series Inductor Filter (ii) With Shunt Capacitor Filter. Calculation of Percentage of Regulation
11. Study of Logic Gates: AND, OR and NOT. Verification of Truth table and giving understanding of voltage level for "0" and "1" level.
12. Study of Bridge Rectifier Without filter. Calculation of Percentage of Regulation.

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**  
**B.Sc. PHYSICS- SEMESTER-I**  
**TYPE OF COURSE: SKILL ENHANCEMENT COURSE**  
**PROGRAMME CODE: SCIUG101**  
**COURSE CODE: SC23SECPHY106**

**COURSE NAME: INSTRUMENTATION MEASUREMENT AND ANALYSIS**  
(Effective from June 2023 Under NEP-2020)

Total Credits: 02	Theory	External Marks-25
Teaching Hours per Week: 02		Internal Marks-25
Teaching Hours per Semester: 30		

**Course Objective:**

- To understand the principles of various instruments and its application.
- To Learn the concepts Vernier calipers, Micrometer screw, spherometer, spectrometer etc.
- To Understands working function of Galvanometer and determine merit of figure.
- Learns about construction, working and use of various measuring instruments.

**Course outcome:**

At the end of the course students will be able to

- Understand the basic knowledge of working of various instruments and its application.
- Learns the construction, working process and use of various measuring instruments.
- Will get sufficient knowledge of Galvanometer and determine various scientific parameters.

:: Syllabus ::

Unit No.	Content	Credit	Hrs 30
Unit-1	<p><b>Vernier Calipers:</b> Introduction, Theory, Figure, Description of the instrument, Detail study of Least count, Errors, Positive error, negative error, Determination of magnitude of positive and negative errors.</p> <p><b>Micrometer Screw:</b> Introduction, Theory, Figure, Description of the instrument, Definition of pitch and its determination, study of least count, Meaning of the error and explanation of positive and negative errors. Determination of positive and negative errors. Method of taking observation with the help of Micrometer Screw.</p> <p><b>Spherometer:</b> Introduction, Theory, Figure, Description of the instrument, To determine the pitch of the screw, To determine the least count of the spherometer, Zero error, Derivation of the formula for the radius of curvature of a curved surface.</p>	1	15

Unit-2	<p><b>Wheatstone Bridge:</b> Introduction, Theory with figure, the figure of meter bridge used in laboratory, construction of Meter bridge.</p> <p>Post-Office box: Introduction, Theory, Circuit Diagram, Theoretical Circuit diagram, explanation of working with necessary formula.</p> <p><b>Galvanometer:</b> Introduction, Theory, Sensitivity and Figure of Merit of Galvanometer.</p> <p><b>Spectrometer:</b> Introduction, Construction and explanation of three main parts of Spectrometer, Mercury Discharge lamp, Sodium Discharge lamp, the adjustment, leveling and the method of recording the observation of Spectrometer.</p>	1	15
<b>Reference:</b> Book for Study: Experimental Book for Physics			

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**  
**B.Sc. PHYSICS-SEMESTER-I**  
**TYPE OF COURSE: SKILL ENHANCEMENT COURSE (SEC)**  
**PROGRAM CODE: SCIUG101 COURSE CODE: SC23SEC PHY106 (A)**

**COURSE NAME: INTRODUCTION TO NANOTECHNOLOGY**  
(Effective from June 2023 Under NEP-2020)

Total Credits: 02	Theory	External Marks-25
Teaching Hours per Week: 02 Teaching Hours per Semester: 30		Internal Marks-25

Sr. No	Content	Credit	Lec. Hrs 30
Unit 1	<p><b>Concept of Nanotechnology:</b>  Nanotechnology, Nanotech Generation, Nanoscience, New form of Carbon, Nanocomposites, Polymer Nanocomposites, Nanomaterials, Properties of nanomaterials- One-, two- and three-dimensional nanomaterials, Molecular nanotechnology, Nanostructured materials by self-assembly, Nanocrystals, What nanodevices can do in the medical field? Nanopores, nanoionics, nano mechanics, Nanorobotics.</p> <p><b>Tools to Make and measure a nano structure:</b>  Tools and Techniques, microscopy, Metrology, Simulation, Carbon Nanotube (CNT)- fabrication, Purification of CNTs, Dispersion, Scanning Probe Microscopes (SPM), Atomic Force Microscopy (AFM), Single Molecule Techniques, Micro lithography and MEMs, Electron beam lithography and focused ion bombardment</p>	1	15
Unit 2	<p><b>Applications of Nanotechnology:</b>  Identified potential applications Expected benefits from nanotechnology, Energy and Energy Efficiency, new energy producers, Medicine, security, Other Applications, Constructions.</p> <p><b>Impact of Nanotechnology:</b>  Societal impact of nanotechnology, Social and ethical impact, Health and environmental impact, Risks with nanotechnology, Indian Scenario in nanotechnology</p>	1	15
<p><b>Reference</b>  <b>Book:</b> Nanotechnology: technology Revolution of 21st Century Rakesh Rathi (S. Chand &amp; Company, New Delhi)</p> <p><b>Further Reading:</b> Introduction to Nanoscience, S. M. Lindsay (Oxford Press) Nano: The Essentials, T. Pradeep (Tata McGraw Hill)</p>			



**PROGRAM CODE : SCIUG102**  
**Syllabus and Scheme of Examination**  
for

**Sem. I and Sem. II of B.Sc. Honors Chemistry**

Four-year Graduate Honors Program in Chemistry  
Under NEP 2020

Submitted

to



*Hemchandracharya North Gujarat University, Patan*

Under

**Choice Based Credit System**

**Implemented w.e. f June, 2023**

Submitted on May, 2023  
ReSubmitted on July, 2023  
Resubmitted on August, 2023

## **PREAMBLE**

The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters.

The UGC has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Higher Educational Institutions (HEIs) in India. The academic reforms recommended by the UGC in the recent past have led to overall improvement in the higher education system. However, due to lot of diversity in the system of higher education, there are multiple approaches followed by universities towards examination, evaluation and grading system. While the HEIs must have the flexibility and freedom in designing the examination and evaluation methods that best fits the curriculum, syllabi and teaching-learning methods, there is a need to devise a sensible system for awarding the grades based on the performance of students.

The National Education Policy (NEP) 2020 (hereafter referred to as NEP or Policy) recognizes that higher education plays 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. It notes that “given the 21st -century requirements, quality higher education must aim to develop good, thoughtful, well-rounded, and creative individuals”. In accordance with the NEP 2020, the UGC has formulated a new student-centric “Curriculum and Credit Framework for Undergraduate Programmes (CCFUP)” incorporating a flexible choice-based credit system, multidisciplinary approach, and multiple entry and exit options. This will facilitate students to pursue their career path by choosing the subject/field of their interest. The grading system is considered to be better than the conventional marks system and hence it has been followed in the top institutions in India and abroad. So it is desirable to introduce uniform grading system. This will facilitate student mobility across institutions within and across countries and also enable potential employers to assess the performance of students. To bring in the desired uniformity, in grading system and method for computing the cumulative grade point average (CGPA) based on the performance of students in the examinations, the UGC has formulated these guidelines.

## **CHOICE BASED CREDIT SYSTEM (CBCS):**

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill-based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student’s performance in examinations, the UGC has formulated the guidelines to be followed.

## **OUTLINE OF CHOICE BASED CREDIT SYSTEM**

1. **Major Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Major Discipline specific course.
2. **Minor discipline** helps a student to gain a broader understanding beyond the major discipline.
3. **Multidisciplinary Course (MDC):** Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.
4. **Interdisciplinary Course (IDC) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).
5. **Ability Enhancement Courses (AEC):** Environmental Science, English Communication/MIL Communication are mandatory for all disciplines.
6. **Skill Enhancement Courses (SEC):** These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based instruction.
7. **Value Added Courses (SEC):** These courses may be chosen from a pool of courses designed to provide value-based education/courses/instruction.

The Proposed new courses in chemistry for undergraduate classes are reassigned in accordance to semester/CBCS/Grading system with new education policy. The new course is based on model curriculum of the university grants commission.

#### **COURSES/ACTIVITIES UNDER THE PROGRAM**

1. **Lecture courses:** Courses involving lectures relating to a field or discipline by an expert or qualified personnel in a field of learning, work/vocation, or professional practice.
2. **Tutorial courses:** Courses involving problem-solving and discussions relating to a field or discipline under the guidance of qualified personnel in a field of learning, work/vocation, or professional practice.
3. **Practicum or Laboratory work:** A course requiring students to participate in a project or practical or lab activity that applies previously learned/studied principles/theory related to the chosen field of learning, work/vocation, or professional practice under the supervision of an expert or qualified individual in the field of learning, work/vocation or professional practice
4. **Seminar:** A course requiring students to participate in structured discussion/conversation or debate focused on assigned tasks/readings, current or historical events, or shared experiences guided or led by an expert or qualified personnel in a field of learning,

work/vocation, or professional practice.

- 5. Internship:** A course requiring students to participate in a professional activity or work experience, or cooperative education activity with an entity external to the education institution, normally under the supervision of an expert of the given external entity. A key aspect of the internship is induction into actual work situations. Internships involve working with local industry, government or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in on-site experiential learning.
- 6. Studio activities:** Studio activities involve the engagement of students in creative or artistic activities. Every student is engaged in performing a creative activity to obtain a specific outcome. Studio-based activities involve visual- or aesthetic-focused experiential work.
- 7. Field practice/projects:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity.
- 8. Community engagement and service:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity. The curricular component of ‘community engagement and service’ will involve activities that would expose students to the socio-economic issues in society so that the theoretical learning’s can be supplemented by actual life experiences to generate solutions to real-life problems.

### **Objectives of Program**

1. Recognizing, identifying, and fostering the unique capabilities of each student to promote her/his holistic development.
2. To meet the growing demand of specialization and advanced courses in applied science.
3. To redesign the courses the special emphasis on local requirements, environment, to link the courses with requirements of the industries and research.
4. Flexibility for learners to move from one institution to another to enable them to have multi and/or interdisciplinary learning.
5. Flexibility to switch to alternative modes of learning (offline, ODL, and Online learning, and hybrid modes of learning)
6. To prepare students for National level entrance test like NET/SLET/JRF and other competitive exams.



**General Information and Rules for Semester I to VIII**  
**B.Sc. Honors (Chemistry) with Research or Without Research**

1. The medium of instruction will be English or/ & Gujarati, question papers will be set in English and Gujarati but answers in examinations will either in English or Gujarati.
2. Passing standard: As per the revised rules and regulations of Hemchandracharya North Gujarat University, Patan.
3. Viva voce will be part practical examination and it will be pertaining to theory as well as practicals studied during end semester examination.
3. The Certificate will be awarded in major course i.e. chemistry after completion of 01 Year with 44 credits and successful completion of 04 credit vocational course during summer vacation of first year if he/she want to exit the course.
4. The Diploma will be awarded in the in major course i.e. in chemistry after completion of 02 Years with 88 credits and successful completion of 04 credit vocational course during summer vacation of second year if he/she want to exit the course..
5. The B. Sc. degree will be awarded in the in major course i.e. in chemistry after completion of 03 Years with 132 credits.
6. The B. Sc. degree with honors with research or without research will be awarded in the in major course i.e. chemistry after completion of 04 Years with 176 credits with research or without research.
7. The college/ Department will run B. Sc. Honors course with honors or without research or both with prior permission of university.
8. Each student is required to complete all theory papers and practicals as specified in each semester. These will include Major Discipline specific course (MJDSC), Minor Discipline specific course (MIDSC), Multidisciplinary/ Inter disciplinary course (MDC/ IDC), Ability enhancement course (AEC), Value added course (VAC), skill enhancement courses (SEC) and practical's.
9. The choice for paper in Minor Discipline specific course (MIDSC), Multidisciplinary/ Inter disciplinary course (MDC/ IDC), Value added course (VAC), skill enhancement courses (SEC) is left to the student.
10. There will be weightage for continuous comprehensive evaluation (CCE) and & weightage to semester End examination (SEE) in Major Discipline specific course (MJDSC), Minor Discipline specific course (MIDSC), Multidisciplinary/ Inter disciplinary course (MDC/ IDC), Ability enhancement course (AEC), Value added course (VAC), skill enhancement courses (SEC) and practical's.

The CCE for each semester shall done as per the continuous evaluation process. For 50 marks following activities are to be performed.

**I. Activity for continuous comprehensive evaluation      Marks (out of 50)**

**(Major Theory)**

(a) Test of theory(Minimum 05)	25
(b) Assignment/ Quiz	10
(c) Group Discussion/ Seminar	05
(d) Problem solving	05
(e) Attendance	05

- |  |                   |
|--|-------------------|
| II. Activity for continuous comprehensive evaluation<br>(Minor/ Skill/Multi/ Interdisciplinary Theory) | Marks (out of 25) |
| (a) Test of theory(Minimum 03)   | 15                |
| (b) Group Discussion/ Seminar  | 05                |
| (c) Attendance   | 05                |
| III. Activity for continuous comprehensive evaluation<br>(Major Practical's)                           | Marks (out of 50) |
| (a) Internal practical exam Group A  | 15                |
| (b) Internal practical exam Group B  | 15                |
| (b) Journal/ Practical Report( Certified)  | 10                |
| (c) Viva voce  | 10                |
| IV. Activity for continuous comprehensive evaluation<br>(Minor/ Multi/ Interdisciplinary Practical's)  | Marks (out of 25) |
| (a) Internal practical exam  | 15                |
| (b) Journal/ Practical Report( Certified)  | 05                |
| (c) Viva voce  | 05                |
11. There shall be coverage of maximum 30% syllabus through online mode of teaching. As per directives of UGC.
  12. Students should be encouraged to use electronic media to complete the course.
  13. For each semester in I<sup>st</sup> year, there will be 550 marks per semester and for completion of certificate course at the time of exit, the total marks will be given out of 1200 (1100+100). The cumulative grade will be given as per university rules.
  14. **Note:** During the preparation of this curriculum, ample care is taken for consideration of the followings:
    - (a) NEP 2020
    - (b) Model curriculum of U.G.C.
    - (c) National Credit Frame work Repot of UGC, 2023
    - (d) Concept of continuous evaluation
    - (e) CGPA (Cumulative Grade Point Average Credit)
    - (f) CBCS (Choice Based Credit System)
    - (g) Semester approach
    - (h) Revised rules and regulation of Hemchandracharya North Gujarat University, Patan.
    - (i) KCG Standard Operating Procedure, August 2023
  15. For internal remuneration, four hours of Practical's should be considered equivalent to two hours of theory.
  16. Minimum 15 students should be in one batch for practical's and external/ internal exam

Semester	Type Of Course Opted	Course Name	Course Code	Credits	Examination			Total Marks
					Internal	External	Examination Hours	
<b>I</b>	<b>Major Discipline Specific course MJDC-</b>	<b>Fundamentals of Chemistry- I</b>	<b>SC23MJDCSCHE101</b>	<b>4</b>	<b>50</b>	<b>50</b>	<b>2.30</b>	<b>100</b>
	<b>Minor Discipline Specific course MIDSC</b>	<b>To be Selected – I Basic chemistry -1</b>	<b>SC23MIDSCCHE102</b>	<b>2</b>	<b>25</b>	<b>25</b>	<b>2.00</b>	<b>50</b>
	<b>Multi/Inter disciplinary Course MDC/IDC</b>	<b>To be Selected (General chemistry-I/ Agricultural chemistry)</b>	<b>SC23MDCCHE103/ SC23MDCCHE103A</b>	<b>2</b>	<b>25</b>	<b>25</b>	<b>2.00</b>	<b>50</b>
	<b>Ability Enhancement Courses AEC</b>	<b>To be Selected ( From languages)</b>	<b>SC23AECHE104</b>	<b>2</b>	<b>25</b>	<b>25</b>	<b>2.00</b>	<b>50</b>
	<b>Value Added course VAC</b>	<b>To be Selected ( pollution and environment protection law)</b>	<b>SC23VACCHE105</b>	<b>2</b>	<b>25</b>	<b>25</b>	<b>2.00</b>	<b>50</b>
	<b>Skill Enhancement Course SEC</b>	<b>To be selected SEC-I Analytical chemistry-1 or SEC-2 Soil analysis or SEC -3 Laboratory</b>	<b>SC23SECCHE106/ SC23SECCHE106A/ SC23SECCHE106B</b>	<b>2</b>	<b>25</b>	<b>25</b>	<b>2.00</b>	<b>50</b>
	<b>Practicals Major Discipline Specific course MJDC</b>	<b>PMJDC Practical -I Lab</b>	<b>SC23PMJDSCCHE101</b>	<b>4</b>	<b>50</b>	<b>50</b>	<b>8</b>	<b>100</b>
	<b>Practicals Minor Discipline Specific course MIDSC</b>	<b>PMIDC Practical-II Lab</b>	<b>SC23PMIDSCCHE102</b>	<b>2</b>	<b>25</b>	<b>25</b>	<b>4</b>	<b>50</b>
	<b>Practicals Multi/Inter Disciplinary Course MDC/IDC</b>	<b>PMDC/PIDC Practical-III Lab</b>	<b>SC23PMDCCHE103</b>	<b>2</b>	<b>25</b>	<b>25</b>	<b>4</b>	<b>50</b>
<b>Total Credits of Semester - I</b>				<b>22</b>	<b>275</b>	<b>275</b>		<b>550</b>

**A. Common Formula for Setting Question Papers for Major Discipline  
Specific course**

Time: 2.30 Hours

Total Marks: 50

Theory Examination Pattern

Que. No: 1	Write any Two out of Three Questions	Unit I	13 Marks
Que. No: 2	Write any Two out of Three Questions	Unit II	12 Marks
Que. No: 3	Write any Two out of Three Questions	Unit III	13 Marks
Que. No: 4	Write any Two out of Three Questions	Unit IV	12 Marks

**B. Common Formula for Setting Question Papers for Minor/ Multi/Inter  
disciplinary Courses**

Time: 2.00 Hours

Total Marks: 25

Theory Examination Pattern

Que. No: 1	Write any Two out of Three Questions	Unit I	08 Marks
Que. No: 2	Write any Two out of Three Questions	Unit II	08 Marks
Que. No: 3	Write any three Small relevant Questions	Unit I, II	09 Marks

**C. Common Formula for Setting Question Papers for Value added/ Skill  
Enhancement Courses**

Time: 2.00 Hours

Total Marks: 25

Theory Examination Pattern

Que. No: 1	Write any Two out of Three Questions	Unit I	08 Marks
Que. No: 2	Write any Two out of Three Questions	Unit II	08 Marks
Que. No: 3	Write any three Small relevant Questions	Unit I, II	09 Marks

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**Course Name : B. Sc. Chemistry                      Semester : I**  
**PROGRAM CODE : SCIUG102**  
**COURSE CODE : SC23MJDSCCHE101**

**Type of course : Major Discipline Specific course**

**Name of course : Fundamentals of chemistry I**

**Total Marks : 100**

**Effective from June 2023 Under NEP 2020**

Total Credits : 04	Teaching Hours per Week: 04	Theory	External 50 Marks
	Teaching Hours per Semester: 60		Internal 50 Marks

**Course Objectives:**

1. To understand the core concepts of valence bond theories.
2. To understand organic chemistry i.e. resonance, hyperconjugation, inductive effect etc. and their application.
3. To study about the chemical kinetics and types of reactions.
4. To know about the Volumetric titrations and calculations for estimation.

**Course Outcome:**

1. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries.
2. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
3. Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.
4. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
5. To know about the Volumetric titrations and calculations for estimation.



Unit	Topic	Credit	Hr
1	<p><b>CHEMICAL BONDING</b></p> <p><b>(A) Valence Bond Theory:</b> Introduction; Hitler-London theory (energy changes taking place during the formation of H<sub>2</sub> Molecule, Pauling-Slater's Theory (orbital Overlap theory of Covalent Bond).</p> <p>Types of Bond, Covalent bond, ionic bond, Coordination covalent bond Coordination bond and Vanderwaals force bond. Hybridization and types of hybridization. SP, Sp<sup>2</sup>, Sp<sup>3</sup>, dsp<sup>2</sup>, sp<sup>3</sup>d, sp<sup>3</sup>d<sup>2</sup></p> <p><b>(B) Molecular Orbital Theory:</b> Introduction. M.O. Treatment for H<sub>2</sub> molecules Bonding molecular orbitals and Anti-bonding molecular orbitals, Sigma and Pi Molecular orbitals. Formation and configuration of Molecular orbital in a Homo-nuclear diatomic species of A<sub>2</sub> type (H<sub>2</sub>; H<sub>2</sub><sup>+</sup>; N<sub>2</sub>; N<sub>2</sub><sup>+</sup>; O<sub>2</sub>; O<sub>2</sub><sup>+</sup>; O<sub>2</sub><sup>-2</sup>)</p> <p>Formation and configuration of Molecular orbital in a Hetero-nuclear diatomic species of AB type (CO; CN; CN<sup>-</sup>; NO; NO<sup>-</sup>)</p>	1	15
2	<p><b>(A) Structure And Properties</b></p> <p>Factors affecting to the properties of organic molecule: Intramolecular forces (dipole-dipole interaction, vander waals forces), Electromeric effect, Inductive effect, Resonance effect(draw resonating structures of Nitro benzene, Chlorobenzene, Phenoxide ion, Anilinium ion, Acetate ion), Hyper conjugation (O,P-directing effect of Alkyl group, Stability of Carbonium ion and Free radicals)</p> <p><b>(B) Reaction Mechanism</b></p> <p>Fission of Covalent bond (With at least one example of each intermediates ), Types of reagents.: Nucleophile, electrophile, Free Radical, Types of organic reaction with mechanism, Substitution reactions Nucleophilic &amp; Electrophilic), Elimination reactions (E1&amp; E2), Addition reactions (Nucleophilic &amp; Electrophilic)</p>	1	15
3	<p><b>Chemical Kinetics.</b></p> <p>Introduction : Rate of reaction, Order of reaction, Molecularity, Rate equation for zeroth order reaction, Rate equation for first order reaction, Characteristics of first order reaction, Rate equation for</p>	1	15

	second order reaction.(a = b) & (a≠b); Characteristics of second order reaction, Rate equation for third order reaction (a = b = c) ; Characteristics of third order reaction, Consecutive reaction, Parallel reaction, Reversible reaction, Numerical.		
4.	<b>Analytical Chemistry</b> Introduction to Analytical Chemistry : Classification of Classical and Electro analytical Techniques, Literature of Analytical Chemistry (Names of Author and Publishers for Any Ten Books, Journals and Reviews), Criterion for Selection of analytical Techniques, Define: Accuracy, Precision, Specification, Detection limit, Characterization limit, Linearity, Range, Robustness, etc. Analytical Data Treatment: Error, Types of errors, Accuracy and Precision. Statistical Terms: Mode, Average, Median, Deviation, Average Deviation, Relative Average Deviation, Standard Deviation & Coefficient of variance. Q-Test for the rejection of result and related numerical, Significant figures, 2.5 d and 4.0 d rules.	1	15

### Books Recommended:

#### Inorganic Chemistry

1. Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coiling Educational. 1983.
2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3<sup>rd</sup> edn, ELPS Oxford University Press, 1999..
3. 'Concise Inorganic Chemistry' J.D.Lee. 5th edn.
4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rd edn, Oxferd. 1999.
5. 'Concise Inorganic Chemistry' J.D.Lee, 4th edn, Champman and hall ELBS, 1991.
6. 'Inorganic Chemistry' by A.G.Sharp, 3rd edn, ELBS, Longman, 1990.

#### Organic Chemistry

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age international Publishers.
2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.
3. Organic Chemistry Vol. I&II. S.M.Muklierji, S.P.Singh. R.P.Kapoor.
4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rd edn. Macmillan.

**Physical Chemistry**

1. Advance Physical Chemistry by Gurdeep raj.
2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli..S.Chand.
3. Principal of Physical Chemistry by Puri Sharma, Pathania.  
Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.

**Analytical Chemistry**

1. Fundamentals of Analytical Chemistry by Skoos& West.
2. Analytical Chemistry, Garry D.Christain.
3. Analytical Chemistry, Day & Underwood.
4. Analytical Chemistry by Lerry&Hergins.
5. Qualitative Analysis by A.I.Vogel, 5<sup>th</sup> edn.

**Further Reading:**

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal  
4<sup>th</sup> edn, Himalaya Publication House.
2. Text book of Organic Chemistry, ArunBahal, S.Chand.
3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.
4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.
5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.
6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.
7. Physical Chemistry by P.W.Atkins. 5<sup>th</sup> edn.Oxferd 1994 7thedn-2002.
8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.
9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.
10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

Program Name : **B. Sc. ChemPMJDSCistry** Semester : **I**  
**PROGRAM CODE : SCIUG102**  
**COURSE CODE : SC23PMJDSCCHE101**

**Type of Course : Practicals Major Discipline Specific Course PMJDSC**

**Name of Course : Practical's for Fundamentals of chemistry I**

**Total Marks : 100**

**Effective from June 2023 Under NEP 2020**

**GROUP A**

Total Credits : 02	Teaching Hours per Week: 04	Practicals	External 25 Marks
Lab Teaching Hours per semester:60			Internal 25 Marks
Minimum Number Practicals to be Performed: 12			

**GROUP B**

Total Credits : 02	Teaching Hours per Week: 04	Practicals	External 25 Marks
Lab Teaching Hours per semester:60			Internal 25 Marks
Minimum Number Practicals to be Performed: 08			

**Course Objectives:**

1. To identify the organic components.
2. Preparation of solutions and their standardization.

**Course Outcomes:**

1. Students will gain a comprehensive knowledge and skills in standardization and preparation of solutions for carrying out reactions.
2. To understand basic methods to identify the compounds on the basis of M. Pt or b. Pt.

Sr.No.	List of Practicals	Credit	Hr
<b>GROUP A</b>	<b>Organic Chemistry (Any twelve)</b> 1) Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point. Preparation of suitable derivative. 2) Candidate should perform the analysis of at least 06 compounds. List of compounds <b>Acids:</b> Benzoic acid. Cinnainic acid, Phthalic acid.Oxalic	2	60

	<p>acid.Succinic acid.</p> <p><b>Phenols:</b> <math>\alpha</math>-Naphthol. <math>\beta</math>-Naphthol.</p> <p><b>Bases:</b> <i>p</i>-Toludine, Diphenylamine. Aniline.Methyl aniline.</p> <p><b>Neutrals:</b> Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, <i>m</i>-Dinitrobenzene, Urea, Thiourea, Toluene. Acetone, Benzaldehyde, Methy acetate, Ethyl acetate.Ethanol, 1-Propanol, Glycerol, Chloroform.Carbon tetrachloride, Chlorobenzene, Nitrobenzene.</p>		
<b>GROUP B</b>	<p><b>Standardization (Any Eight)</b></p> <ol style="list-style-type: none"> <li>1. Identify laboratory glassware and equipments.</li> <li>2. Calibration of burette, Pipette and measuring flasks.</li> <li>3. Preparation of standard stock solution of HCl by v/v method and their different dilutions.</li> <li>4. Preparation of standard solution of succinic acid and standardization of NaOH</li> <li>5. Preparation of standard solution of oxalic acid and standardization of KOH</li> <li>6. Preparation of standard solution of <math>\text{Na}_2\text{S}_2\text{O}_3</math> and standardization of <math>\text{I}_2</math> solution.</li> <li>7. Preparation of standard solution of EDTA and estimation of <math>\text{Ca}^{+2}</math> in <math>\text{CaCl}_2</math> solution.</li> <li>8. Preparation of standard solution of EDTA and estimation of <math>\text{Mg}^{+2}</math> in <math>\text{MgCl}_2</math> solution.</li> <li>9. Preparation of standard solution of Oxalic acid and standardization of <math>\text{KMnO}_4</math> solution.</li> <li>10. Preparation of standard solution of <math>\text{K}_2\text{Cr}_2\text{O}_7</math> and standardization of <math>\text{FeSO}_4</math> solution.</li> <li>11. Preparation of standard stock (i.e. 0.1 N NaOH solutions by w / v method and their different dilutions.</li> </ol>	2	60
<p><b>Books Recommended:</b></p> <p>1.Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By</p>			

Pandey O.P. & et Al. publisher S. Chand's, Paperback December 2010.

2. Basic Principles of Practical Chemistry,

by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr. Subhojit Ghosh (Author), Dr. Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

**Further Reading:**

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisher Mc Graw Hill, 1st Edition Paperback – 16 September 2020.

2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.



**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

Course Name : **B. Sc. Chemistry** Semester : **I**  
**PROGRAM CODE : SCIUG102**  
**COURSE CODE : SC23MIDSCCHE102**

**Type of course : Minor Elective course MIDSC**

**Name of course : Fundamentals of chemistry I**

**Total Marks : 50**

**Effective from June 2023 Under NEP 2020**

Total Credits : 02	Teaching Hours per Week: 02	Theory	External 25 Marks
	Teaching Hours per Semester: 30		Internal 25 Marks

**Course Objectives:**

1. To understand the core concepts of valence bond theories.
2. To understand organic chemistry i.e. resonance, hyperconjugation, inductive effect etc. and their application.

**Course Outcome:**

1. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries.
2. Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.
3. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

Unit	Topic	Credit	Hr
1	<b>CHEMICAL BONDING</b> <b>(A) Valence Bond Theory:</b> Introduction; Hitler-London theory (energy changes taking place during the formation of H <sub>2</sub> Molecule, Pauling-Slater's Theory (orbital Overlap theory of Covalent Bond). Types of Bond, Covalent bond, ionic bond, Coordination covalent bond Coordination bond and Vanderwaals force bond. Hybridization and	1	15

	<p>types of hybridization. <math>sp</math>, <math>sp^2</math>, <math>sp^3</math>, <math>dsp^2</math>, <math>sp^3d</math>, <math>sp^3d^2</math></p> <p><b>(B) Molecular Orbital Theory:</b> Introduction. M.O. Treatment for <math>H_2</math> molecules Bonding molecular orbitals and Anti-bonding molecular orbitals, Sigma and Pi Molecular orbitals. Formation and configuration of Molecular orbital in a Homo-nuclear diatomic species of <math>A_2</math> type (<math>H_2</math>; <math>H_2^+</math>; <math>N_2</math>; <math>N_2^+</math>; <math>O_2</math>; <math>O_2^+</math>; <math>O_2^{2-}</math>)</p> <p>Formation and configuration of Molecular orbital in a Hetero-nuclear diatomic species of AB type (CO; CN; <math>CN^-</math>; NO; <math>NO^-</math>)</p>		
2	<p><b>(A) Structure And Properties</b></p> <p>Factors affecting to the properties of organic molecule: Intramolecular forces (dipole-dipole interaction, vander waals forces), Electromeric effect, Inductive effect, Resonance effect(draw resonating structures of Nitro benzene, Chlorobenzene, Phenoxide ion, Anilinium ion, Acetate ion), Hyper conjugation ( O,P-directing effect of Alkyl group, Stability of Carbonium ion and Free radicals)</p> <p><b>(B) Reaction Mechanism</b></p> <p>Fission of Covalent bond (With at least one example of each intermediates ), Types of reagents.: Nucleophile, electrophile, Free Radical, Types of organic reaction with mechanism, Substitution reactions Nucleophilic &amp; Electrophilic), Elimination reactions (E1&amp; E2), Addition reactions (Nucleophilic &amp; Electrophilic)</p>	1	15
<p><b>Books Recommended:</b></p> <p><b>Inorganic Chemistry</b></p> <ol style="list-style-type: none"> <li>1.Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.</li> <li>2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3<sup>rd</sup> edn, ELPS Oxford University Press, 1999..</li> <li>3. 'Concise Inorganic Chemistry' J.D.Lee. 5th edn.</li> <li>4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rd edn, Oxferd. 1999.</li> <li>5. 'Concise Inorganic Chemistry' J.D.Lee, 4th edn, Champman and hall ELBS,1991.</li> <li>6. 'Inorganic Chemistry' by A.G.Sharp, 3rd edn, ELBS, Longman, 1990.</li> </ol> <p><b>Organic Chemistry</b></p> <ol style="list-style-type: none"> <li>1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.</li> </ol>			

2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.
3. Organic Chemistry Vol. I&II.S.M.Mukherji, S.P.Singh.R.P.Kapoor.
4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rd edn. Macmillan.

**Further Reading:**

1. Reaction Mechanism and Reagents in Organic Chemistry, Gurdeep R. Chatwal 4th edn, Himalaya Publication House.
2. Text book of Organic Chemistry, Arun Bahal, S. Chand.
3. Organic Chemistry, R. Morrison and R. Boyd, 6th edn, Pearson Education 2003.
4. Organic Chemistry. T.W. Graham Solomons, 4th edn. John Wiley. 1998.
5. Nuclear Chemistry by C.V. Shekhar, Dominant-Publisher. New Delhi.
6. Essentials of physical Chemistry by B.S. Bahal, Arun Bahal. G. D. Tuli.
7. Physical Chemistry by P.W. Atkins. 5<sup>th</sup> edn. Oxford 1994 7th edn-2002.

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

Program Name : **B. Sc. Chemistry** Semester : **I**  
**PROGRAM CODE : SCIUG102**  
**COURSE CODE : SC23PMIDSCCHE102**

**Type of Course : Practicals Minor (Elective) Discipline Specific Course PMIDSC**

**Name of Course : Practical's for Fundamentals of chemistry I**

**Total Marks : 50**

**Effective from June 2023 Under NEP 2020**

Total Credits : 02    Teaching Hours per Week: 04 Lab Teaching Hours per semester: 60 Minimum Number Practicals to be Performed: 10	Practicals	External 25 Marks
		Internal 25 Marks

**Course Objectives:**

1. To identify the organic components.
2. Preparation of solutions and their standardization.

**Course Outcomes:**

1. Students will gain a comprehensive knowledge and skills in standardization and preparation of solutions for carrying out reactions.
2. To understand basic methods to identify the compounds on the basis of M. Pt or b. Pt.

Sr.No.	List of Practicals	Credit	Hr
1	<b>Organic Chemistry (Any six)</b>  1) Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point. Preparation of suitable derivative.  2) Candidate should perform the analysis of at least 06 compounds. List of compounds <b>Acids:</b> Benzoic acid. Cinnamic acid, Phthalic acid. Oxalic acid. Succinic acid. <b>Phenols:</b> $\alpha$ -Naphthol. $\beta$ -Naphthol. <b>Bases:</b> <i>p</i> -Toluidine, Diphenylamine. Aniline. Methyl aniline. <b>Neutrals:</b> Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, <i>m</i> -Dinitrobenzene, Urea, Thiourea, Toluene. Acetone,	1	30

	Benzaldehyde, Methyl acetate, Ethyl acetate, Ethanol, 1-Propanol, Glycerol, Chloroform, Carbon tetrachloride, Chlorobenzene, Nitrobenzene.		
2	<b>Standardization : (Any Four)</b> 1. Preparation of standard solution of succinic acid and standardization of NaOH / KOH 2. Preparation of standard solution of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> and standardization of I <sub>2</sub> solution. 3. Preparation of standard solution of EDTA and estimation of Ca <sup>+2</sup> / Mg <sup>+2</sup> in CaCl <sub>2</sub> / MgCl <sub>2</sub> solution. 4. Preparation of standard solution of Oxalic acid and standardization of KMnO <sub>4</sub> solution. 5. Preparation of standard solution of K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> and standardization of FeSO <sub>4</sub> solution. 6. Preparation of standard stock (i.e. 0.1 N NaOH solution by w / v method and their different dilutions. 7. Preparation of standard stock solution of HCl by v/v method and their different dilutions.	1	30

**Books Recommended:**

1. Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By Pandey O.P. & et Al. publisher S. Chand's, Paperback December 2010.

2. Basic Principles of Practical Chemistry, by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons. By Dr. Subhojit Ghosh (Author), Dr. Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

**Further Reading:**

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisher Mc Graw Hill, 1st Edition Paperback – 16 September 2020.

2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

Course Name : **B. Sc. Chemistry** Semester : **I**  
**PROGRAM CODE : SCIUG102**  
**COURSE CODE : SC23MDCCHE103**

**Type of course : Multidisciplinary Course MDC**

**Name of course : General chemistry I**

**Total Marks : 50**

**Effective from June 2023 Under NEP 2020**

Total Credits : 02	Teaching Hours per Week: 02	Theory	External 25 Marks
	Teaching Hours per semester: 30		Internal 25 Marks

**Course Objectives:**

1. To study about the Chemical kinetics and types of reactions.
2. To know about the Volumetric titrations and calculations for estimation.

**Course Outcomes:**

1. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
2. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
3. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.
4. Students will be able to function as a member of an interdisciplinary problem solving team.

Unit	Topic	Credit	Hr
1	<b>Chemical Kinetics.</b> Introduction : Rate of reaction, Order of reaction, Molecularity, Rate equation for zeroth order reaction, Rate equation for first order	1	15



	reaction, Characteristics of first order reaction, Rate equation for second order reaction.(a = b) & (a≠b); Characteristics of second order reaction, Rate equation for third order reaction (a = b = c) ; Characteristics of third order reaction, Consecutive reaction, Parallel reaction, Reversible reaction, Numerical.		
2	<b>Analytical Chemistry</b> Introduction to Analytical Chemistry : Classification of Classical and Electro analytical Techniques, Literature of Analytical Chemistry (Names of Author and Publishers for Any Ten Books, Journals and Reviews), Criterion for Selection of analytical Techniques, Define: Accuracy, Precision, Specification, Detection limit, Characterization limit, Linearity, Range, Robustness, etc.Analytical Data Treatment: Error, Types of errors, Accuracy and Precision. Statistical Terms: Mode, Average, Median, Deviation, Average Deviation, Relative Average Deviation, Standard Deviation & Coefficient of variance. Q-Test for the rejection of result and related numerical, Significant figures, 2.5 d and 4.0 d rules.	1	15
<b>Books Recommended:</b>  <b>Physical Chemistry</b> 1. Advance Physical Chemistry by Gurdeep raj. 2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli..S.Chand. 3. Principal of Physical Chemistry by Puri Sharma, Pathania. Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.  <b>Analytical Chemistry</b> 1. Fundamentals of Analytical Chemistry by Skoos& West. 2. Analytical Chemistry, Garry D.Christain. 3. Analytical Chemistry, Day & Underwood. 4. Analytical Chemistry by Lerry&Hergins. 5. Qualitative Analysis by A.I.Vogel, 5thedn.  <b>Further Reading:</b> 1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4thedn, Himalaya Publication House. 2. Text book of Organic Chemistry, ArunBahal, S.Chand.			

3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.
4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.
5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.
6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.
7. Physical Chemistry by P.W.Atkins. 5<sup>th</sup> edn.Oxferd 1994 7thedn-2002.
8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.
9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.
10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

Program Name : **B. Sc. Chemistry** Semester : **I**  
**PROGRAM CODE : SCIUG102**  
**COURSE CODE : SC23PMDCCHE103**

**Type of course : Practicals Multi Disciplinary Course PMDC**

**Name of course : Practical's for General chemistry I**

**Total Marks :50**

**Effective from June 2023 Under NEP 2020**

Total Credits : 02	Teaching Hours per Week: 04	Practicals	External 25 Marks
	Lab Teaching Hours per semester: 60		Internal 25 Marks
Minimum Number Practicals to be Performed: 10			

**Course Objectives:**

1. To identify the organic components.
2. Preparation of solutions and their standardization.

**Course Outcomes:**

1. Students will gain a comprehensive knowledge and skills in standardization and preparation of solutions for carrying out reactions.
2. To understand basic methods to identify the compounds on the basis of M. Pt or b. Pt.

Sr.No.	List of Practicals	Credit	Hr
1	<b>Organic Chemistry (Any six)</b>  1) Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point. Preparation of suitable derivative.  2) Candidate should perform the analysis of at least 06 compounds. List of compounds <b>Acids:</b> Benzoic acid. Cinnamic acid, Phthalic acid. Oxalic acid. Succinic acid. <b>Phenols:</b> $\alpha$ -Naphthol. $\beta$ -Naphthol. <b>Bases:</b> <i>p</i> -Toluidine, Diphenylamine. Aniline. Methyl aniline. <b>Neutrals:</b> Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, <i>m</i> -Dinitrobenzene, Urea, Thiourea, Toluene. Acetone,	1	30

	Benzaldehyde, Methyl acetate, Ethyl acetate, Ethanol, 1-Propanol, Glycerol, Chloroform, Carbon tetrachloride, Chlorobenzene, Nitrobenzene.		
2	<b>Standardization (Any Four)</b> <ol style="list-style-type: none"> <li>1) Preparation of standard solution of succinic acid and standardization of NaOH / KOH</li> <li>2) Preparation of standard solution of <math>\text{Na}_2\text{S}_2\text{O}_3</math> and standardization of <math>\text{I}_2</math> solution.</li> <li>3) Preparation of standard solution of EDTA and estimation of <math>\text{Ca}^{+2}</math> / <math>\text{Mg}^{+2}</math> in <math>\text{CaCl}_2</math> / <math>\text{MgCl}_2</math> solution.</li> <li>4) Preparation of standard solution of Oxalic acid and standardization of <math>\text{KMnO}_4</math> solution.</li> <li>5) Preparation of standard solution of <math>\text{K}_2\text{Cr}_2\text{O}_7</math> and standardization of <math>\text{FeSO}_4</math> solution.</li> <li>6) Preparation of standard stock (i.e. 0.1 N NaOH solution by w / v method and their different dilutions.</li> <li>7) Preparation of standard stock solution of HCl by v/v method and their different dilutions.</li> </ol>	1	30
<b>Books Recommended:</b> <p>1. Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By Pandey O.P. &amp; et Al. publisher S. Chand's, Paperback December 2010.</p> <p>2. Basic Principles of Practical Chemistry, by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012</p> <p>3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons. By Dr. Subhojit Ghosh (Author), Dr. Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.</p> <b>Further Reading:</b> <p>1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisher Mc Graw Hill, 1st Edition Paperback – 16 September 2020.</p> <p>2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal &amp; Company, 2020.</p>			

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

Course Name : **B. Sc. Chemistry**      Semester : **I**  
**PROGRAM CODE : SCIUG102**  
**COURSE CODE : SC23MDCCHE103A**

**Type of course : Multi Disciplinary Course MDC**

**Name of course : Agricultural Chemistry**

**Total Marks : 50**

**Effective from June 2023 Under NEP 2020**

Total Credits : 02	Teaching Hours per Week: 02	Theory	External 25 Marks
	Teaching Hours per semester: 30		Internal 25 Marks

**Course Objectives:**

1. To know about types of fertilizers
2. Major industrial suppliers of fertilizers
3. Need and importance of organic farming
4. To have Knowledge about Dry land agricultural farming.

**Course Outcome:**

1. Students will have a firm foundation in the fundamentals and application of current fertilizers.
2. Students will know about organic farming and its importance.
3. Status of dry land farming in India and its solution.

Unit	Topic	Credit	Hr
1	<b>Organic Farming</b> Introduction & history of organic farming, objective of organic farming, principle of organic farming, types of organic farming, techniques of organic farming, method of organic farming, difference between organic and Nonorganic farming, importance of organic farming, pros of organic farming, cons of organic farming, growth of organic farming, government initiative for organic farming, benefit: economical.	1	15

	Plant Nutrients, Major Nutrients, Minor Nutrients, Trace Nutrients		
2	<p><b>Reinforced &amp; Dry land Agriculture:</b></p> <p>Introduction &amp; history of Reinforced &amp; Dry land Agriculture, Problem &amp; prospects of rainfed and Dry land Agriculture in India, Soil and climatic conditions prevalent in dry land areas.</p> <p>Definition of Fertilizer, Classification of Fertilizer, Nano fertilizer, Super Phosphate, Tripal Super Phosphate. Mix Fertilizer.</p> <p>Droughts: Types, effect of water deficient on physio-morphological characteristics of plant. Crops management practices in dry land areas, Contingent crop planning for aberrant weather</p>	1	15
<p><b>Books Recommended:</b></p> <ol style="list-style-type: none"> <li>1. Principle of Organic farming: S R Ready, As per ICAR Syllabus</li> <li>2. Prakrutik Kheti (Gujarati Version) June 2020 By Shree Acharya Devrat, Dr. A. R. Pathak</li> </ol> <p><b>Further Reading:</b></p> <ol style="list-style-type: none"> <li>1. Industrial Chemistry by B. K. Sharma, Pragati Prakashan, New Delhi.</li> </ol>			



**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

Program Name : **B. Sc. Chemistry** Semester : **I**  
**PROGRAM CODE : SCIUG102**  
**COURSE CODE : SC23PMDCCHE103A**

**Type of course : Practicals Multi disciplinary Course PMDC**

**Name of course: Practical's for Agricultural chemistry**

**Total Marks : 50**

**Effective from June 2023 Under NEP 2020**

Total Credits : 02	Teaching Hours per Week: 04	Practicals	External 25 Marks
	Lab Teaching Hours per semester:60		Internal 25 Marks
Minimum Number Practicals to be Performed: 10			

**Course Objectives:**

1. To understand soil taxonomy.
2. To know about metrological properties of soil.
3. To provide information about essential elements in soil.
4. To understand about nanofertilizers.

**Course Outcome:**

1. Students will understand about quality of soil in our locality.
2. To know about preparation of organic fertilizers.
3. Interpretation of satellite data.

Sr.	List of Practicals	Credit	Hr
1	<b>(Any six)</b>  1. Classification of soils using soil taxonomy. 2. Identification and quantification of minerals in soil fractions 3. Analysis of plants for essential elements 4. Chemical analysis of soil for total and available nutrients. 5. Identification of fertilizers and nanofertilizers 6. Nutrient contents in nitrogenous, phosphatic and potassic fertilizers	1	15

	7. Decomposition of organic matter in soil		
2	<p><b>(Any Four)</b></p> <p>8. Aerial photo and satellite data interpretation for soil and land.</p> <p>9. Morphological properties of soil profile in different landforms</p> <p>10. Grouping soils using available data base in terms of soil quality.</p> <p>11. Field Project - Preparation of Organic farming fertilizers</p> <p>12. Field Project - Applying and studying Organic Farming fertilizers.</p>	1	15
<p><b>Books Recommended:</b></p> <ol style="list-style-type: none"> <li>1. Indian Society of Soil Science. 2002.</li> <li>2. Fundamentals of Soil Science. ISSS, New Delhi Kirkham, D. and Powers, W. L. 1972.</li> <li>3. Lal, R. and Shukla, M. K. 2004. Principles of Soil Physics. Marcel Dekker</li> </ol> <p><b>Further Reading:</b></p> <ol style="list-style-type: none"> <li>4. Brady N. C. and Weil R. R. 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.</li> <li>5. Principles Plant Nutrition. International Potash Institute, Switzerland.</li> </ol>			

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

Program Name : **B. Sc. Chemistry** Semester : **I**

**PROGRAM CODE : SCIUG102**

**COURSE CODE : SC23VACCHE105**

**Type of course : Value Added Course VAC**

**Name of course : Pollution laws and Environment Protection**

**Total Marks : 50**

**Effective from June 2023 Under NEP 2020**

Total Credits : 02	Teaching Hours per Week: 02	Theory	External 25 Marks
	Teaching Hours per semester:30		Internal 25 Marks

**Course Objectives:**

1. To provide for prevention, control, and abatement of air pollution. To provide for the establishment of the boards at the central and state levels to implement the act.
2. To preserve and protect the nature's gifts from pollution.
3. To protect the man's fundamental rights of freedom
4. To enforce laws regarding the protection of environment in the regions.

**Course Outcome:**

1. Students will understand that Equality and adequate conditions of life in an environment of quality that permits a life of dignity and wellbeing
2. To take strict actions against those who harm the environment
3. To safe guard better environment and better environment conditions..

Unit	Topic	Credit	Hr
1	<b>Introduction:</b> Environmental pollution, Types of pollution, Environment legislation, climate change in India ,Need for environment legislation, Purpose of environment legislation, Laws related to environment in India, Environment policies in India.	1	15
2	<b>Regulations:</b> The Noise Pollution (Regulation and Control)	1	15

	<p>(Amendment) Rules, 2010, The Air (prevention and control of pollution) Act, 1981, The National Environment Appellate Authority Act, 1997, The Environment (Siting for Industrial Projects) Rules, 1999, The Ozone-Depleting Substances (Regulation And Control) Rules, 2000.</p> <p>Landmark cases on environment legislation in India</p> <ol style="list-style-type: none"> <li>1. J.C. Galstaun v. DuniaLal Seal (1905)</li> <li>2. M.C. Mehta &amp; Another vs. Union of India &amp; Others</li> <li>3. Subhash Kumar v. State of Bihar (1991)</li> <li>4. A global perspective on environment laws United Nations Conference on the Human Environment, Stockholm, 1972.</li> </ol>		
<p><b>Books Recommended:</b></p> <ol style="list-style-type: none"> <li>1. Pollution Control Acts, Rules &amp; Notifications Issued thereunder, Central Pollution Control Board (Ministry Of Environment, Forest &amp; Climate Change, Government Of India) Parivesh Bhawan, East Arjun Nagar, Delhi – 110032 Website: <a href="http://Www.Cpcb.Nic.In">Http://Www.Cpcb.Nic.In</a> April, 2021.</li> <li>2. Environmental Law In India, By P Leelakrishnan, 6th Edition 2021 By P Leelakrishnan, Publisher: Lexis Nexis.</li> <li>3. Environmental Law and Policy in India, Shyam Diwan &amp; Armin Rosencranz, Oxford University Press.</li> </ol> <p><b>Further Reading:</b></p> <ol style="list-style-type: none"> <li>1. Pollution Control Acts, Rules &amp; Notifications Issued thereunder, Central Pollution Control Board (Ministry Of Environment, Forest &amp; Climate Change, Government Of India) Parivesh Bhawan, East Arjun Nagar, Delhi – 110032 Website: <a href="http://Www.Cpcb.Nic.In">Http://Www.Cpcb.Nic.In</a> April, 2021.</li> <li>2. Environmental Law and Policy in India, Shyam Diwan &amp; Armin Rosencranz, Oxford University Press.</li> </ol>			

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

Program Name : **B. Sc. Chemistry** Semester : **I**  
**PROGRAM CODE : SCIUG102**  
**COURSE CODE : SC23SECCE106**

**Type of course : Skill Enhancement course SEC**

**Name of course : Analytical Chemistry-I**

**Total Marks : 50**

**Effective from June 2023 Under NEP 2020**

Total Credits : 02	Teaching Hours per Week: 02	Theory	External 25 Marks
	Teaching hours per semester: 30		Internal 25 Marks

**Course Objectives:**

1. To understand importance of taking precautions in Chemical laboratory
2. To have knowledge of lab apparatus
3. To know about primary and secondary laboratory reagents .

**Course Outcome:**

1. Students will gain a comprehensive knowledge and skills in assessing laboratory reagents.
2. To understand the importance glass wares in chemical laboratories and in performing experiments.
3. Students will learn how to prepare chemical solutions needed in chemical laboratories.

Unit	Topic	Credit	Hr
1	<b>Lab Apparatus</b>  (A) Glass apparatus Beaker, test tube, boiling tube, conical flask, filtration flask, round bottom flask, flat bottom flask, funnel, separating funnel, watch glass, measuring cylinder, petridish, desiccator, measuring cylinder, glass rod, glass tube.  (B) Volumetric and Heating apparatus Volumetric apparatus: Volumetric flask, burette, pipette, analytical balance, electronic balance. Heating apparatus: Bunsen burner, water bath, sand bath, hot air oven, heating mantle	1	15

	(C) Miscellaneous Apparatus Buchner funnel, burner, test tube stand, tong, burette stand, clamp, china dish, wire gauze, cork, vacuum pumps, crucibles, clay pipe triangle, pestle and mortar, spatulas, thermometer, pH meter, Kipp's apparatus		
2	<b>Laboratory Reagents And Solvents Reagents</b> Classification of reagents according to their action; (i) acids (ii) bases (iii) salts (iv) complexing agents (v) oxidizing and reducing agents (vi) precipitating agents (vii) chelating agents. Each type to be explained with at least one suitable example. Primary and secondary standards: Definition, characteristics, uses examples for different types of reactions. Solvents: Solute, Solvent & Solution, classification of solvents (i) Protic and aprotic (ii) Acidic, basic amphiprotic and neutral (iii) Aqueous and non-aqueous (iv) Polar and nonpolar. Each type is to be explained with at least one example.	1	15

**Books Recommended:**

1. Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by GH Jeffery and others) 5<sup>th</sup> Ed. The English Language Book Society of Longman
2. Willard, Hobert H. et. al: Instrumental Methods of Analysis, 7<sup>th</sup> Ed. Wardsworth Publishing Company, Belmont, California, USA, 1988.
3. Christian, Gary D; Analytical Chemistry, 6<sup>th</sup> Ed. New York- John Willy, 2004.
4. Harris, Daniel C, Quantitative Chemical Analysis, 3<sup>rd</sup> Edition, W.H. Freeman and Company, New York, 2001.
5. Khopkar, S.M. Basic Concepts of Analytical Chemistry New Age, International Publisher, 2009.
6. Koogs, West and Holler, Fundamentals of Analytical Chemistry, 6<sup>th</sup> Edition, Saunders College Publishing, New York. 1991.

**Further Reading:**

**Suggestive Digital Platforms Web Links:**

1. <http://chemcollective.org/vlabs>
2. <https://www.vlab.co.in/broad-area-chemical-sciences>
3. <https://wp.labster.com/chemistry-virtual-labs/>
4. [https://www.youtube.com/watch?v=O\\_nyEj\\_hZzg](https://www.youtube.com/watch?v=O_nyEj_hZzg)

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

Program Name : **B. Sc. Chemistry** Semester : **I**

**PROGRAM CODE : SCIUG102**

**COURSE CODE : SC23SECCHE106A**

**Type of course : Skill Enhancement Course SEC**

**Name of course : Chemical Laboratory Management**

**Total Marks : 50**

**Effective from June 2023 Under NEP 2020**

Total Credits : 02	Teaching Hours per Week: 02	Theory	External 25 Marks
	Teaching Hours per semester: 30		Internal 25 Marks

**Course Objectives:**

1. To understand and appreciate role of laboratory assistants chemicals laboratories at school, college and university level.
2. Handling of chemicals in safer ways.
3. To manage chemicals and assist students in learning of chemical experiments.

**Course Outcome:**

1. Students will gain a comprehensive knowledge and skills in prepare solutions in the laboratory.
2. This course will prepare students for entry-level roles in the industry.
3. A proper chemical lab management will help in safety of chemical sciences department and success to reach different applications

Unit	Topic	Credit	Hr
1	<b>Laboratory assistant –</b> Duties and Qualifications of laboratory assistant, Lab Assistant job title, Tasks and duties, different type of lab duties, Essential skills in laboratory assistant, Role and responsibilities, Duties of lab assistant in school, college and University Understanding safety rules, Maintaining record of students usage of chemicals and glasswares, use greener ways and reduce waste in labs. Design Experimental Products for Degradation after Use. Labelling of chemicals, classification of	1	15



	chemical mixtures.		
2	<p><b>Fundamentals of laboratory management,</b></p> <p>Types of laboratory management, Importance of quality of laboratory management, Management of chemicals-Acquisition of chemicals, Receiving the chemicals, Inventory and tracking of chemicals, Chemical segregation, storage limitations, Guidance on Safe Storage of Chemicals in Laboratories: Principles of Safe Storage, checking Quality of chemicals .</p> <p><b>Laboratory safety manual:</b> chemical management questions, Laboratory information system, Lab Collector LIMS,</p>	1	15
<p><b>Books Recommended:</b></p> <ol style="list-style-type: none"> <li>1. Prudent Practices in the Laboratory, Handling and Management of Chemical Hazards, National research Council, committee on Prudent Practices in laboratory, National Academic Press, 2011.</li> <li>2. Laboratory Quality/Management by Parson Kenneth N, Publisher Xilbris, Atlantic publishers Hardcover, 2006.</li> <li>3. Safe Storage of Laboratory Chemicals, Hardcover 2nd edition, Printed May 1991 by Wiley-Inter science.</li> </ol> <p><b>Further Reading:</b></p> <ol style="list-style-type: none"> <li>1. Laboratory Work in Chemistry by Keiser Edward H., Publisher: Forgotten Books</li> <li>2. Laboratory Management System - General Requirements by Kumar Pawan Bharati) Publisher: Discovery Publishing House Pvt Ltd, 2020.</li> </ol>			

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

Program Name : **B. Sc. Chemistry** Semester : **I**

**PROGRAM CODE : SCIUG102**

**COURSE CODE : SC23SECCE106B**

**Type of course : Skill Enhancement Course SEC**

**Name of course: Soil Testing and Analysis**

**Total Marks : 50**

**Effective from June 2023 Under NEP 2020**

Total Credits : 02    Teaching Hours per Week: 02 Teaching Hours per semester: 30	Theory	External 25 Marks
		Internal 25 Marks

**Course Objectives:**

1. To estimate the physical properties and available nutrient status (macro, secondary and micro-nutrients) of soils.
2. Evaluation of fertility status of soil
3. To provide soil test based recommendations to farmers for improving soil fertility and economic return to farmers.

**Course Outcome:**

1. Students will gain a comprehensive knowledge and skills in assessing land suitability for various agricultural and non-agricultural uses.
2. Explores the problems and potentials of soil and decide the most appropriate land use.
3. Soil analysis is a valuable tool for your farm as it determines the inputs required for efficient and economic production.
4. A proper soil test will help ensure the application of enough fertilizer to meet the requirements of the crop while taking advantage of the nutrients already present in the soil.

Unit	Topic	Credit	Hr
1	<b>Introduction:</b> Definition of Soil, Formation of Soil, Types of Soils & Basic Concepts. Soil Components: Air, Water, inorganic and organic solids,	1	15

	<p><b>Properties of Soil:</b> A) Physical Properties :- Soil Separates, Texture, Aggregation and Structure, Temperature, Colour, Properties of Soil Mixture, Pore Space, Bulk Density, Particle Density, Aeration and Drainage, Compaction, Surface area, Soil water relationships. B) Chemical Properties :- Morphology of Colloids, Chemistry of Clays, Ionic Exchange, Acidity, Alkalinity, pH, Salinity, Reactions in Liming and Acidification. C) Biological Properties :- Soil Organic Matter, C: N Relationships, N-Transformation, Soil Organisms, Sulfur Transformation.</p>		
2	<p><b>Sample Collection and Processing:</b> Purpose of Soil testing and analysis, selection of field, Method of Soil Sample collection Methods of soil sample processing, precautions during soil collection &amp; processing, Preservation labeling and Storage of soil samples, various types of tools used for collection.</p> <p><b>Study of Instruments:</b> PH Meter, Conductivity meter, spectrometer, UV-Spectrophotometer, use of soil testing kit and mobile soil testing van. Kjeldahl's Assembly for determination of nitrogen.</p> <p><b>Soil Test Report &amp; Fertilizer Recommendation:</b> Preparation of Soil analysis and test report, Fertilizer recommendation, preparation of soil test summaries and fertility maps.</p>	1	15
<p><b>Books Recommended :</b></p> <ol style="list-style-type: none"> <li>1. Soils and soil fertility, Troch, F.R. And Thompson, L.M. Oxford Press.</li> <li>2. Fundamentals of soil science, Foth, H.D. Wiley Books.</li> <li>3. Soil Science and Management, Plaster, Edward J., Delmar Publishers.</li> <li>4. Principles of Soil Chemistry (2nd Ed.) Marcel Dekker Inc., New York.</li> </ol> <p><b>Further Reading:</b></p> <ol style="list-style-type: none"> <li>5. Handbook of Agricultural Sciences, S.S.Singh, P.Gupta, A.K.Gupta, Kalyani Publication.</li> <li>6. Soil Sampling, Preparation and analysis, Marcel Dekker, Inc, New York.</li> <li>7. Soil Sampling and methods of analysis, Carter M.R. and E.G.Gregorich, 2007, 2nd Ed..</li> <li>8. Methods of soil analysis, Part, American society of Agronomy Inc., Keute, A.Et.al., 1986.</li> </ol>			

# HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC "A" (3.02) State University

PATAN - 384 265



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## 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)

**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**

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# 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.

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*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 (MJDSC) (credits: 4+4)	SCIUG103	BIOMOLECULES AND CELL BIOLOGY (SC23MJDSCBOT201) (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)	—

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## SUMMARY OF THE PROGRAMME

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

*BTU*

**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.

<b>Sl. No.</b>	<b>NCRF Credit Levels</b>	<b>Type of Award</b>	<b>Stage of Exit</b>	<b>Mandatory Credits to be secured for the Award</b>
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 (MJDSC) 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	<b>Major</b>	<b>With Research or without Research (RP/OJT)</b>			
	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	<b>CCE (50%)</b> Classroom & Mid-Term Evaluation	50	25
2	<b>SEE (50%)</b>	50	25
	<b>Total</b>	<b>100</b>	<b>50</b>

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

$$\text{SGPA (Si)} = \sum (\text{Ci} \times \text{Gi}) / \sum \text{Ci}$$

Where Si is the SGPA for ith course, Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith 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.

$$\text{CGPA} = \sum (\text{Ci} \times \text{Si}) / \sum \text{Ci}$$

Where Si is the SGPA of the ith semester and Ci 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	SC23MJDSCBOT101 SC23MiDSCBOT102 SC23MDCBOT103 SC23PMJDSCBOT101 (Group A+B) SC23PMiDSCBOT102 SC23PMDCBOT103 SC23AECBOT104 SC23IKSBOT105 SC23SECBOT106	Semester-I						
		Discipline Specific Core Course(DSC)						
		Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	02:30
		Minor Discipline Specific Core Courses (MiDSC)	2	25	25	50	2	02:00
		Multi/Inter Disciplinary Courses (MDC/IDC)	2	25	25	50	2	02:00
		Practical Course(PDSC)						
		Major Discipline Specific Core Courses (PMJDSC)	8	50	50	100	4	05:00
		Minor Discipline Specific Core Courses (PMiDSC)	4	25	25	50	2	02:30
		Multi/Inter Disciplinary Courses (PMDC/PIDC)	4	25	25	50	2	02:30
		Ability Enhancement Course (AEC)						
		Ability Enhancement Courses (AEC) (Languages)	2	25	25	50	2	02:00
		Value Added Course (VAC)/ Indian Knowledge System (IKS)						
		Indian Knowledge System (IKS)	2	25	25	50	2	02:00
		Skill Enhancement Course (SEC)						
		Skill Enhancement Course (SEC)	2	25	25	50	2	02:00
			30	275	275	550	22	
B.Sc. Semester -II	SC23MJDSCBOT201 SC23MiDSCBOT202 SC23MDCBOT203 SC23PMJDSCBOT201 (Group A+B) SC23PMiDSCBOT202 SC23PMDCBOT203 SC23AECBOT204 SC23VACBOT205 SC23SECBOT206	Semester-II						
		Discipline Specific Core Course(DSC)						
		Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	02:30
		Minor Discipline Specific Core Courses (MiDSC)	2	25	25	50	2	02:00
		Multi/Inter Disciplinary Courses (MDC/IDC)	2	25	25	50	2	02:00
		Practical Course(PDSC)						
		Major Discipline Specific Core Courses (PMJDSC)	8	50	50	100	4	05:00
		Minor Discipline Specific Core Courses (PMiDC)	4	25	25	50	2	02:30
		Minor Discipline Specific Core Courses (PMiDSC)	4	25	25	50	2	02:30
		Ability Enhancement Course (AEC)						
		Ability Enhancement Courses (AEC) (Languages)	2	25	25	50	2	02:00
		Value Added Course (VAC)/ Indian Knowledge System (IKS)						
		Value Added Courses (VAC)	2	25	25	50	2	02:00
		Skill Enhancement Course (SEC)						
		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 <sup>st</sup> Year	I	8	4	4	2	2 (SEC)	2 (IKS)	-	22	
	II	8	4	4	2	2 (SEC)	2 (VAC)	-	22	
1 <sup>st</sup> 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 <sup>nd</sup> Year	III	12	-	4	2	2 (SEC)	2 (IKS)	-	22	
	IV	12	4	-	2	2 (SEC)	2 (VAC)	-	22	
2 <sup>nd</sup> 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 <sup>rd</sup> Year	V	12	8	-	-	2 (SEC)	-	-	22	
	VI	12	4	-	2	4(Internship)	-	-	22	
3 <sup>rd</sup> 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 <sup>th</sup> Year	VII	12	4	-	-	-	-	6 (OJT)	22	
	VIII	12	4	-	-	-	-	6 (OJT)	22	
4 <sup>th</sup> 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	VII	12	4	-	-	-	-	6 (RP)	22	UG Honours with Research Degree
	VIII	12	4	-	-	-	-	6 (RP)	22	
4 <sup>th</sup> 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: SC23MJDSCBOT101: 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)

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

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

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

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

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

**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)

<b>MINOR DISCIPLINE SPECIFIC CORE COURSE -THEORY (MIDSC)</b>							
<b>Programme Code: SCIUG103</b>							
<b>COURSE</b>	<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>THEORY</b>			
				<b>Credits</b>	<b>Lectures</b>	<b>CCE</b>	<b>SEE</b>
<b>Certificate Course</b>	<b>B. Sc. I</b>	<b>SC23MiDSC BOT102</b>	<b>MICROBES AND ALGAE</b>	<b>2</b>	<b>30hrs</b>	<b>25 Marks</b>	<b>25 Marks</b>
<b>Course outcomes:</b>	<p>After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"> <li>1. Develop understanding about the classification and diversity of different microbes including viruses and their economic importance.</li> <li>2. Develop conceptual skill about identifying microbes.</li> <li>3. Gain knowledge about developing commercial enterprise of microbial products.</li> <li>4. Learn host –pathogen relationship and disease management.</li> <li>5. Learn Presentation skills (oral &amp; writing) in Botany by usage of computer of computer &amp; multimedia.</li> <li>6. Gain Knowledge about uses of microbes in various fields.</li> <li>7. Understand the structure and reproduction of certain selected bacteria.</li> <li>8. Gain Knowledge about the economic values of this lower group of plant community.</li> <li>8. Gain laboratory skills such as microscopy, microbial cultures, staining, identification, preservation of microbes for their applications in research and industry.</li> </ol> <p><b>Pedagogy:</b> Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</p>						
<b>UNIT</b>	<b>TOPIC</b>						<b>NO. OF LECTURES (30hrs)</b>
<b>Unit 1</b>	<p><b><u>VIRUSES AND BACTERIA</u></b></p> <ul style="list-style-type: none"> <li>• <b>Plant Viruses:</b> Discovery, physiochemical and biological characteristics; classification (Baltimore), RNA virus (TMV).</li> <li>• <b>Bacteria:</b> General characteristics of Bacteria; Cell structure- Salient features; Types of Bacteria based on flagella, Nutritional types (Brief explanation with suitable example).</li> </ul>						<b>10</b>

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

**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)

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



	<ul style="list-style-type: none"> <li>➤ Permanent Slide – Thallus,</li> <li>➤ Permanent Slide – Cap cell,</li> <li>➤ Permanent Slide – Sex organ - Oogonium.</li> <li>• To study the Life history of <i>Ectocarpus</i> through: <ul style="list-style-type: none"> <li>➤ Mounting - Thallus</li> <li>➤ Mountings - Reproductive structure</li> <li>➤ Permanent Slide– Thallus,</li> <li>➤ Permanent Slide– <i>Ectocarpus</i>: <b>unilocular</b> sporangia.</li> <li>➤ Permanent Slide– <i>Ectocarpus</i>: <b>plurilocular</b> sporangia.</li> </ul> </li> </ul>	
<p><b><i>Suggested Readings:</i></b></p> <ol style="list-style-type: none"> <li>1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.</li> <li>2. Wiley JM, Sherwood LM and Woolverton CJ. (2013). Prescott's Microbiology. 9th Edition. McGrawHill International.</li> <li>3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.</li> <li>4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.</li> <li>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.</li> <li>6. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.</li> </ol>		

**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)

<b>MULTI/INTER DISCIPLINARY COURSE-THEORY (MDSC)</b>							
<b>PROGRAMME CODE: SCIUG103</b>							
<b>COURSE</b>	<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>THEORY</b>			
				<b>Credits</b>	<b>Lectures</b>	<b>CCE</b>	<b>SEE</b>
<b>Certificate Course</b>	<b>B.Sc. I</b>	<b>SC23MDSC BOT103</b>	<b>PLANTS IN EVERYDAY LIFE</b>	<b>2</b>	<b>30hrs</b>	<b>25 Marks</b>	<b>25 Marks</b>
<b>Course outcomes:</b>	<p>After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"><li>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 &amp; its utilization.</li><li>2. Recall various economically and medicinally important plant species used in day-to-day life.</li><li>3. Explain the uses of economically important plants and illustrate the processing of various plant parts.</li><li>4. Analyze the utilization of various plant resources in day-to-day life.</li></ol> <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><b>Pedagogy:</b> Lectures/ Tutorials/Assignments/Presentation / Demonstration/Field visit/Team based learning.</p>						
<b>UNIT</b>	<b>TOPIC</b>						<b>NO. OF LECTURES (30hrs)</b>
<b>Unit 1</b>	<b><u>COMMON WILD PLANTS AND THEIR UTILIZATION:</u></b> <ul style="list-style-type: none"><li>• Identification and utilization of following plants:<ul style="list-style-type: none"><li>➤ Herde (<i>Terminalia chebula</i>)</li><li>➤ Behda (<i>Terminalia bellirica</i>)</li><li>➤ Amla (<i>Phyllanthus emblica</i>)</li><li>➤ Shimlo (<i>Bombax ceiba</i>)</li></ul></li></ul>						<b>15</b>

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

10. Sambamurthy 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)

<b>MULTI/INTER DISCIPLINARY COURSE-PRACTICAL (PMDSC)</b>						
<b>PROGRAMME CODE: SCIUG103</b>						
<b>COURSE</b>	<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>PRACTICAL</b>		
				<b>Credits</b>	<b>CCE</b>	<b>SEE</b>
<b>Certificate Course</b>	<b>B.Sc. I</b>	<b>SC23PMD SCBOT103</b>	<b>PLANTS IN EVERYDAY LIFE</b>	<b>2 (60hrs)</b>	<b>25 Marks</b>	<b>25 Marks</b>
<b>Course outcomes:</b>	<p>After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"><li>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 &amp; its utilization.</li><li>2. Recall various economically and medicinally important plant species used in day-to-day life.</li><li>3. Explain the uses of economically important plants and illustrate the processing of various plant parts.</li><li>4. Analyze the utilization of various plant resources in day-to-day life.</li></ol> <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><b>Pedagogy:</b> Lectures, Tutorials, Assignments, Demonstrations, live specimens, Herbarium specimens, Videos, Team based learning, Field visit and report writing.</p>					
<b>UNIT</b>	<b>TOPIC</b>					<b>NO. OF LECTURES (60hrs)</b>
<b>Unit 1</b>	<p><b><u>COMMON WILD PLANTS AND THEIR UTILIZATION:</u></b></p> <ul style="list-style-type: none"><li>• Identification, Local and Botanical Name, Family, Useful Parts, Chemical constituents and utilization of following plants:<ul style="list-style-type: none"><li>➤ Harde (<i>Terminalia chebula</i>)</li><li>➤ Behda (<i>Terminalia bellirica</i>)</li><li>➤ Amla (<i>Phyllanthus emblica</i>)</li><li>➤ Shimlo (<i>Bombax ceiba</i>)</li></ul></li></ul>					<b>30</b>

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

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			
				Credits	Lectures	CCE	SEE
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. <b>Pedagogy:</b> Lectures, Tutorials, Assignments, Demonstrations, live specimens, Videos, Team based learning, Garden visit and report writing.						
UNIT	TOPIC						NO. OF LECTURES (30 hrs)
Unit 1	<b><u>HORTICULTURE-I</u></b> 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	<b><u>HORTICULTURE-II</u></b> 1. Landscape: Principles, Types and Planning 2. Floriculture and its implements 3. Bonsai 4. Important Horticulture crops of Gujarat						15
<b>Suggested Readings:</b> 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.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

## **Faculty of Science**

### **B. Sc. Zoology**

Syllabus/ scheme

**Semester – 1 to 2**



*With effect from*

*June-2023*

Date: 12/08/2023

Total page: 41

<b>HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN</b>	
<b>B. Sc. (Zoology) Syllabus 2023 (according to NEP-2020)</b>	
<b>Document code</b>	<b>Syllabus ZL- 2021</b>
<b>Name of faculty</b>	<b>Science</b>
<b>Faculty code</b>	<b>SCI</b>
<b>Programme name</b>	<b>B. Sc. ZOOLOGY</b>
<b>Programme code</b>	<b>SCIUG104</b>
<b>Effective from</b>	<b>June-2023</b>

The proposed new structure for B. Sc. course is based on NEP-2020 which is in force June-2023.

### **Course Pattern**

1. This programme is divided into **Eight Semesters** (Four Years). The duration of an academic year consists of two semesters, each of 15 weeks for teaching. The academic session in each semester will provide 90 teaching days. Each semester has 22 credits and the programme is comprised of total 176 credits.
2. The theory courses with 4 credits shall have 60 hrs of direct classroom teaching workload (15 weeks  $\times$  4). The theory courses with 3 credits shall have 45 hrs of teaching workload (15 weeks  $\times$  3) and the theory courses with 2 credits shall have 30 hrs of teaching workload (15 weeks  $\times$  2).

**Attendance:** The attendance rules will be as per the rules and regulation of Hemchandracharya North Gujarat University, Patan.

**Medium of Instruction:** The medium of instruction shall be Gujarati but students are free to write answers in Gujarati or English in examination.

**Language of question paper:** Question paper should be drawn in Gujarati and English translation of the questions must be given in the question paper.

Number of students in each batch for practical examination should be 15.

## Evaluation

### Continuation and Comprehensive Evaluation (CEE)

1. For CEE of 50 marks following component should be used.

Sr. No.	Component	Marks
1	Daily/Weekly/Monthly unit test/ Internal exam	25
2	Assignment/ Quiz test	10
3	Development of soft skill (Seminar/ Group discussion)	05
4	Solving exercise/ Work base training/ Reading analysis	05
5	Attendance	05
	<b>Total</b>	<b>50</b>

2. For CEE of 25 marks following component should be used.

Sr. No.	Component	Marks
1	Daily/Weekly/Monthly unit test/ Internal exam	15
2	Assignment/ Quiz test	05
4	Attendance	05
	<b>Total</b>	<b>25</b>

### Semester End Evaluation (SEE)

1. For SEE of 50 marks following question paper style should be used.

	Total marks	
Q. 1	10	Must be drawn from Unit 1 and will have three long questions out of which any two must be answered (5 marks each)
Q. 2	10	Must be drawn from Unit 2 and will have three long questions out of which any two must be answered (5 marks each)
Q. 3	10	Must be drawn from Unit 3 and will have three long questions out of which any two must be answered (5 marks each)
Q. 4	10	Must be drawn from Unit 4 and will have three long questions out of which any two must be answered (5 marks each)
Q. 5	10	08 short questions must be drawn from all units, out of which any 05 must be answered (2 marks each)
<b>Total</b>	<b>50</b>	



2. For SEE of 25 marks following question paper style should be used.

	<b>Total marks</b>	
Q. 1	10	Must be drawn from Unit 1 and will have three long questions out of which any two must be answered (5 marks each)
Q. 2	10	Must be drawn from Unit 2 and will have three long questions out of which any two must be answered (5 marks each)
Q. 3	05	08 short questions must be drawn from both units, out of which any 05 must be answered (1 marks each)
<b>Total</b>	<b>25</b>	

## **PROGRAM OBJECTIVE**

1. The primary objective of the program is to impart quality education in the subject of Zoology as a basic science and its applied branches to the students.
2. To provide quality education in a branch of Biological sciences i.e., Zoology with different specializations.
3. To facilitate Higher education & research in zoology.
4. To provide quality education offering skill-based programs and motivate the students for self-employment in applied branches of Zoology.
5. To inculcate the spirit of resource conservation and love for nature.
6. To conduct field studies and different projects of local and global interests.
7. To provides opportunities for professional and personal development through curricular and co- curricular activities.
8. Provide consultancy and organize extension activities.

## **PROGRAMME OUTCOMES**

1. To understand the complex phylogeny, physiology, immunology, endocrinology, development biology and evolution of different animals.
2. For instance, if you major in Zoology, you can also still take courses from across the other complementary.
3. Apply the wide range of subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.
4. Understand the applications of biological techniques to various fields of biology.
5. When you graduate with a Bachelor of Science (Zoology) you can serve as academician in different institutes.
6. The syllabus has been designed in such a way that it will give good experience to the student to work under pressure.

### B. Sc. Semester I (Zoology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDSC ZOO101	Fundamentals of Zoology-I	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC ZOO102	Basics of Zoology-I	2	25	25	50	2	2
Multi Disciplinary Course	SC23MDC ZOO103	Introduction to Zoology-I	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC ZOO101	Fundamentals of Zoology-I Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Fundamentals of Zoology-I Practical Part B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC ZOO102	Basics of Zoology-I Practical	4	25	25	50	2	More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC ZOO103	Introduction to Zoology-I Practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC ZOO104	English	2	25	25	50	2	2
Value added courses	SC23VAC ZOO105		2	25	25	50	2	2
Skill Enhancement Course	SC23SEC ZOO106	Apiculture	2	25	25	50	2	2
<b>Total</b>			<b>30</b>	<b>275</b>	<b>275</b>	<b>550</b>	<b>22</b>	

# Semester I

### B. Sc. Semester I (Zoology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDSC ZOO101	Fundamentals of Zoology-I	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC ZOO102	Basics of Zoology-I	2	25	25	50	2	2
Multi Disciplinary Course	SC23MDC ZOO103	Introduction to Zoology-I	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC ZOO101	Fundamentals of Zoology-I Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Fundamentals of Zoology-I Practical Part B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC ZOO102	Basics of Zoology-I Practical	4	25	25	50	2	More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC ZOO103	Introduction to Zoology-I Practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC ZOO104	English	2	25	25	50	2	2
Value added courses	SC23VAC ZOO105		2	25	25	50	2	2
Skill Enhancement Course	SC23SEC ZOO106	Apiculture	2	25	25	50	2	2
<b>Total</b>			<b>30</b>	<b>275</b>	<b>275</b>	<b>550</b>	<b>22</b>	

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. ZOOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG104**

**MAJOR DISCIPLINE SPECIFIC COURSE CODE: SC23MJDSCZOO101**

**FUNDAMENTALS OF ZOOLOGY-I**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

<b>Total Credits- 04 (04 Period/Week)</b>	<b>Theory</b>	<b>External-50 Marks</b>
		<b>Internal- 50 Marks</b>

**Program Outcome:**

1. The programme shall help students to understand importance and role of animals in an ecosystem
2. Understand the applications of techniques to various fields of biology.
3. The programme shall provide subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.

**Course Outcome:**

1. The student shall have basic knowledge about general topics of classification of animals.
2. The student shall have basic knowledge about classification of acoelomates and pseudocoelomates up to class level and the functional anatomy of typical representative/s of different phylums
3. The student shall have basic knowledge about general topics of cytology.
4. The student shall have basic knowledge about general topics of wildlife biology.

<b>Sr. No</b>		<b>Credit</b>	<b>Hr</b>
<b>1</b>	<b>Unit-1</b> <ul style="list-style-type: none"><li>• Principles of classification, Grades of body organization: level of organization, body symmetry, formation of germ layers, formation of coelom, body segmentation.</li><li>• General characteristics and classification of protozoa (up to class)</li><li>• Protozoan related diseases: infestation, symptoms and treatment (Malaria, Amoebiasis, Giardiasis, Kala-azar)</li><li>• General characteristics and classification of phylum Porifera (up to class)</li><li>• Canal system and types of spicules in sponges</li></ul>	<b>1</b>	<b>15</b>

2	Unit-2	<ul style="list-style-type: none"> <li>General characteristics and classification of phylum Cnidaria (up to class)</li> <li>Type study <i>Hydra</i> (habit and habitat, external feature, locomotion, body wall, nervous system, reproductive system)</li> <li>General characteristics and classification of phylum Platyhelminthes (up to class)</li> <li>General characteristics and classification of phylum Nematoda (up to class)</li> <li>Platyhelminthes and nematoda related diseases: Life cycle, infestation, symptoms and treatment (Cysticercosis, Ascariasis, Filariasis, Taeniasis)</li> </ul>	1	15
3	Unit-3	<ul style="list-style-type: none"> <li>Cell discovery and cell theory (Robert Hook and Theodor Schwann), General cellular structure of prokaryotic and eukaryotic cell (Animal cell)</li> <li>Structure of nucleus and chromosomes</li> <li>Cell organelles structure and function: Ribosome, Golgi body, Endoplasmic Reticulum. Mitochondria, Centrioles, Lysosome</li> <li>Cell cycle (normal cell and cancer cell) and Cell division (Amitosis, Mitosis &amp; Meiosis)</li> </ul>	1	15
4	Unit-4	<ul style="list-style-type: none"> <li>Scope and importance of wildlife: Definition of wildlife: causes of wildlife depletion; importance of wildlife, rare, endangered, threatened and endemic species of Gujarat and India</li> <li>Wildlife protection: Reintroduction of wild animals and Wildlife Protection Act, 1972 and wildlife conservation methods (In situ and Ex situ conservation)</li> <li>Protected areas: Some important National parks, Sanctuaries and Reserve forests in Gujarat. (Marine National Park, Gir National Park, Nal Sarovar Wildlife Sanctuary and Jessor Wildlife Sanctuary)</li> <li>Tools and techniques used in study of wildlife biology</li> </ul>	1	15

**Reference:**

- Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14<sup>th</sup> edition
- Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.

**Further Reading:**

- Verma PS and Agrawal VK, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.
- Magguran, A.E. (1996). Ecological diversity and its measurements. Princeton University.

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. ZOOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG104**

**PRACTICAL MAJOR DISCIPLINE SPECIFIC COURSE CODE:**

**SC23PMJDSCZOO101**

**FUNDAMENTALS OF ZOOLOGY-I PRACTICAL**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

<b>Total Credits-04</b>	<b>Part A: 2 credit</b>	<b>(04 Period/Week)</b>	<b>Internal- 25 Marks</b>	<b>External-25 Marks</b>	<b>Total marks: 100</b>
	<b>Part B: 2 credit</b>	<b>(04 Period/Week)</b>	<b>Internal- 25 Marks</b>	<b>External-25 Marks</b>	

**PART A**

**List of Practicals**

1. Study of classification of Protozoa (up to class) using laboratory specimens, models, slides, charts (Amoeba, Euglena, Paramecium, Plasmodium)
2. Study of classification of phylum Porifera (up to class) using laboratory specimens, models, slides, charts (Sycon or Leucosolenia, Hylonema or Euplectella, Spongilla or Euspongia)
3. Study of classification of phylum Cnidaria (up to class) using laboratory specimens, models, slides, charts (Physalia or Hydra, Aurelia, Coral)
4. Study of histological structure of gonads of Hydra.
5. Study of classification of phylum Platyhelminthes and Nemetoda (up to class) using laboratory specimens, models, slides, charts (Planaria, Liver fluke or Polystomum, Tap worm, Ascaris or Filariaworm)
6. Study of external morphology of *Paramecium* and preparation of whole mount slide of *Paramecium* from culture.
7. Examination of pond water collected from different places for diversity in Protista
8. Study of life stages of *Fasciola hepatica*, *Taenia solium*, *Ascaris lumbricoides*, *Wuchereria bancrofti* (through Specimens / Slides/ micro-photographs)
9. Study of life stages of *Fascaris lumbricoides* and *Wuchereria bancrofti* (through Specimens / Slides/ micro-photographs)
10. Study of human parasitic diseases related to protozoan (Malaria, Amoebiasis, Giardiasis, Kala-Azar)
11. Study of Life cycle of Plasmodium, Ascaris and *Wuchereria bancrofti* using charts and slides
12. Study of human parasitic diseases related to Platyhelminthes and Nematoda (Cysticercosis, Ascariasis, Filariasis, Taeniasis)
13. Study of canal system of sponges using slide/chart
14. Study of different types of spicules of sponge using slide/chart



## **PART B**

### **List of Practicals**

1. To study compound microscope.
2. To study the structure of prokaryotic and eukaryotic cell using slide or chart.
3. To study typical eukaryotic onion cell under microscope
4. To study mitosis from onion root tip (Temporary / Permanent Slide)
5. Study of ultra structure of chromosome.
6. Study of different types of chromosomes.
7. Study of different Cell organelles: Eukaryotic Nucleus, Eukaryotic Ribosome and Endoplasmic Reticulum using charts or permanent slides
8. Study of cell cycle using chart.
9. Study of structure, procedure and type of microtome
10. Study of some important tools used in wild life: Camera, binocular, tripod, shot gun, tranquilizer, telescope/spotting scope.
11. Quantification of fauna using quadrat sampling method (calculation of density, abundance and frequency of occurrence)
12. Demonstration of census technique methods (line transect, belt transect, point count, mark capture-recapture method)
13. To map the distribution of rare and endangered animal species of Gujarat and India.
14. Study of various National Parks of Gujarat state.
15. Study of various Wildlife Sanctuaries of Gujarat state.
16. To visit any protected area (National park/Sanctuary) and prepare a report of visit.

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. ZOOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG104**

**MINOR DISCIPLINE SPECIFIC COURSE CODE: SC23MIDSCZOO102**

**BASICS OF ZOOLOGY-I**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

<b>Total Credits- 02 (02 Period/Week)</b>	<b>Theory</b>	<b>External-25 Marks</b>
		<b>Internal- 25 Marks</b>

**Program Outcome:**

1. The programme shall help students to understand importance and role of animals in an ecosystem
2. Understand the applications of techniques to various fields of biology.
3. The programme shall provide subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.

**Course Outcome:**

After thorough understanding of the content student will be able to explain:

1. Basic knowledge about general topics of classification of kingdom Animalia.
2. The economic and ecological importance of some Non-chordates

<b>Sr. No</b>		<b>Credit</b>	<b>Hr</b>
<b>1</b>	<b>Unit-1</b> <ul style="list-style-type: none"><li>• Principles of classification, Grades of body organization: level of organization, body symmetry, formation of germ layers, formation of coelom, body segmentation.</li><li>• General characteristics and classification of protozoa (up to class)</li><li>• Protozoan related diseases: infestation, symptoms and treatment (Malaria, Amoebiasis, Giardiasis, Kala-azar)</li><li>• General characteristics and classification of phylum Porifera (up to class)</li><li>• Canal system and types of spicules in sponges</li></ul>		<b>15</b>

2	Unit-2	<ul style="list-style-type: none"> <li>• General characteristics and classification of phylum Cnidaria (up to class)</li> <li>• Type study <i>Hydra</i> (habit and habitat, external feature, locomotion, body wall, nervous system, reproductive system)</li> <li>• General characteristics and classification of phylum Platyhelminthes (up to class)</li> <li>• General characteristics and classification of phylum Nematoda (up to class)</li> <li>• Platyhelminthes and Nematoda related diseases: Life cycle, infestation, symptoms and treatment (Cysticercosis, Ascariasis, Filariasis, Taeniasis)</li> </ul>	1	15
<p><b>Reference:</b></p> <ol style="list-style-type: none"> <li>1. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14<sup>th</sup> edition</li> <li>2. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.</li> </ol> <p><b>Further Reading:</b></p> <ol style="list-style-type: none"> <li>1. Verma PS and Agrawal VK, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.</li> <li>2. Magguran, AE (1996). Ecological diversity and its measurements. Princeton University.</li> </ol>				

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. ZOOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG104**

**PRACTICAL MINOR DISCIPLINE SPECIFIC COURSE CODE:**

**SC23PMIDSCZOO102**

**BASICS OF ZOOLOGY-I**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

<b>Total Credits- 02 (04 Period/Week)</b>	<b>External-25 Marks</b>
	<b>Internal- 25 Marks</b>

**List of Practicals**

1. Study of classification of Protozoa (up to class) using laboratory specimens, models, slides, charts (Amoeba, Euglena, Paramecium, Plasmodium)
2. Study of classification of phylum Porifera (up to class) using laboratory specimens, models, slides, charts (Sycon or Leucosolenia, Hylonema or Euplectella, Spongilla or Euspongia)
3. Study of classification of phylum Cnidaria (up to class) using laboratory specimens, models, slides, charts (Physalia or Hydra, Aurelia, Coral)
4. Study of histological structure of gonads of Hydra.
5. Study of classification of phylum Platyhelminthes and Nemetoda (up to class) using laboratory specimens, models, slides, charts (Planaria, Liver fluke or Polystomum, Tap worm, Ascaris or Filariaworm)
6. Study of external morphology of *Paramecium* and preparation of whole mount slide of *Paramecium* from culture.
7. Examination of pond water collected from different places for diversity in Protista
8. Study of life stages of *Fasciola hepatica*, *Taenia solium*, *Ascaris lumbricoides*, *Wuchereria bancrofti* (through Specimens / Slides/ micro-photographs)
9. Study of life stages of *Fascaria lumbricoides* and *Wuchereria bancrofti* (through Specimens / Slides/ micro-photographs)
10. Study of human parasitic diseases related to protozoan (Malaria, Amoebiasis, Giardiasis, Kala-Azar)
11. Study of Life cycle of Plasmodium, Ascaris and *Wuchereria bancrofti* using charts and slides
12. Study of human parasitic diseases related to Platyhelminthes and Nematoda (Cysticercosis, Ascariasis, Filariasis, Taeniasis)
13. Study of canal system of sponges using slide/chart
14. Study of different types of spicules of sponge using slide/chart

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. ZOOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG104**

**MULTIDISCIPLINARY SPECIFIC COURSE CODE: SC23MDCZOO103**

**INTRODUCTION TO ZOOLOGY-I**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

<b>Total Credits- 02 (02 Period/Week)</b>	<b>Theory</b>	<b>External-25 Marks</b>
		<b>Internal- 25 Marks</b>

**Program Outcome:**

1. The programme shall help students to understand importance and role of animals in an ecosystem
2. Understand the applications of techniques to various fields of biology.
3. The programme shall provide subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.

**Course Outcome:**

1. The student shall have basic knowledge about general topics of cytology.
2. The student shall have basic knowledge about general topics of wildlife biology.

<b>Sr. No</b>			<b>Credit</b>	<b>Hr</b>
<b>1</b>	<b>Unit-1</b>	<ul style="list-style-type: none"><li>• Cell discovery and cell theory (Robert Hook and Theodor Schwann), General cellular status of prokaryotic and eukaryotic cells Animal Cell)</li><li>• Structure of nucleus and chromosomes</li><li>• Cell organelles structure and function: Ribosome, Golgi body, Endoplasmic Reticulum. Mitochondria, Centrioles, Lysosome</li><li>• Cell cycle (normal cell and cancer cell) and Cell division (Amitosis, Mitosis &amp; Meiosis)</li></ul>	<b>1</b>	<b>15</b>
<b>2</b>	<b>Unit-2</b>	<ul style="list-style-type: none"><li>• Scope and importance of wildlife: Definition of wildlife: causes of wildlife depletion; importance of wildlife, rare, endangered, threatened and endemic species of Gujarat and India</li><li>• Wildlife protection: Reintroduction of wild animals and Wildlife Protection Act, 1972 and Wildlife conservation</li></ul>	<b>1</b>	<b>15</b>

		<p>methods (In situ and Ex situ conservation)</p> <ul style="list-style-type: none"> <li>Protected areas: Some important National parks, Sanctuaries and Reserve forests in Gujarat. (Marine National Park, Gir National Park, Nal sarovar Wildlife Sanctuary and Jessore Wildlife Sanctuary)</li> <li>Tools and techniques used in study of wildlife biology</li> </ul>		
<p><b>Reference:</b></p> <ol style="list-style-type: none"> <li>Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14<sup>th</sup> edition</li> <li>Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.</li> </ol> <p><b>Further Reading:</b></p> <ol style="list-style-type: none"> <li>Verma PS and Agrawal Vk, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.</li> <li>Magguran, A.E. (1996). Ecological diversity and its measurements. Princeton University.</li> </ol>				

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. ZOOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG104**

**PRACTICAL MULTIDISCIPLINARY SPECIFIC COURSE CODE:**

**SC23PMDCZOO103**

**INTRODUCTION TO ZOOLOGY-I**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

<b>Total Credits- 02 (04 Period/Week)</b>	<b>External-25 Marks</b>
	<b>Internal- 25 Marks</b>

**List of Practicals**

1. To study compound microscope.
2. To study the structure of prokaryotic and eukaryotic cell using slide or chart.
3. To study typical eukaryotic onion cell under microscope
4. To study mitosis from onion root tip (Temporary / Permanent Slide)
5. Study of ultra structure of chromosome.
6. Study of different types of chromosomes.
7. Study of different Cell organelles: Eukaryotic Nucleus, Eukaryotic Ribosome and Endoplasmic Reticulum using charts or permanent slides
8. Study of cell cycle using chart.
9. Study of structure, procedure and type of microtome
10. Study of some important tools used in wild life: Camera, binocular, tripod, shot gun, tranquilizer, telescope/spotting scope.
11. Quantification of fauna using quadrat sampling method (calculation of density, abundance and frequency of occurrence)
12. Demonstration of census technique methods (line transect, belt transect, point count, mark capture-recapture method)
13. To map the distribution of rare and endangered animal species of Gujarat and India.
14. Study of various National Parks of Gujarat state.
15. Study of various Wildlife Sanctuaries of Gujarat state.
16. To visit any protected area (National park/Sanctuary) and prepare a report of visit.

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. ZOOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG104**

**SKILL ENHANCEMENT COURSE CODE: SC23SECZOO106**

**APICULTURE**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

<b>Total Credits- 02 (02 Period/Week)</b>	<b>Theory</b>	<b>External- 25 Marks</b> <b>Internal- 25 Marks</b>
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**Program Outcome:**

1. The programme shall help students to understand importance and role of animals in an ecosystem
2. Understand the applications of techniques to various fields of biology.
3. The programme shall provide subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.

**Course Outcome:**

1. The student shall have basic knowledge about morphology and life cycle of honey bee.
2. The student shall have basic knowledge identification and importance of honey bee in apiculture.

<b>Sr. No</b>		<b>Credit</b>	<b>Hr</b>
<b>1</b>	<b>Unit-1</b> <ul style="list-style-type: none"><li>• Introduction, history and importance of apiculture.</li><li>• Classification, morphology and diversity of honey bees.</li><li>• Life history and social organization in honey bee.</li><li>• Selection criteria of honey bee for apiculture.</li></ul>	<b>1</b>	<b>15</b>
<b>2</b>	<b>Unit-2</b> <ul style="list-style-type: none"><li>• A typical bee hive (natural)</li><li>• Methods of Bee Keeping – Old and Modern.</li><li>• Appliances for modern method.</li><li>• Products of bee keeping: Honey &amp; Bee Wax.</li></ul>	<b>1</b>	<b>15</b>

**Reference:**

1. Economic Zoology : G. S. Shukla & V. B. Upadhyay, Rastogi Publication, Meerut.
2. Economic and Applied Entomology: Kumar and Nigum, Emkay Publication, Delhi.

**Further Reading:**

1. Graham, J M (1992) The hive and the honey bee. Dadant and Sons, Hamilton, Illinois.
2. Mishra R.C. (1995) Honey bees and their management in India. ICAR Publication, Delhi.



**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. ZOOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG104**

**PRACTICAL MAJOR DISCIPLINE SPECIFIC COURSE**

**FUNDAMENTALS OF ZOOLOGY-I PRACTICAL**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

**PRACTICAL SKELETON**

**Time: more than 3 Hours**

**Total Marks: 50**

<b>Q 1</b>	Prepare a temporary slide of onion root tip showing different stages of mitosis.  <b>OR</b> Prepare a temporary slide of onion cells and describe the structure of cell.	<b>05</b>
<b>Q 2</b>	Prepare a temporary slide of Protista from given sample  <b>OR</b> Prepare a temporary slide of Paramecium from given sample.  <b>OR</b> Identify and describe the structure and function of given microtome	<b>05</b>
<b>Q 3</b>	Quantification of fauna using quadrat method	<b>07</b>
<b>Q 4</b>	Identify the disease and describe its cause, symptoms and cure  <b>OR</b> Identify and map the distribution of rare and endangered animal species of Gujarat and India.	<b>05</b>
<b>Q 5</b>	<b>Do as directed</b> 1. Identify the disease and describe its cause, symptoms and cure/ types of chromosome 2. Identify and classify the specimen up to class and describe its morphological characters (Protozoa) 3. Identify and classify the specimen up to class and describe its morphological characters (Porifera) 4. Identify and classify the specimen up to class and describe its morphological characters (Cnidaria) 5. Identify and classify the specimen up to class and describe its morphological characters (Platyhelminthes) 6. Identify and classify the specimen up to class and describe its morphological characters (Nematoda)	<b>18</b>
<b>Q 6</b>	Viva voce and field trip report	<b>05</b>
<b>Q 7</b>	Journal submission	<b>05</b>

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. ZOOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG104**

**PRACTICAL MINOR DISCIPLINE SPECIFIC COURSE**

**BASICS OF ZOOLOGY-I PRACTICAL**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

**PRACTICAL SKELETON**

**Time: 3 Hours**

**Total Marks: 25**

<b>Q 1</b>	Examine the sample of pond water under microscope and show different Protists to examiner  <b>OR</b> Prepare slide of Paramecium from given culture and show it to examiner	<b>04</b>
<b>Q 2</b>	Identify the disease and describe its cause, symptoms and cure	<b>03</b>
<b>Q 3</b>	Do as directed 1. Identify and classify the specimen up to class and describe its morphological characters. (Protozoa) 2. Identify and classify the specimen up to class and describe its morphological characters. (Porifera) 3. Identify and classify the specimen up to class and describe its morphological characters. (Cnidarian) 4. Identify and classify the specimen up to class and describe its morphological characters. (Platyhelminthes, Nematoda)	<b>12</b>
<b>Q 4</b>	Viva-voce	<b>03</b>
<b>Q 5</b>	Journal	<b>03</b>

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. ZOOLOGY SEMESTER I**  
**PROGRAM CODE: SCIUG104**  
**PRACTICAL MULTI DISCIPLINARY SPECIFIC COURSE**

**INTRODUCTION TO ZOOLOGY-I PRACTICAL**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

**PRACTICAL SKELETON**

**Time: 3 Hours**

**Total Marks: 25**

<b>Q 1</b>	Prepare a temporary slide of onion root tip showing different stages of mitosis.  <b>OR</b> Prepare a temporary slide of onion cells and describe the structure of cell.	<b>04</b>
<b>Q 2</b>	Identify and describe the use of tools or technique in wildlife biology  <b>OR</b> Quantification of fauna using quadrat method	<b>03</b>
<b>Q 3</b>	<b>Do as directed</b> 1. Identify and describe the part of microscope 2. Identify and describe the structure and function of cell organelle/ types of chromosome 3. Identify and comment on the threats of endangered animal 4. Identify and comment on the location and fauna of National park/ sanctuary	<b>12</b>
<b>Q 4</b>	Viva voce and Field trip report submission	<b>03</b>
<b>Q 5</b>	Journal submission	<b>03</b>

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

**Faculty of Science**

**B. Sc. Microbiology**

Syllabus/ scheme

**Semester – 1 to 2**



*With effect from*

*June-2023*

Date: 12/08/2023

Total page: 41

<b>HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN</b>	
<b>B. Sc. (Zoology) Syllabus 2023 (according to NEP-2020)</b>	
<b>Document code</b>	<b>Syllabus MB- 2021</b>
<b>Name of faculty</b>	<b>Science</b>
<b>Faculty code</b>	<b>SCI</b>
<b>Programme name</b>	<b>B. Sc. MICROBIOLOGY</b>
<b>Programme code</b>	<b>SCIUG105</b>
<b>Effective from</b>	<b>June-2023</b>

The proposed new structure for B. Sc. course is based on NEP-2020 which is in force from June-2023.

### **Course Pattern**

1. This programme is divided into **Eight Semesters** (Four Years). The duration of an academic year consists of two semesters, each of 15 weeks for teaching. The academic session in each semester will provide 90 teaching days. Each semester has 22 credits and the programme is comprised of total 176 credits.
2. The theory courses with 4 credits shall have 60 hrs of direct classroom teaching workload (15 weeks  $\times$  4). The theory courses with 3 credits shall have 45 hrs of teaching workload (15 weeks  $\times$  3) and the theory courses with 2 credits shall have 30 hrs of teaching workload (15 weeks  $\times$  2).

**Attendance:** The attendance rules will be as per the rules and regulation of Hemchandracharya North Gujarat University, Patan.

**Medium of Instruction:** The medium of instruction shall be Gujarati but students are free to write answers in Gujarati or English in examination.

**Language of question paper:** Question paper should be drawn in English

Number of students in each batch for practical examination should be 15.

## Evaluation

### Continuation and Comprehensive Evaluation (CEE)

1. **For CEE of 50** marks following components shall be considered.

Sr. No.	Component	Marks
1	Daily/Weekly/Monthly unit test/ Internal exam	25
2	Assignment/ Quiz test	10
3	Development of soft skill (Seminar/ Group discussion)	05
4	Solving exercise/ Work base training/ Reading analysis	05
5	Attendance	05
	<b>Total</b>	<b>50</b>

2. For **CEE of 25** marks following component should be used.

Sr. No.	Component	Marks
1	Daily/Weekly/Monthly unit test/ Internal exam	15
2	Assignment/ Quiz test	05
3	Attendance	05
	<b>Total</b>	<b>25</b>

### Semester End Evaluation (SEE)

1. For SEE of 50 marks following question paper style shall be considered.

	Total marks	
Q. 1	10	Must be drawn from Unit 1 and will have three long questions out of which any two must be answered (5 marks each)
Q. 2	10	Must be drawn from Unit 2 and will have three long questions out of which any two must be answered (5 marks each)
Q. 3	10	Must be drawn from Unit 3 and will have three long questions out of which any two must be answered (5 marks each)
Q. 4	10	Must be drawn from Unit 4 and will have three long questions out of which any two must be answered (5 marks each)
Q. 5	10	08 short questions must be drawn from all units, out of which any 05 must be answered (2 marks each)
<b>Total</b>	<b>50</b>	

2. For SEE of 25 marks following question paper style shall be considered.

	<b>Total marks</b>	
Q. 1	10	Must be drawn from Unit 1 and will have three long questions out of which any two must be answered (5 marks each)
Q. 2	10	Must be drawn from Unit 2 and will have three long questions out of which any two must be answered (5 marks each)
Q. 3	05	08 short questions must be drawn from both units, out of which any 05 must be answered (1 marks each)
<b>Total</b>	<b>25</b>	



## **PROGRAM OBJECTIVE**

1. The primary objective of the program is to impart quality education in the subject of Microbiology as a basic science and its applied branches to the students.
2. To provide quality education in a branch of Biological sciences i.e., Microbiology with different specializations.
3. To facilitate Higher education & research in Microbiology.
4. To provide quality education offering skill-based programs and motivate the students for self-employment in applied branches of Microbiology.
5. To inculcate the spirit of resource conservation and love for nature.
6. To conduct field studies and different projects of local and global interests.
7. To provide opportunities for professional and personal development through curricular and co- curricular activities.
8. Provide consultancy and organize extension activities.

## **PROGRAMME OUTCOMES**

1. To understand the fundamental of microbes as well as complex microbe structure, physiology and evolution of microbes through taxonomic study.
2. For instance, if you major in microbiology, you can also still take courses from across the other complementary.
3. Apply the wide range of subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.
4. Understand the applications of biological techniques to various fields of biology.
5. When you graduate with a Bachelor of Science (microbiology) you can serve as an academician in different institutes.
6. The syllabus has been designed in such a way that it will give good experience to the student to work under pressure.

### B. Sc. Semester I (Microbiology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDSC MIC101	Fundamentals of Microbiology	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC MIC102	Microbiological techniques	2	25	25	50	2	2
Multi Disciplinary Course	SC23MDC MIC103	Basic microbiology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC MIC101	Fundamentals of Microbiology PracticalPart A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Fundamentals of Microbiology PracticalPart B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC MIC102	Microbiological techniques Practical	4	25	25	50	2	More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC MIC103	Basic microbiology practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC MIC104	English	2	25	25	50	2	2
Value added courses	SC23VAC MIC105	To be selected from Basket	2	25	25	50	2	2
Skill Enhancement Course	SC23SEC MIC106	Microbial culture preservation	2	25	25	50	2	2
<b>Total</b>			<b>30</b>	<b>275</b>	<b>275</b>	<b>550</b>	<b>22</b>	

# Semester I

### B. Sc. Semester I (Microbiology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDSC MIC101	Fundamentals of Microbiology	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC MIC 102	Microbiological techniques	2	25	25	50	2	2
Multi Disciplinary Course	SC23MDC MIC 103	Basic microbiology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC MIC101	Fundamentals of Microbiology PracticalPart A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Fundamentals of Microbiology PracticalPart B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC MIC102	Microbiological techniques	4	25	25	50	2	More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC MIC103	Basic microbiology	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC MIC104	English	2	25	25	50	2	2
Value added courses	SC23VAC MIC105	To be select from Basket	2	25	25	50	2	2
Skill Enhancement Course	SC23SEC MIC106	Microbial culture preservation	2	25	25	50	2	2
<b>Total</b>			<b>30</b>	<b>275</b>	<b>275</b>	<b>550</b>	<b>22</b>	

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**  
**COURSE NAME B. SC. MICROBIOLOGY SEMESTER I**  
**PROGRAM CODE: SCIUG105**

**MAJOR DISCIPLINE SPECIFIC COURSE CODE: SC23MJDSCMIC101**  
**FUNDAMENTALS OF MICROBIOLOGY**

<b>Total Credits- 04</b>	<b>(04 Period/Week)</b>	<b>Theory</b>	<b>External-50 Marks</b>
			<b>Internal- 50 Marks</b>

**Course objective**

To make student familiar with microbiology as important subject, History and development of subject, Scope of microbiology in various sectors and basic introduction to microbes

**Unit-I: History of Development of Microbiology**

- Development of microbiology as a discipline, Spontaneous generation vs. biogenesis. Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming
- Role of microorganisms in fermentation, Germ theory of disease, Principle of immunization.
- Contributions of Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A. Waksman, Paul Ehrlich, Elie Metchnikoff, Edward Jenner

**Unit-II: Scope of Microbiology**

- Distribution of microbes in nature
- Taxonomic and integrative Approaches for subdivision of microbiology, Concept of classification, major groups of microorganisms
- Applied area of Microbiology: Medical, Agriculture, Soil, water, food, Dairy, industries, veterinary, aquatic, Space, geochemical and petroleum.

**Unit-III: Microscopy and Staining**

- Basic Principle of microscopy, working of Light and compound microscope.
- Working principle of Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope,

- Stains and staining: Dyes and stains – Definition and examples acidic & basic dyes and leuco compounds
- Principles of staining techniques for bacteria
- Types of staining: simple, negative, differential and gram staining

#### **Unit-IV: Introduction to Microbial World**

- Systems of classification Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility.
- Difference between prokaryotic and eukaryotic microorganisms
- General characteristics of Acellular microorganisms: A general introduction with special reference to the structure of the following: TMV, T4 and  $\lambda$  phage, one step multiplication curve

#### **Outcomes**

- ✓ Students will familiarize with Importance of microbiology,
- ✓ Understand scope of microbiology in various fields.
- ✓ Contribution of scientists in field of microbiology
- ✓ Explain various microscopic and staining techniques for observing microorganisms.

#### **References**

1. Elementary Microbiology Vol-I, H. A. Modi (2014)
2. Microbiology- Michael J Pleczar – 5<sup>th</sup> Edition
3. Principle of microbiology by Ronald M. Atlas, 2<sup>nd</sup> Edition

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**  
**COURSE NAME B. SC. MICROBIOLOGY SEMESTER - I**  
**PROGRAM CODE: SCIUG105**

**PRACTICLS: SC23 PMJDSCMIC101 PART-A & PART B**

<b>Total Credits-04</b>	<b>Part A: 2 credit</b>	<b>(04 Period/Week)</b>	<b>Internal- 25 Marks</b>	<b>External-25 Marks</b>	<b>Total marks: 100</b>
	<b>Part B: 2 credit</b>	<b>(04 Period/Week)</b>	<b>Internal- 25 Marks</b>	<b>External-25 Marks</b>	

**LIST OF PRASCTICALS**

1. Microbiology Good Laboratory Practices and Biosafety.
2. To study the principle, working methodology and applications of important instruments (biological safety cabinets, autoclave, BOD incubator, hot air oven, pH meter) used in the microbiology laboratory
3. Preparation of standard solutions: (A) Percent solutions (B) Part dilutions (C) Molar solutions (D) Normal solutions (E) Molal solutions (F) PPM and PPB solutions
4. Study of basic principle and working components of Light microscope
5. Study of *Rhizopus*, *Penicillium*, *Aspergillus* using temporary mounts
6. Study of *Spirogyra* and *Chlamydomonas*, *Volvox* using temporary Mounts
7. Study of the following protozoans using permanent mounts/photographs: *Amoeba*, *Entamoeba*, *Paramecium* and *Plasmodium*
8. Staining techniques for bacteria – Monochrome staining using Acidic and Basic dyes
9. Study of morphology of different bacteria
10. Hanging drop technique to demonstrate Bacterial motility
11. Gram staining of bacteria
12. Study of flagella and pili staining (Loeffler's method)
13. Staining of bacterial spore
14. Study of fungal mycelia and spores
15. Study of algae under microscope
16. Staining of cell wall by Dyar's / Ringer's method
17. Capsule staining in bacteria by Hiss / Maneval's Method
18. Endospore staining by Dorner's / Snyder's method

## Reference

1. Patel R.J. and Patel R.K. (2016) Experimental microbiology Volume I, 9th Edition. Aditya,
2. Patel R.J. and Patel R.K. (2017) Experimental microbiology Volume II, 9th Edition. Aditya,
3. Cappuccino J.G. (2016) Microbiology; A Laboratory Manual, 11th Edition. Pearson Education (Singapore) Pvt. Ltd., (ISBN: 978-9332535190)



**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**  
**COURSE NAME B. SC. MICROBIOLOGY SEMESTER - I**  
**PROGRAM CODE: SCIUG105**

**MINOR DISCIPLINE SPECIFIC COURSE CODE: SC23MIDSCMIC102**  
**MICROBIOLOGICAL TECHNIQUES**

<b>Total Credits- 02 (02 Period/Week)</b>	<b>Theory</b>	<b>External-25 Marks</b>
		<b>Internal- 25 Marks</b>

**Objective**

To understand student for basic microbiology techniques

**Unit-I: Microscopy Techniques**

- Basic Principle of microscopy
- Types of microscopes used in microbiology
- Working principle of Light microscope and its components
- Working principle of Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope

**Unit-II Bacterial staining techniques**

- Stains and staining: Dyes and stains – Definition and examples acidic & basic dyes and luco compounds
- Principles of staining techniques for bacteria
- Steps in various staining process, role of intensifier and decolorisers
- Types of staining: simple, negative, differential and gram staining

**Outputs**

- ✓ student will understand principle and types of various microscopes
- ✓ Student will have hands on experience for operating microscope
- ✓ student will learn staining technique for observation of bacterial cells

**Reference**

1. Elementary Microbiology Vol-I, H. A. Modi (2014)
2. Microbiology- Michael J Pleczar – 5<sup>th</sup> Edition

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. MICROBIOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG105**

**PRACTICAL MINOR DISCIPLINE SPECIFIC COURSE CODE:SC23PMIDSCMIC102**

**MICROBIOLOGICAL TECHNIQUES**

<b>Total Credits- 02      (04 Period/Week)</b>	<b>External-25 Marks</b>
	<b>Internal- 25 Marks</b>

**LIST OF PRACTICALS**

- Microbiology Good Laboratory Practices and Biosafety.
- To study the principle, working methodology and applications of important instruments (biological safety cabinets, autoclave, BOD incubator, hot air oven, pH meter) used in the microbiology laboratory
- Study of basic principle and working components of Light microscope
- Study of *Rhizopus*, *Penicillium*, *Aspergillus* using temporary mounts
- Study of *Spirogyra* and *Chlamydomonas*, *Volvox* using temporary Mounts
- Study of the following protozoans using permanent mounts/photographs: *Amoeba*, *Entamoeba*, *Paramecium* and *Plasmodium*
- Study of staining techniques for bacteria

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. MICROBIOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG105**

**MULTIDISCIPLINARY SPECIFIC COURSE CODE: SC23MDCMIC103**

**BASIC MICROBIOLOGY**

<b>Total Credits- 02 (02 Period/Week)</b>	<b>Theory</b>	<b>External-25 Marks</b>
		<b>Internal- 25 Marks</b>

**Objective**

To understand student about basic microbiology concept

**Unit-I: Scope of Microbiology**

- Distribution of microbes in nature
- Taxonomic and integrative Approaches for subdivision of microbiology, Concept of classification, major groups of microorganisms
- Applied area of Microbiology: Medical, Agriculture, Soil, water, food, Dairy, industries, veterinary, aquatic, Space, geochemical and petroleum.

**Unit-II: Bacterial cell and Microscopy**

- Basic structure of bacterial cell, Morphology of bacteria
- Basic Principle of microscopy, working of Light and compound microscope.
- Satins and staining: Dyes and stains – Definition and examples acidic & basic dyes and luco compounds
- Principles of staining techniques for bacteria
- Types of staining: simple, negative, differential and gram staining

**Reference**

1. Elementary Microbiology Vol-I, H. A. Modi (2014)
2. Microbiology- Michael J Pleczar – 5<sup>th</sup> Edition

**Outputs**

- ✓ Student will well verse with scope of microbiology
- ✓ Student will have hands on experience for operating microscope
- ✓ student will learn staining technique for observation of bacterial cells

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. MICROBIOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG105**

**PRACTICAL MULTIDISCIPLINARY SPECIFIC COURSE CODE:SC23PMDCMIC103**

**BASIC MICROBIOLOGY**

<b>Total Credits- 02      (04 Period/Week)</b>	<b>External-25 Marks</b>
	<b>Internal- 25 Marks</b>

**LIST OF PRACTICALS**

- Microbiology Good Laboratory Practices and Biosafety.
- To study the principle, working methodology and applications of important instruments (biological safety cabinets, autoclave, BOD incubator, hot air oven, pH meter) used in the microbiology laboratory
- Study of basic principle and working components of Light microscope
- Study of morphology of different bacteria
- Study of bacterial staining

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**  
**COURSE NAME B. SC. MICROBIOLOGY SEMESTER I**  
**PROGRAM CODE: SCIUG105**

**SKILL ENHANCEMENT COURSE CODE: SC23SECMIC106**  
**MICROBIAL CULTURE PRESERVATION**

<b>Total Credits- 02 (02 Period/Week)</b>	<b>Theory</b>	<b>External- 25 Marks</b> <b>Internal- 25 Marks</b>
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**UNIT-I Preparation of media**

- Different types and composition of isolation media
- Media and reagent preparation: Calculation of normality, molarities and % solution
- Methods of sample collections and its transport
- Sterilization of media and methods of sterilization

**UNIT-II Pure culture and maintenance**

- Pure culture techniques: Serial dilution, Double dilution, plating methods: Streaking, spreading and pouring
- Preservation of culture: sub culturing, Oil overlay, storage at low temperature, Lyophilization and use of liquid nitrogen
- National and international culture collections and their functions

**Reference**

1. Elementary Microbiology Vol-I, H. A. Modi (2014)
2. Microbiology- Michael J Pleczar – 5<sup>th</sup> Edition
3. Principle of microbiology by Ronald M. Atlas, 2<sup>nd</sup> Edition

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**  
**COURSE NAME B. SC. MICROBIOLOGY SEMESTER I**  
**PROGRAM CODE: SCIUG105**

**PRACTICAL MAJOR DISCIPLINE SPECIFIC COURSE**  
**FUNDAMENTALS OF MICROBIOLOGY PRACTICAL**  
**PRACTICAL SKELETON (External Examination)**

**Time: more than 3 Hours**

**Total Marks: 50**

<b>Q 1</b>	Perform any one practical from list given below	<b>10</b>
<b>Q 2</b>	Perform any one practical from list given below	<b>10</b>
<b>Q 3</b>	Perform any one practical from list given below	<b>10</b>
<b>Q 4</b>	Spotting	<b>10</b>
<b>Q 5</b>	Viva voce	<b>05</b>
<b>Q 6</b>	Journal submission	<b>05</b>

**PRACTICAL MAJOR DISCIPLINE SPECIFIC COURSE**  
**FUNDAMENTALS OF MICROBIOLOGY PRACTICAL**  
**PRACTICAL SKELETON (Internal Examination)**

**Time: 3 Hours**

**Total Marks: 50**

<b>Q 1</b>	Perform any one practical from list given below	<b>20</b>
<b>Q 2</b>	Perform any one practical from list given below	<b>10</b>
<b>Q 3</b>	Spotting	<b>10</b>
<b>Q 4</b>	Viva voce	<b>05</b>
<b>Q 5</b>	Lab. Records	<b>05</b>

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**  
**COURSE NAME B. SC. MICROBIOLOGY SEMESTER I**  
**PROGRAM CODE: SCIUG105**

**PRACTICAL MINOR DISCIPLINE SPECIFIC COURSE**  
**MICROBIOLOGICAL TECHNIQUES PRACTICAL**  
**PRACTICAL SKELETON (External Examination)**

**Time: 3 Hours**

**Total Marks: 25**

<b>Q 1</b>	Perform any one practical from list given below	<b>05</b>
<b>Q 2</b>	Perform any one practical from list given below	<b>05</b>
<b>Q 3</b>	Spotting	<b>05</b>
<b>Q 4</b>	Viva-voce	<b>05</b>
<b>Q 5</b>	Journal	<b>05</b>

**PRACTICAL MINOR DISCIPLINE SPECIFIC COURSE**  
**MICROBIOLOGICAL TECHNIQUES PRACTICAL**  
**PRACTICAL SKELETON (Internal Examination)**

**Time: 3 Hours**

**Total Marks: 25**

<b>Q 1</b>	Perform any one practical from list given below	<b>05</b>
<b>Q 2</b>	Perform any one practical from list given below	<b>05</b>
<b>Q 3</b>	Spotting	<b>05</b>
<b>Q 4</b>	Viva voce	<b>05</b>
<b>Q 5</b>	Lab. Records	<b>05</b>

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**COURSE NAME B. SC. MICROBIOLOGY SEMESTER I**

**PROGRAM CODE: SCIUG105**

**PRACTICAL MULTIDISCIPLINARY COURSE**

**BASIC MICROBIOLOGY PRACTICAL**

**PRACTICAL SKELETON (External Examination)**

**Time: 3 Hours**

**Total Marks: 25**

<b>Q 1</b>	Perform any one practical from list given below	<b>05</b>
<b>Q 2</b>	Perform any one practical from list given below	<b>05</b>
<b>Q 3</b>	Spotting	<b>05</b>
<b>Q 4</b>	Viva-voce	<b>05</b>
<b>Q 5</b>	Journal	<b>05</b>

**PRACTICAL MULTIDISCIPLINARY COURSE**

**BASIC MICROBIOLOGY PRACTICAL**

**PRACTICAL SKELETON (Internal Examination)**

**Time: 3 Hours**

**Total Marks: 25**

<b>Q 1</b>	Perform any one practical from list given below	<b>05</b>
<b>Q 2</b>	Perform any one practical from list given below	<b>05</b>
<b>Q 3</b>	Spotting	<b>05</b>
<b>Q 4</b>	Viva voce	<b>05</b>
<b>Q 5</b>	Lab. Records	<b>05</b>



**HEMCHANDRACHARYA NORTH  
GUJARAT UNIVERSITY PATAN**

**B.Sc. Biotechnology Syllabus (New Education  
Policy-NEP)**

<b>Document code</b>	<b>Syllabus Biotechnology NEP- 2023</b>
<b>Name of faculty</b>	<b>Science</b>
<b>Faculty code</b>	<b>SCI</b>
<b>Programme name</b>	<b>Undergraduate (B.Sc.)</b>
<b>Subject</b>	<b>Biotechnology</b>
<b>Programme code</b>	<b>SCIUG106</b>
<b>Effective from</b>	<b>June-2023</b>

**Hemchandracharya North Gujarat University,  
PATAN**

**B.Sc. Biotechnology  
Syllabus**

**w.e.f.**

**from June 23-24**

**under NEP**

## About

Biotechnology is emerging subject in the biological spectrum. Biotechnology is multidisciplinary field which has major impact on our lives. The technology is known since years which involve working with cells or cell-derived molecules for various applications. It has wide range of uses and is termed “technology of hope” which impact human health, well being of other life forms and our environment. It has revolutionized diagnostics and therapeutics; however, the major challenges to the human beings have been threats posed by deadly virus infections as avian flu, Chikungunya, Ebola, Influenza A, SARS, West Nile, and the latest Zika virus. Personalized medicine is increasingly recognized in healthcare system. In this chapter, the readers would understand the applications of biotechnology in human health care system. It has also impacted the environment which is loaded by toxic compounds due to human industrialization and urbanization. Bioremediation process utilizes use of natural or recombinant organisms for the cleanup of environmental toxic pollutants. The development of insect and pest resistant crops and herbicide tolerant crops has greatly reduced the environmental load of toxic insecticides and pesticides. The increase in crop productivity for solving world food and feed problem is addressed in agricultural biotechnology. The technological advancements have focused on development of alternate, renewable, and sustainable energy sources for production of biofuels. Marine biotechnology explores the products which can be obtained from aquatic organisms. As with every research area, the field of biotechnology is associated with many ethical issues and unseen fears. These are important in defining laws governing the feasibility and approval for the conduct of particular research. Biotechnological advancement has made human life easy in all aspects of human life. Environment, health (diagnostics and treatment), agriculture, forensics, archeology, evolutionary biology and dairy are the major field where biotechnology research is driving new paths. Biotechnology is a professional and challenging field. Unlike conventional science, biotechnology nurtures creativity, innovative ideas and advanced way of learning in the students. The field opens horizons to the world. Those young minds that have no boundary limits have great scope in biotechnology.

The National Education Policy (NEP) 2020 (hereafter referred to as NEP or Policy) recognizes that higher education plays 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. It notes that “given the 21st-century requirements, quality higher education must aim to develop good, thoughtful, well-rounded, and creative individuals”.

The NEP highlights certain fundamental principles that would guide both the education system at large, as well as individual educational institutions. The principles that have a direct bearing on the curricula for different levels of higher education include:

- i. Recognizing, identifying, and fostering the unique capabilities of each student to promote her/his holistic development;

- ii. Flexibility, so that learners can select their learning trajectories and programmes, and thereby choose their own paths in life according to their talents and interests;
- iii. Flexibility, so that learners can select their learning trajectories and programmes, and thereby choose their own paths in life according to their talents and interests;
- iv. Multidisciplinary and holistic education across the sciences, social sciences, arts, humanities, and sports for a multidisciplinary world;
- v. Emphasis on conceptual understanding rather than rote learning, critical thinking to encourage logical decision-making and innovation; ethics and human & constitutional values, and life skills such as communication, teamwork, leadership, and resilience;
- vi. Extensive use of technology in teaching and learning, removing language barriers, increasing access for Divyang students, and educational planning and management;
- vii. Respect for diversity and respect for the local context in all curricula, pedagogy, and policy;
- viii. Equity and inclusion as the cornerstone of all educational decisions to ensure that all students are able to thrive in the education system and the institutional environment are responsive to differences to ensure that high-quality education is available for all.
- ix. Rootedness and pride in India, and its rich, diverse, ancient, and modern culture, languages, knowledge systems, and traditions.

University has adopted a framework with the NEP guidelines in mind. A student can enroll for undergraduate program with these instructions. A student has option for multiple entry and exit to the course. A student gets certificate after completing two semesters; a diploma after completing four semesters. Once a student completes six semesters, he earns bachelor degree. He can further continue his study for two more semesters i.e. eight semesters (Four year graduate program) study and can earn bachelor degree with honours. Student also has opportunity to study same program without or with research.

### Syllabus B.Sc. (Biotechnology) Sem-I and II

Sr. No.	Course code	Study components	Instructions Hrs./week	Examination			Credit	Exam Hours
				Continuous & Comprehensive Evaluation (CCE)	Semester End Evaluation (SEE)	Total		
Semester I								
Theory Course (DSC)								
1	SC23MJDSCBIO101	Introduction to Biotechnology	04	50	50	100	4	2:30
3	SC23MIDSCBIO102	Introduction to Biotechnology	02	25	25	50	2	2:00
4	SC23MDCBIO103	Introduction to Biotechnology	02	25	25	50	2	2:00
Practical Course (PDSC)								
5	SC23PMJDSCBIO101	Introduction to Biotechnology	4 (Group A + Group B)	50	25 Group A 25 Group B	25 Group A 25 Group B	4	5:00
6	SC23PMIDSCBIO102	Introduction to Biotechnology	04	25	25	50	2	2:30
7	SC23PMDCBIO103	Introduction to Biotechnology	04	25	25	50	2	2:30
Ability Enhancement Course								
9	SC23AECBIO104	English	02	---	50	50	2	2:00
Value Added Course								
10	---	To be chosen from basket offered by university	02	---	50	50	2	2:00
Skill Enhancement Course (SEC)								
11	SC23SECBIO106	Basics of Forensic	02	---	50	100	2	2:00

		Biotechnology						
			30	200	350	550	22	
<b>Semester II</b>								
<b>Theory Course (DSC)</b>								
1	SC23MJDSCBIO201	Cell Biology	04	50	50	100	4	2:30
3	SC23MIDSCBIO202	Cell Biology	02	25	25	50	2	2:00
4	SC23MDCBIO203	Cell Biology	02	25	25	50	2	2:00
<b>Practical Course (PDSC)</b>								
5	SC23PMJDSCBIO201	Cell Biology	4 (Group A + Group B)	50	25 Group A 25 Group B	25 Group A 25 Group B	4	5:00
6	SC23PMIDSCBIO202	Cell Biology	04	25	25	50	2	2:30
7	SC23PMDCBIO203	Cell Biology	04	25	25	50	2	2:30
<b>Ability Enhancement Course</b>								
9	SC23AECBIO204	English	02	---	50	50	2	2:00
<b>Value Added Course</b>								
10	---	To be chosen from basket offered by university	02	---	50	50	2	2:00
<b>Skill Enhancement Course (SEC)</b>								
11	SC23SECBIO206	Agriculture Biotechnology	02	---	50	100	2	2:00
			30	200	350	550	22	

**Examination Structure:**

Major subject paper will have 50 marks theory paper. There will be total four questions. Three questions of 10 marks will be asked from each unit in Semester End Evaluation (SEE) examination (University examination). These questions will have 50% options. Fourth question will be from all units; short questions like definition etc. shall be asked.

Minor subject paper will have 25 marks theory paper. There will be three questions. Two questions from each unit will carry 10 marks. There will be 50% options. Third question will be from both units; short questions like definition etc. shall be asked.

Multidisciplinary subject will have similar paper style as for minor subject.

SEC, VAC/IKS, AEC will have SEE (university examination) only. These subjects are to be chosen from the basket offered by the university.

For Semester End Evaluation (SEE), 75% presence in all subjects and 70% presence in the subject is must.

**Internal Examination:**

The distribution of Continuous & Comprehensive Evaluation (CEE) (Internal Examination) for Major/ Minor/ Multidisciplinary subjects will be as below.

Written Test/ Weekly Test	45 %
Assignments/ MCQs/ Very short questions	45 %
Attendance/ Regularity written test and activity	10 %

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**SCIUG106**

**BT (Biotechnology)**

**SEMESTER I**

**Introduction to Biotechnology**

**SC23MJDSCBIO101**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

<b>Total Credits- 04 (04 Periods/ Week)</b>	<b>Theory</b>	<b>External 50 marks</b>
		<b>Internal 50 marks</b>

**Program Outcome**

1. Students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.
2. Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.
3. Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.
4. Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?
5. Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.
6. Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.
7. Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.
8. Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

**Course Outcome**

1. Course will help students in understanding basics of biotechnology and its applied areas.
2. Students will understand use of biotechnology in Agriculture sector.
3. Course targets application of biotechnology in human health care.
4. Course aims to create basic understanding of use of biotechnology in resolution of various problems such as environmental pollution.



Sr. No.			Credit	Hrs.
1	UNIT-1	Introduction to biotechnology Historical development in Biotechnology Areas of Biotechnology Industrial sector of Biotechnology Startup and Innovation (SSIP)	1	15
2	UNIT-2	Scope of Biotechnology in Agriculture Biotechnology and crop improvement Biopesticide Application of plant tissue culture in Agriculture	1	15
3	UNIT-3	Role of biotechnology in health care Production of recombinant therapeutic proteins Molecular diagnosis Vaccine improvement using biotechnology	1	15
4	UNIT-4	Biotechnology in human welfare Bioremediation, Biofertilizer Application of biotechnology in forensic science	1	15

**References:**

1. Textbook of biotechnology by R.C. Dubay

**Further Reading:**

2. Principles of gene manipulation by S.B. Primrose, R.M. Twyman 6<sup>th</sup> Edition

**SC23PMJDSCBIO101**

**Introduction to Biotechnology Practicals**

**Group B**

1. Do's and Don'ts of Laboratory
2. Handling concentrated acids/ alkalis
3. Hazards chemicals and handling
4. Instructions and mock for primary treatment in case of accident
5. Introduction of MSDS of a chemical
6. Carcinogens and instructions on handling carcinogenic chemicals
7. Introduction to solution: Molarity, Molality and Normality.
8. Making Percent solution
9. Making Molar solution
10. Making Normal solution

**Group B**

11. Basic layout of Biotechnology lab
12. Introduction to sterilization/ disinfection and its importance in the laboratory
13. Introduction to SOP for instruments
14. Laminar Air Flow: architecture and handling
15. Centrifuge: architecture and handling
16. Microscope: architecture and handling
17. Autoclave: architecture and handling
18. Vis-Spectrophotometer: architecture and handling
19. Important buffers in biotechnology laboratory
20. Personal protective equipments for routine and highly pathogenic work

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**SCIUG106**

**BT (Biotechnology)**

**SEMESTER I**

**Introduction to Biotechnology**

**SC23MIDSCBIO102**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

<b>Total Credits- 02 (02 Periods/ Week)</b>	<b>Theory</b>	<b>External 25 marks</b>
		<b>Internal 25 marks</b>

**Program Outcome**

1. Students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.
2. Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.
3. Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.
4. Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?
5. Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.
6. Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.
7. Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.
8. Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

**Course Outcome**

1. Course will help students in understanding basics of biotechnology and its applied areas.
2. Students will understand use of biotechnology in Agriculture sector.
3. Course targets application of biotechnology in human health care.
4. Course aims to create basic understanding of use of biotechnology in resolution of various problems such as environmental pollution.

Sr. No.			Credit	Hrs.
1	UNIT-1	Introduction to biotechnology Historical development in Biotechnology Areas of Biotechnology Industrial sector of Biotechnology Startup and Innovation (SSIP) Scope of Biotechnology in Agriculture Biotechnology and crop improvement Biopesticide Application of plant tissue culture in Agriculture	1	15
2	UNIT-2	Role of biotechnology in health care Production of recombinant therapeutic proteins Molecular diagnosis Vaccine improvement using biotechnology Biotechnology in human welfare Bioremediation Biofertilizer Application of biotechnology in forensic science	1	15

**References:**

1. Textbook of biotechnology by R.C. Dubay

**Further Reading:**

1. Principles of gene manipulation by S.B. Primrose, R.M. Twyman 6<sup>th</sup> Edition

**SC23PMIDSCBIO102 Introduction to Biotechnology Practicals**

1. Do's and Don'ts of Laboratory
2. Handling concentrated acids/ alkalis
3. Hazards chemicals and handling
4. Instructions and mock for primary treatment in case of accident
5. Introduction of MSDS of a chemical
6. Carcinogens and instructions on handling carcinogenic chemicals
7. Introduction to solution: Molarity, Molality and Normality.
8. Making Percent solution
9. Making Molar solution
10. Making Normal solution
11. Basic layout of Biotechnology lab
12. Introduction to sterilization/ disinfection and its importance in the laboratory
13. Introduction to SOP for instruments
14. Laminar Air Flow: architecture and handling
15. Centrifuge: architecture and handling
16. Microscope: architecture and handling
17. Autoclave: architecture and handling
18. Vis-Spectrophotometer: architecture and handling
19. Important buffers in biotechnology laboratory
20. Personal protective equipments for routine and highly pathogenic work

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**SCIUG106**

**BT (Biotechnology)**

**SEMESTER I**

**Introduction to Biotechnology**

**SC23MDCBIO103**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

<b>Total Credits- 02 (02 Periods/ Week)</b>	<b>Theory</b>	<b>External 25 marks</b>
		<b>Internal 25 marks</b>

**Program Outcome**

1. Students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.
2. Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.
3. Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.
4. Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?
5. Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.
6. Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.
7. Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.
8. Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

**Course Outcome**

1. Course will help students in understanding basics of biotechnology and its applied areas.
2. Students will understand use of biotechnology in Agriculture sector.
3. Course targets application of biotechnology in human health care.
4. Course aims to create basic understanding of use of biotechnology in resolution of various problems such as environmental pollution.

Sr. No.			Credit	Hrs.
1	UNIT-1	Introduction to biotechnology Historical development in Biotechnology Areas of Biotechnology Industrial sector of Biotechnology Startup and Innovation (SSIP). Scope of Biotechnology in Agriculture Biotechnology and crop improvement Biopesticide	1	15
2	UNIT-2	Application of plant tissue culture in Agriculture. Role of biotechnology in health care Production of recombinant therapeutic proteins Molecular diagnosis Vaccine improvement using biotechnology Biotechnology in human welfare Bioremediation Biofertilizer Application of biotechnology in forensic science	1	15

**References:**

1. Textbook of biotechnology by R.C. Dubay

**Further Reading:**

1. Principles of gene manipulation by S.B. Primrose, R.M. Twyman 6<sup>th</sup> Edition

**SC23PMDCBIO103**

**Introduction to Biotechnology Practicals**

1. Do's and Don'ts of Laboratory
2. Handling concentrated acids/ alkalis
3. Hazards chemicals and handling
4. Instructions and mock for primary treatment in case of accident
5. Introduction of MSDS of a chemical
6. Carcinogens and instructions on handling carcinogenic chemicals
7. Introduction to solution: Molarity, Molality and Normality.
8. Making Percent solution
9. Making Molar solution
10. Making Normal solution
11. Basic layout of Biotechnology lab
12. Introduction to sterilization/ disinfection and its importance in the laboratory
13. Introduction to SOP for instruments
14. Laminar Air Flow: architecture and handling
15. Centrifuge: architecture and handling
16. Microscope: architecture and handling
17. Autoclave: architecture and handling
18. Vis-Spectrophotometer: architecture and handling
19. Important buffers in biotechnology laboratory
20. Personal protective equipments for routine and highly pathogenic work

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**SCIUG106**

**BT (Biotechnology)**

**SEMESTER I**

**Basics of Forensic Biotechnology**

**SC23SEC BIO106**

**EFFECTIVE FROM JUNE 2023-24 UNDER NEP**

<b>Total Credits- 02 (02 Periods/ Week)</b>	<b>Theory</b>	<b>External 50 marks</b>
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**Program Outcome**

1. Students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.
2. Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.
3. Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.
4. Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?
5. Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.
6. Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.
7. Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.
8. Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

**Course Outcome**

1. Describe the significance of DNA profiling in various civil and criminal trials
2. Comprehend how to extract DNA from different biological materials in various conditions for forensic purposes
3. Gain in-depth knowledge of how different molecular biology techniques can be used for DNA profiling
4. Think critically and discuss the legal and ethical issues of DNA profiling in the forensic investigation process

<b>Sr. No.</b>			<b>Credit</b>	<b>Hrs.</b>
1	UNIT-1	Introduction and principles of forensic science, forensic science laboratory and its organization and service, tools and techniques in forensic science. Role of the toxicologist, significance of toxicological findings	1	15
2	UNIT-2	Principle of DNA fingerprinting, application of DNA profiling in forensic medicine, Investigation Tools, eDiscovery, Evidence Preservation, Search and Seizure of Computers, Introduction to Cyber security.	1	15

**References:**

1. Fundamentals of Biotechnology and Forensic Science by A K Shukla Amod K Singh

# **B.Sc. (Mathematics)**

**Detailed Syllabus as per NEP with Effect from July 2023**



<b>FACULTY:</b>	<b>SCIENCE</b>
<b>SUBJECT:</b>	<b>MATHEMATICS</b>
<b>PROGRAMME NAME:</b>	<b>BACHELOR OF SCIENCE</b>
<b>PROGRAMME CODE:</b>	<b>SCIUG107</b>
<b>SEMESTER:</b>	<b>I to II (1<sup>st</sup> Year)</b>
<b>TOTAL PAGE:</b>	<b>01 TO 39 (with First Cover Page)</b>
<b>DATE:</b>	<b>10 August 2023</b>



Term	Type of Course	Mathematics Course Code	Total Units /Practical	Credit	Hrs. Per Term	External Marks (SEE)	Internal Marks (CCE)	Total Marks	External Examination Duration	Page No
Semester I	MJDSC	Paper-1	4	4	60	50	50	100	2.5Hrs	02/39
		Practical	Group A:10 Group B:10	4	120	50	50	100	Min5.0Hrs	04/39 & 06/39
	MIDSC	Paper-1	2	2	30	25	25	50	2Hrs	10/39
		Practical	10	2	60	25	25	50	Min2.5Hrs	12/39
	MDC	Paper-1	2	2	30	25	25	50	2Hrs	14/39
		Practical	10	2	60	25	25	50	Min2.5Hrs	16/39
	SEC	Paper-1	2	2	30	25	25	50	2.0Hrs	18/39
Semester II	MJDSC	Paper-1	4	4	60	50	50	100	2.5Hrs	20/39
		Practical	Group A:10 Group B:10	4	120	50	50	100	Min5.0Hrs	22/39 & 24/39
	MIDSC	Paper-1	2	2	30	25	25	50	2Hrs	27/39
		Practical	10	2	60	25	25	50	Min2.5Hrs	29/39
	MDC	Paper-1	2	2	30	25	25	50	2Hrs	31/39
		Practical	10	2	60	25	25	50	Min2.5Hrs	3134/39
	SEC	Paper-1	2	2	30	25	25	50	2.0Hrs	35/39
Sem 1 & Sem 2			Evaluation System for CCE and SEE							37/39

## B.Sc. (Mathematics) SEMESTER-1 Syllabus

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
<b>SUBJECT :</b>	<b>MATHEMATICS</b>
<b>PROGRAM CODE:</b>	<b>(B. Sc.) SCIUG107</b>
<b>SEMESTER:</b>	<b>I</b>
<b>COURSE NAME:</b>	<b>Major Discipline Theory Course-1</b>
<b>COURSE CODE:</b>	<b>SC23MJDSCMAT101</b>
<b>PAPER NAME</b>	<b>Calculus and Vector Analysis</b>
<b>With Effect From :</b>	<b>JULY 2023</b>
<b>Total Theory Credits:</b>	<b>04 (04 Period /Week)</b>
<b>Exam Pattern:</b>	<b>50 Marks (CCE) + 50 Marks (SEE) = 100 Marks</b>
<b>Program Outcome :</b>	
<b>1</b>	<b>The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.</b>
<b>2</b>	<b>Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.</b>
<b>3</b>	<b>The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.</b>
<b>4</b>	<b>Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.</b>
<b>Course Outcome :</b>	
<b>1</b>	<b>Develop skills in successive differentiation, including using Leibnitz's Theorem to find higher-order derivatives, and applying it to solve Problems and real-world applications.</b>
<b>2</b>	<b>Understand the geometrical concept of Cauchy Mean Value theorem, to expand functions in power series using Taylor's &amp; Maclaurin's Theorem, evaluate limits using L'Hospitals Rules.</b>
<b>3</b>	<b>Understand the fundamental concepts of vector algebra, including scalar product and vector multiplication, co-planar vectors, and reciprocal vectors set.</b>
<b>4</b>	<b>Learn the concept of partial derivatives and vector analysis, including Understanding the properties of gradient, divergence, and curl, and Using them to solve problems.</b>

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	1	(Revision: Definition of derivative, repeat all formula of derivative ) Successive Differentiation: Define Successive Differentiation, Derive Standard result for $n^{\text{th}}$ derivatives and all examples for this formula for some special functions: namely, $(ax + b)^m$ ; $\frac{1}{ax+b}$ ; $\text{Log}(ax + b)$ ; $m^{ax+b}$ ; $e^{ax+b}$ ; $\text{Sin}(ax + b)$ ; $\text{Cos}(ax + b)$ ; $e^{ax}.\text{Cos}(bx + c)$ ; $e^{ax}.\text{Sin}(bx + c)$ ; where $m \in R$ . Derive LEIBNITZ'S theorem for Successive Differentiation and its related Examples.	1	15
2	2	[Revision: Roll's Theorem & Lagrange Mean Value Theorem] Cauchy Mean Value Theorem & Expansion of Functions: Cauchy mean value theorem and its various forms & applications, Taylor's Theorem (without proof) and its various forms, Maclaurin's theorem and its applications, Expansion in power series of some functions like $e^x$ , $\sin x$ , $\cos x$ , $\sinh x$ , $\cosh x$ Indeterminate Forms like $\frac{0}{0}, \frac{\infty}{\infty}, \infty - \infty, 0^0, 1^\infty, \infty^0, 0^\infty$ ; L'hospital's Rule for $\frac{0}{0}$ Form and $\frac{\infty}{\infty}$ Form(without proof)	1	15
3	3	[Revision: Geometry of Vector] Vector: Scalar multiplication of three and four vectors in $R^3$ , Vector multiplication of three and four vectors in $R^3$ , Co-planar vector of $R^3$ , Theorems for scalar and vector Product of three and four vectors, Reciprocal Vectors Set, Theorems of Mutually Reciprocal Vectors, and examples for each of these topics.	1	15
4	4	Partial Derivative and Vector Analysis: Partial Derivative: Definition of partial derivative and Partial derivative of higher order and its examples. Vector Analysis: Definition of gradient, theorems of gradient and its examples, Definition of divergence, theorems of divergence and its examples, Definition of curl, theorems of Curl and its examples, Some property of gradient, divergence and curl and their examples.	1	15
References:				
1	Shanti Narayan, Differential Calculus, S. Chand Publishing, ISBN: 978-9352836756			
2	Murry R. Spiegel, Vector Analysis. Schaum's Outlines, ISBN: 978-0071615457			
3	NCERT Class XII Mathematics Textbook			
Further Reading:				
1	Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732			
2	Herry F. Davis, Introduction to Vector Analysis, 5 <sup>th</sup> Edition, McGraw-Hill Education, ISBN: 978-0070178379			

<b>Hemchandracharya North Gujarat University, Patan</b>	
<b>As per NEP-2020</b>	
<b>SUBJECT :</b>	<b>MATHEMATICS</b>
<b>PROGRAM CODE:</b>	<b>(B. Sc.) SCIUG107</b>
<b>SEMESTER:</b>	<b>I</b>
<b>COURSE NAME:</b>	<b>Major Discipline Practical Course-1 (Group A) Practical on Calculus</b>
<b>COURSE CODE:</b>	<b>SC23PMJDSCMAT101 (A)</b>
<b>With Effect From :</b>	<b>JULY 2023</b>
<b>Total Practical Credits:</b>	<b>02 (04 Period /Week) (Batch of 15 Students)</b>
<b>Exam Pattern:</b>	<b>25 Marks (CCE) + 25 Marks (SEE) = 50 Marks</b>
<b>Program Outcome :</b>	
<b>1</b>	<b>The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.</b>
<b>2</b>	<b>Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.</b>
<b>3</b>	<b>The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.</b>
<b>4</b>	<b>Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.</b>
<b>Course Outcome :</b>	
<b>1</b>	<b>Develop skills in successive differentiation, including using Leibnitz's Theorem to find higher-order derivatives, and applying it to solve problems and real-world applications.</b>
<b>2</b>	<b>Understand the geometrical concept of Cauchy Mean Value theorem, to expand functions in power series using Taylor's &amp; Maclaurin's Theorem, evaluate limits using L'Hospitals Rules.</b>

No.	Practical DETAILS : Group A
1	Successive Differentiation and Standard Results (Part 1) Task: Define successive differentiation and demonstrate the process of finding the $n$ th derivative of various functions, including $(ax + b)^m$ , $\frac{1}{ax+b}$ , $\log(ax + b)$ , $M^{ax+b}$ . Solve examples to illustrate the application of successive differentiation in finding higher-order derivatives.
2	Successive Differentiation and Standard Results (Part 2) Task: Apply successive differentiation to derive the $n$ th derivatives of functions such as $e^{ax+b}$ , $\sin(ax + b)$ and $\cos(ax + b)$ . Provide step-by-step explanations of the derivation process and solve examples to showcase the application of these results.
3	Successive Differentiation and Standard Results (Part 3) Task: Extend the concept of successive differentiation to functions $e^{ax} \sin(bx + c)$ and $e^{ax} \cos(bx + c)$ . Derive the $n$ th derivatives of these functions and solve examples to demonstrate the application of successive differentiation in finding higher-order derivatives.
4	Leibnitz's Theorem for Successive differentiation (Part-1) Task: Apply Leibnitz's theorem for successive differentiation.
5	Leibnitz's Theorem for Successive differentiation(Part-2) Task: Apply Leibnitz's theorem for successive differentiation for parametric equations.
6	Cauchy Mean Value Theorem (Part-1): Task: Verify C.M.V. theorem is applicable or not? for functions in given interval and if possible, find value of $c$ in respective interval.
7	Cauchy Mean Value Theorem (Part-2): Task : Application of C.M.V. theorem.
8	Taylor's Theorem: Task: To expand functions in power series using Taylor's theorem.
9	Maclaurin's Theorem: Task: To expand functions in power series using Maclaurin's theorem.
10	Indeterminate Forms: Task: To find the value of limit using L'Hospital's Rules.
<b>References:</b>	
1	Shanti Narayan, Differential Calculus, S. Chand Publishing, ISBN: 978-9352836756
2	Murry R. Spiegel, Vector Analysis. Schaum's Outlines, ISBN: 978-0071615457
3	B. S. Vatsa, Theory of Matrices, 2 <sup>nd</sup> Edition, Wiley Eastern Ltd. ISBN: 978-8126558646
4	"Complex Variables and Applications" by James Ward Brown and Ruel V. Churchill ,McGraw-Hill Education ISBN: 978-0074183170
<b>Further Reading:</b>	
1	Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732
2	Herry F. Davis, Introduction to Vector Analysis, 5 <sup>th</sup> Edition, McGraw-Hill Education, ISBN: 978-0070178379
3	Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd. , New Delhi ISBN: 978-0070602302
4	J. V. Deshpande, Complex Analysis, Tata McGraw- Hill Publishing Co. Ltd. , New Delhi ISBN: 978-0070587380

<b>Hemchandracharya North Gujarat University, Patan</b>	
<b>As per NEP-2020</b>	
<b>SUBJECT :</b>	<b>MATHEMATICS</b>
<b>PROGRAM CODE:</b>	<b>(B. Sc.) SCIUG107</b>
<b>SEMESTER:</b>	<b>I</b>
<b>COURSE NAME:</b>	<b>Major Discipline Practical Course-1 (Group B)</b>
<b>COURSE CODE:</b>	<b>SC23PMJDSCMAT101 (B)</b>
<b>With Effect From :</b>	<b>JULY 2023</b>
<b>Total Practical Credits:</b>	<b>02 (04 Period /Week) (Batch of 15 Students)</b>
<b>Exam Pattern:</b>	<b>25 Marks (CCE) + 25 Marks (SEE) = 50 Marks</b>
<b>The basic requirement for the smooth and better conduction of the practical program:</b>	
<ol style="list-style-type: none"> <li>1. Must require a Computer operator and a peon for better conduction of the practical and maintenance of computer systems.</li> <li>2. Must have a computer lab fully equipped with Microsoft Office tools and internet facility.</li> </ol>	
<b>Program Outcome :</b>	
<b>1</b>	The B.Sc. program in Mathematics aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.
<b>2</b>	Upon completing the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.
<b>3</b>	The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.
<b>4</b>	Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, and algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.
<b>Course Outcome :</b>	
<b>1</b>	<b>Proficiency in Microsoft Word for Mathematical Writing:</b> <ul style="list-style-type: none"> <li>• Students should be able to create and format mathematical documents using Microsoft Word, including equations, symbols, and mathematical notation.</li> <li>• They should understand how to use Word features to structure and organize their mathematical research papers effectively.</li> </ul>
<b>2</b>	<b>Data Analysis with Microsoft Excel:</b> <ul style="list-style-type: none"> <li>• Students should gain a good understanding of Excel functions and tools relevant to mathematical data analysis.</li> <li>• They should be able to use Excel for tasks like organizing data, generating charts, and performing basic statistical analyses.</li> </ul>
<b>3</b>	<b>Creating Presentations with Microsoft PowerPoint:</b> <ul style="list-style-type: none"> <li>• Students should be able to create engaging and informative presentations on mathematical topics using PowerPoint.</li> <li>• They should understand how to effectively use visual aids, diagrams, and graphs to communicate mathematical concepts.</li> </ul>

No.	PRACTICAL DETAILS
Unit-1	Microsoft Office Word Tools used in Mathematical Research
1	<p><b>Text Basics for Math Type Equations, Text Formatting, and saving file</b></p> <ul style="list-style-type: none"> <li>• Typing the text, Typing Math Type equations, Alignment of text</li> <li>• Editing Text: Cut, Copy, Paste, Select All, Clear</li> <li>• Find &amp; Replace</li> <li>• New, Open, Close, Save, Save As</li> <li>• Formatting Text: Font Size, Font Style</li> <li>• Font Color, Use Bold, Italic, and Underline</li> <li>• Change the Text Case</li> <li>• Line spacing, Paragraph spacing</li> <li>• Shading text and paragraph</li> <li>• Working with Tabs and Indents</li> </ul> <p><b>(Questions to be asked in Practical: Making a word document for the best research paper style using Math type equations, and symbols and formatting them)</b></p>
2	<p><b>Working with Objects</b></p> <ul style="list-style-type: none"> <li>• Shapes, Clipart and Picture, Word Art, Smart Art</li> <li>• Columns and Orderings - To Add Columns to a Document</li> <li>• Change the Order of Objects</li> <li>• Page Number, Date &amp; Time</li> <li>• Inserting Text boxes</li> <li>• Inserting Word art</li> <li>• Inserting symbols</li> <li>• Inserting Chart</li> </ul> <p><b>(Questions to be asked in Practical: Making a Word document for the best research paper style using charts, clipart, inserting figures, and formatting them)</b></p>
3	<p><b>Working with Data Tables</b></p> <ul style="list-style-type: none"> <li>• Working with Tables, Table Formatting</li> <li>• Table Styles</li> <li>• Alignment option</li> <li>• Merge and split option * Headers &amp; Footers</li> </ul> <p><b>(Questions to be asked in Practical: Making a Word document for the best research paper style using data tables, Headers, Footers page numbers with title names and formatting them)</b></p>
Unit-2	Microsoft Office Excel Tools used in Mathematical Research
4	<p><b>Introduction to Excel</b></p> <ul style="list-style-type: none"> <li>• Introduction to Excel interface</li> <li>• Understanding rows and columns, Naming Cells</li> <li>• Working with Excel workbook and sheets</li> <li>• New, Open, Close, Save, Save As</li> <li>• Formatting Text: Font Size, Font Style</li> <li>• Font Color, Use Bold, Italic, and Underline</li> <li>• Wrap text, Merge, and Centre</li> <li>• Currency, Accounting, and other formats</li> <li>• Modifying Columns, Rows &amp; Cells</li> </ul>

	<b>(Questions to be asked in Practical: Making an Excel worksheet for the given data which is to be used in a research paper and formatting them)</b>
<b>5</b>	<b>Perform Calculations with Functions</b> <ul style="list-style-type: none"> <li>• Creating Simple Formulas</li> <li>• Setting up your own formula</li> <li>• Date and Time Functions, Financial Functions</li> <li>• Logical Functions, Lookup, and Reference</li> <li>• Functions Mathematical Functions</li> <li>• Statistical Functions, Text Functions.</li> </ul> <b>(Questions to be asked in Practical: Using statistical, text, and mathematical functions in Excel worksheet for the given data to obtain desired values in a mathematical format which is to be used in a research paper and formatting them)</b>
<b>Unit-3</b>	<b>Microsoft Office Excel Plotting Tools Used in Mathematical Research</b>
<b>6</b>	<b>Plotting of Graphs</b> <ul style="list-style-type: none"> <li>• Plotting graphs of trigonometric functions</li> <li>• Plotting graphs of inverse trigonometric function</li> <li>• Plotting graphs of Polynomial equations</li> </ul> <b>(Questions to be asked in Practical: Using statistical, text, and mathematical functions in Excel worksheet for the given data to obtain graphs of different types of functions which are to be used in a research paper and formatting them)</b>
<b>7</b>	<b>Sort and filter data</b> <ul style="list-style-type: none"> <li>• Using number filter, Text filter</li> <li>• Custom filtering</li> <li>• Removing filters from columns</li> <li>• Conditional formatting</li> </ul> <b>(Questions to be asked in Practical: To make an Excel worksheet for the given data to obtain graphs of different types of functions which are to be used in a research paper and formatting them)</b>
<b>Unit-4</b>	<b>Microsoft Office Power Point Tools Used in Mathematical Research</b>
<b>8</b>	<b>Introduction to PowerPoint Environment</b> <ul style="list-style-type: none"> <li>• New, Open, Close, Save, Save As</li> <li>• Typing the text, Alignment of text</li> <li>• Formatting Text: Font Size, Font Style</li> <li>• Font Color, Use Bold, Italic, and Underline</li> <li>• Cut, Copy, Paste, Select All, Clear text</li> <li>• Find &amp; Replace</li> <li>• Working with Tabs and Indents</li> </ul>
<b>9</b>	<b>Creating slides and applying themes</b> <ul style="list-style-type: none"> <li>• Inserting a new slide</li> <li>• Changing the layout of slides</li> <li>• Duplicating slides</li> <li>• Copying and pasting slide</li> <li>• Applying themes to the slide layout</li> <li>• Changing theme color</li> </ul>



	<ul style="list-style-type: none"> <li>• Slide background</li> <li>• Formatting slide background Using slide views</li> </ul>
<b>10</b>	<b>Working with bullets and numbering</b> <ul style="list-style-type: none"> <li>• Multilevel numbering and Bulleting</li> <li>• Creating List</li> <li>• Page bordering</li> <li>• Page background</li> <li>• Aligning text</li> <li>• Text directions</li> <li>• Columns option</li> </ul>
<b>11</b>	<b>Working with Objects</b> <ul style="list-style-type: none"> <li>• Shapes, Clipart and Picture, Word Art, Smart Art</li> <li>• Change the Order of Objects</li> <li>• Inserting slide header and footer</li> <li>• Inserting Text boxes</li> <li>• Inserting shapes, using quick styles</li> <li>• Inserting Word art</li> <li>• Inserting symbols</li> <li>• Inserting Chart</li> </ul> <p><b>(Questions to be asked in Practical: To make a PowerPoint presentation using the word file made using the above practical and presenting it which are to be used in RDC of Ph. D.)</b></p>
<b>References:</b>	
<b>1</b>	"Excel Spreadsheet Manual for Applied Mathematics" by Stela Pudar-Hozo, Indiana University Northwest, Pearson Publication
<b>2</b>	"Microsoft PowerPoint 2019 Step by Step" by Joan Lambert and Joyce Cox:
<b>3</b>	"Microsoft Word 2019 For Dummies" by Dan Gookin:
<b>4</b>	"Microsoft Excel Data Analysis and Business Modeling" by Wayne L. Winston
<b>Further Reading:</b>	
<b>1</b>	"MathType Cookbook" by Richard L. Evans and W. J. "Jerry" Cody:
<b>2</b>	"Math into LaTeX" by George Grätzer:
<b>3</b>	Applied Mathematics with Microsoft Excel by Chester Piascik published by Brooks/Cole
<b>4</b>	Microsoft Office Book by Rouf published by Innovative Solutions

<b>Hemchandracharya North Gujarat University, Patan</b>	
<b>As per NEP-2020</b>	
<b>SUBJECT :</b>	<b>MATHEMATICS</b>
<b>PROGRAM CODE:</b>	<b>(B. Sc.) SCIUG107</b>
<b>SEMESTER:</b>	<b>I</b>
<b>COURSE NAME:</b>	<b>Minor Discipline Theory Course-1</b>
<b>COURSE CODE:</b>	<b>SC23MIDSCMAT102</b>
<b>PAPER NAME</b>	<b>Introduction to Calculus</b>
<b>With Effect From :</b>	<b>JULY 2023</b>
<b>Total Theory Credits:</b>	<b>02 (02 Period /Week)</b>
<b>Exam Pattern:</b>	<b>25 Marks (CCE) + 25 Marks (SEE) = 50 Marks</b>
<b>Program Outcome :</b>	
<b>1</b>	<b>The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.</b>
<b>2</b>	<b>Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.</b>
<b>3</b>	<b>The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.</b>
<b>4</b>	<b>Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.</b>
<b>Course Outcome :</b>	
<b>1</b>	<b>Develop skills in successive differentiation, including using Leibnitz's Theorem to find higher-order derivatives, and applying it to solve Problems and real-world applications.</b>
<b>2</b>	<b>Understand the geometrical concept of Cauchy Mean Value theorem, to expand functions in power series using Taylor's &amp; Maclaurin's Theorem, evaluate limits using L'Hospitals Rules.</b>

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	1	(Revision: Definition of derivative, repeat all formula of derivative ) Successive Differentiation: Define Successive Differentiation, Derive Standard result for n <sup>th</sup> derivatives and all examples for this formula for some special functions: namely, $(ax + b)^m$ ; $\frac{1}{ax+b}$ ; $\text{Log}(ax + b)$ ; $m^{ax+b}$ ; $e^{ax+b}$ ; $\text{Sin}(ax + b)$ ; $\text{Cos}(ax + b)$ ; $e^{ax}.\text{Cos}(bx + c)$ ; $e^{ax}.\text{Sin}(bx + c)$ ; where $m \in R$ . Derive LEIBNITZ'S theorem for Successive Differentiation and its related Examples.	1	15
2	2	[Revision: Roll's Theorem & Lagrange Mean Value Theorem] Cauchy Mean Value Theorem & Expansion of Functions: Cauchy mean value theorem and its various forms & applications, Taylor's Theorem (without proof) and its various forms, Maclaurin's theorem and its applications, Expansion in power series of some functions like $e^x, \sin x, \cos x, \sinh x, \cosh x$ Indeterminate Forms like $\frac{0}{0}, \frac{\infty}{\infty}, \infty - \infty, 0^0, 1^\infty, \infty^0, 0^\infty$ ; L'hospital's Rule for $\frac{0}{0}$ Form and $\frac{\infty}{\infty}$ Form(without proof)	1	15
References:				
1	Shanti Narayan, Differential Calculus, S. Chand Publishing, ISBN: 978-9352836756			
2	Murry R. Spiegel, Vector Analysis. Schaum's Outlines, ISBN: 978-0071615457			
3	NCERT Class XII Mathematics Textbook			
Further Reading:				
1	Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732			
2	Herry F. Davis, Introduction to Vector Analysis, 5 <sup>th</sup> Edition, McGraw-Hill Education, ISBN: 978-0070178379			

<b>Hemchandracharya North Gujarat University, Patan</b>	
<b>As per NEP-2020</b>	
<b>SUBJECT :</b>	<b>MATHEMATICS</b>
<b>PROGRAM CODE:</b>	<b>(B. Sc.) SCIUG107</b>
<b>SEMESTER:</b>	<b>I</b>
<b>COURSE NAME:</b>	<b>Minor Discipline Practical Course-1 Practical on Introduction to Calculus</b>
<b>COURSE CODE:</b>	<b>SC23PMIDSCMAT102</b>
<b>With Effect From :</b>	<b>JULY 2023</b>
<b>Total Practical Credits:</b>	<b>02 (04 Period /Week)</b>
<b>Exam Pattern:</b>	<b>25 Marks (CCE) + 25 Marks (SEE) = 50 Marks</b>
<b>Program Outcome :</b>	
<b>1</b>	<b>The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.</b>
<b>2</b>	<b>Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.</b>
<b>3</b>	<b>The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.</b>
<b>4</b>	<b>Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.</b>
<b>Course Outcome :</b>	
<b>1</b>	<b>Develop skills in successive differentiation, including using Leibnitz's Theorem to find higher-order derivatives, and applying it to solve problems and real-world applications.</b>
<b>2</b>	<b>Understand the geometrical concept of Cauchy Mean Value theorem, to expand functions in power series using Taylor's &amp; Maclaurin's Theorem, evaluate limits using L'Hospitals Rules.</b>

No.	Practical DETAILS
1	Successive Differentiation and Standard Results (Part 1) Task: Define successive differentiation and demonstrate the process of finding the $n$ th derivative of various functions, including $(ax + b)^m$ , $\frac{1}{ax+b}$ , $\log(ax + b)$ , $M^{ax+b}$ . Solve examples to illustrate the application of successive differentiation in finding higher-order derivatives.
2	Successive Differentiation and Standard Results (Part 2) Task: Apply successive differentiation to derive the $n$ th derivatives of functions such as $e^{ax+b}$ , $\sin(ax + b)$ and $\cos(ax + b)$ . Provide step-by-step explanations of the derivation process and solve examples to showcase the application of these results.
3	Successive Differentiation and Standard Results (Part 3) Task: Extend the concept of successive differentiation to functions $e^{ax} \sin(bx + c)$ and $e^{ax} \cos(bx + c)$ . Derive the $n$ th derivatives of these functions and solve examples to demonstrate the application of successive differentiation in finding higher-order derivatives.
4	Leibnitz's Theorem for Successive differentiation (Part-1) Task: Apply Leibnitz's theorem for successive differentiation.
5	Leibnitz's Theorem for Successive differentiation (Part-2) Task: Apply Leibnitz's theorem for successive differentiation for parametric equations.
6	Cauchy Mean Value Theorem (Part-1): Task: Verify C.M.V. theorem is applicable or not? for functions in given interval and if possible, find value of $c$ in respective interval.
7	Cauchy Mean Value Theorem (Part-2): Task : Application of C.M.V. theorem.
8	Taylor's Theorem: Task: To expand functions in power series using Taylor's theorem.
9	Maclaurin's Theorem: Task: To expand functions in power series using Maclaurin's theorem.
10	Indeterminate Forms: Task: To find the value of limit using L'Hospital's Rules.
References:	
1	Shanti Narayan, Differential Calculus, S. Chand Publishing, ISBN: 978-9352836756
2	Murry R. Spiegel, Vector Analysis. Schaum's Outlines, ISBN: 978-0071615457
3	NCERT Class XII Mathematics Textbook
Further Reading:	
1	Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732
2	Herry F. Davis, Introduction to Vector Analysis, 5 <sup>th</sup> Edition, McGraw-Hill Education, ISBN: 978-0070178379

<b>Hemchandracharya North Gujarat University, Patan</b>	
<b>As per NEP-2020</b>	
<b>SUBJECT :</b>	<b>MATHEMATICS</b>
<b>PROGRAM CODE:</b>	<b>(B. Sc.) SCIUG107</b>
<b>SEMESTER:</b>	<b>I</b>
<b>COURSE NAME:</b>	<b>Multi-Disciplinary Theory Course-1</b>
<b>COURSE CODE:</b>	<b>SC23MDCMAT103</b>
<b>PAPER NAME</b>	<b>Mathematics-1</b>
<b>With Effect From :</b>	<b>JULY 2023</b>
<b>Total Theory Credits:</b>	<b>02 (02 Period /Week)</b>
<b>Exam Pattern:</b>	<b>25 Marks (CCE) + 25 Marks (SEE) = 50 Marks</b>
<b>Program Outcome :</b>	
<b>1</b>	The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.
<b>2</b>	Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.
<b>3</b>	The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.
<b>4</b>	Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.
<b>Course Outcome :</b>	
<b>1</b>	Develop skills in successive differentiation, including using Leibnitz's Theorem to find higher-order derivatives, and applying it to solve Problems and real-world applications.
<b>2</b>	Understand the geometrical concept of Cauchy Mean Value theorem, to expand functions in power series using Taylor's & Maclaurin's Theorem, evaluate limits using L'Hospitals Rules.

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	1	(Revision: Definition of differentiation, Recall all formulas for differentiation ) Successive Differentiation: Definition of Successive Differentiation, Derive formulas for n <sup>th</sup> derivatives of some functions like, $(ax + b)^m$ ; $\frac{1}{ax+b}$ ; $\text{Log}(ax + b)$ ; $m^{ax+b}$ ; $e^{ax+b}$ ; $\text{Sin}(ax + b)$ ; $\text{Cos}(ax + b)$ ; $e^{ax}.\text{Cos}(bx + c)$ ; $e^{ax}.\text{Sin}(bx + c)$ ; where $m \in R$ and using these formulas solve related examples. Derive Leibnitz's theorem for Successive Differentiation and solve its related examples.	1	15
2	2	[ Recall the Roll's Theorem & Lagrange Mean Value Theorem] Derive the Cauchy Mean Value Theorem and deduce its various forms, using these forms solve related examples. Expansion of Functions: Taylor's Theorem (without proof) and deduce its various forms, Derive Maclaurin's theorem. Applications of Taylor's & Maclaurin's expansion formulas, Expansion of $e^x$ , $\sin x$ , $\cos x$ , $\sinh x$ , $\cosh x$ in infinite series. Know the Indeterminate Forms $\frac{0}{0}, \frac{\infty}{\infty}, \infty - \infty, 0^0, 1^\infty, \infty^0, 0^\infty$ ; Evaluation of limit using L'hospital's Rule for $\frac{0}{0}$ Form and $\frac{\infty}{\infty}$ Form.	1	15
References:				
1	Shanti Narayan, Differential Calculus, S. Chand Publishing, ISBN: 978-9352836756			
2	Murry R. Spiegel, Vector Analysis. Schaum's Outlines, ISBN: 978-0071615457			
4	NCERT Class XII Mathematics Textbook			
Further Reading:				
1	Herry F. Davis, Introduction to Vector Analysis, 5 <sup>th</sup> Edition, McGraw-Hill Education, ISBN: 978-0070178379			
2	James Stewart, Calculus: Concepts and Contexts, 4 <sup>th</sup> Edition, Thomson Brooks/Cole, 2018 ISBN: 978-1417687669			

<b>Hemchandracharya North Gujarat University, Patan</b>	
<b>As per NEP-2020</b>	
<b>SUBJECT :</b>	<b>MATHEMATICS</b>
<b>PROGRAM CODE:</b>	<b>(B. Sc.) SCIUG107</b>
<b>SEMESTER:</b>	<b>I</b>
<b>COURSE NAME:</b>	<b>Multi-Disciplinary Practical Course-1 Practical on Mathematics-1</b>
<b>COURSE CODE:</b>	<b>SC23PMDCMAT103</b>
<b>With Effect From :</b>	<b>JULY 2023</b>
<b>Total Theory Credits:</b>	<b>02 (04 Period /Week)</b>
<b>Exam Pattern:</b>	<b>25 Marks (CCE) + 25 Marks (SEE) = 50 Marks</b>
<b>Program Outcome :</b>	
<b>1</b>	<b>The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.</b>
<b>2</b>	<b>Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.</b>
<b>3</b>	<b>The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.</b>
<b>4</b>	<b>Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.</b>
<b>Course Outcome :</b>	
<b>1</b>	<b>Develop skills in successive differentiation, including using Leibnitz's Theorem to find higher-order derivatives, and applying it to solve problems and real-world applications.</b>
<b>2</b>	<b>Understand the geometrical concept of Cauchy Mean Value theorem, to expand functions in power series using Taylor's &amp; Maclaurin's Theorem, evaluate limits using L'Hospitals Rules.</b>



No.	Practical DETAILS
1	<b>Successive Differentiation and Standard Results (Part 1)</b> Task: Define successive differentiation and demonstrate the process of finding the nth derivative of various functions including $(ax + b)^m$ , $\frac{1}{ax+b}$ , $\log(ax + b)$ , $M^{ax+b}$ . Solve examples to illustrate the application of successive differentiation in finding higher-order derivatives.
2	<b>Successive Differentiation and Standard Results (Part 2)</b> Task: Apply successive differentiation to derive the nth derivatives of functions such as $e^{ax+b}$ , $\sin(ax + b)$ and $\cos(ax + b)$ Provide step-by-step explanations of the derivation process and solve examples to showcase the application of these results.
3	<b>Successive Differentiation and Standard Results (Part 3)</b> Task: Extend the concept of successive differentiation to functions $e^{ax} \sin(bx + c)$ and $e^{ax} \cos(bx + c)$ . Derive the nth derivatives of these functions and solve examples to demonstrate the application of successive differentiation in finding higher-order derivatives.
4	<b>Leibnitz's Theorem for Successive differentiation (Part-1)</b> Task: Apply Leibnitz's theorem for successive differentiation.
5	<b>Leibnitz's Theorem for Successive differentiation(Part-2)</b> Task: Apply Leibnitz's theorem for successive differentiation for parametric equations.
6	<b>Cauchy Mean Value Theorem (Part-1):</b> Task: Verify C.M.V. theorem is applicable or not? for functions in given interval and if possible, find value of c in respective interval.
7	<b>Cauchy Mean Value Theorem (Part-2):</b> Task : Application of C.M.V. theorem.
8	<b>Taylor's Theorem:</b> Task: To expand functions in power series using Taylor's theorem.
9	<b>Maclaurin's Theorem:</b> Task: To expand functions in power series using Maclaurin's theorem.
10	<b>Indeterminate Forms:</b> Task: To find the value of limit using L'Hospital's Rules.
<b>References:</b>	
1	Shanti Narayan, Differential Calculus, S. Chand Publishing, ISBN: 978-9352836756
2	Murry R. Spiegel, Vector Analysis. Schaum's Outlines, ISBN: 978-0071615457
4	NCERT Class XII Mathematics Textbook
<b>Further Reading:</b>	
1	Herry F. Davis, Introduction to Vector Analysis, 5 <sup>th</sup> Edition, McGraw-Hill Education, ISBN: 978-0070178379
2	James Stewart, Calculus: Concepts and Contexts, 4 <sup>th</sup> Edition, Thomson Brooks/Cole, 2018 ISBN: 978-1417687669

<b>Hemchandracharya North Gujarat University, Patan</b>	
<b>As per NEP-2020</b>	
<b>SUBJECT :</b>	<b>MATHEMATICS</b>
<b>PROGRAM CODE:</b>	<b>(B. Sc.) SCIUG107</b>
<b>SEMESTER:</b>	<b>I</b>
<b>COURSE NAME:</b>	<b>Skill Enhancement Theory Course-1</b>
<b>COURSE CODE:</b>	<b>SC23SECMAT106</b>
<b>PAPER NAME</b>	<b>Mathematics for Competitive Exams-1</b>
<b>With Effect From :</b>	<b>JULY 2023</b>
<b>Total Theory Credits:</b>	<b>02 (02 Period /Week)</b>
<b>Exam Pattern:</b>	<b>25 Marks (CCE) + 25 Marks (SEE) = 50 Marks</b>
<b>Program Outcome :</b>	
<b>1</b>	<b>The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.</b>
<b>2</b>	<b>Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.</b>
<b>3</b>	<b>The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.</b>
<b>4</b>	<b>Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.</b>
<b>Course Outcome :</b>	
<b>1</b>	<b>Students get knowledge about mathematical rules, formulae and concepts for competitive examination.</b>
<b>2</b>	<b>Students were aware with the short tricks to solve the problems asked in competitive examination which are time consuming by its usual methods of solving them.</b>

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	1	<b>Number System: Numerals, Face Value and Place Value of the Digits in a Number, Types of Numbers, Operations on Numbers, Divisibility Tests Unit's Place of an Expression</b> <b>Number Series: Types of Series, Types of Questions Asked on Number Series</b> <b>HCF and LCM: Factors and Multiples, Least Common Multiple (LCM), Highest Common Factor(HCF), Method to Calculate LCM and HCF of Fractions, Method to Solve Questions Based on Bells</b>	1	15
2	2	<b>Square Root and Cube Root: Square, Square Root, Properties of Squares and Square Roots, Short Cut Techniques, Cube, Cube Root, Properties of Cube and Cube Roots</b> <b>Indices and Surds: Indices, Surds, Properties of surds, Operations on Surds, Short Cut Techniques.</b>	1	15
<b>References:</b>				
1	<b>Rajesh Verma, Fast Track objective Arithmetic, Arihant Publication India Ltd.</b>			
2	<b>Dr. R. S. Agrawal, Quantitative Aptitude, S. Chand Publication India Ltd.</b>			
<b>Further Reading:</b>				
1	<b>Satish Kumar, Maths in Moments, Arihant Publication India Ltd.</b>			
2	<b>Abhinay Sharma, Competitive Mathematics, Kiran Institute of Career Excellence.</b>			
3	<b>જગદીશ પટેલ, વિબર્ટ સહાયક, વિબર્ટ કેરિયર એક્સેમ્પી.</b>			



# હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC B (2.21) State University

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

ફોન: (૦૨૭૬૬) ૨૩૭૦૦૦

ફેક્સ : (૦૨૭૬૬) ૨૩૧૮૧૭

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પરિપત્ર નં.-૨૫૫/૨૦૨૪

રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦

વિષય: સ્નાતક કક્ષાના સેમેસ્ટર-૧ થી ૬ના બી.એસ.સી. કોમ્પ્યુટર સાયન્સ વિષયનો અભ્યાસક્રમ /  
પરિક્ષા સ્કીમ અંગે.

આ યુનિવર્સિટી સંલગ્ન એમ.એન.કોલેજ, વિસનગરના આચાર્યશ્રીને જણાવવાનું કે, રાષ્ટ્રીય શિક્ષણ નીતિ ૨૦૨૦ અંતર્ગત કોમ્પ્યુટર સાયન્સ વિષયની તારીખ: ૨૫/૦૮/૨૦૨૪ની સભાના ઠરાવ.નં.૩ અને ૪થી કરેલ ભલામણ અનુસાર સામેલ પરિશિષ્ટ પ્રમાણેના બી.એસ.સી. કોમ્પ્યુટર સાયન્સના સેમેસ્ટર-૧ થી ૬નો સિલેબર્સ શૈક્ષણિક વર્ષ: ૨૦૨૩-૨૪ થી ક્રમશઃ અમલમાં આવે તે રીતે વિદ્યાશાખા/ એકેડેમિક કાઉન્સિલ/સક્ષમ સત્તામંડળવતી સ્વીકારી મંજૂર કરેલ છે, જેનો અમલ કરવા સારૂ સંબંધિતોને આ સાથે મોકલવામાં આવે છે.

સદર બાબતની જાણ આપના સ્તરે થી અધ્યાપકશ્રીઓ તથા વિદ્યાર્થીઓને કરવાની રાખશો.

નોંધ: (૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરીપત્રની એક નકલ કોલેજના / ડિપાર્ટમેન્ટના ગ્રંથાલયમાં મૂકવાની રહેશે.

(૨) આ પરીપત્ર યુનિવર્સિટીની વેબસાઇટ [www.ngu.ac.in](http://www.ngu.ac.in) પર પણ ઉપલબ્ધ કરવામાં આવેલ છે. આથી સંબિધિત કોલેજોએ ડાઉનલોડ કરી ઉપયોગ કરવા જણાવવામાં આવે છે.

બિડાણ: ઉપર મુજબ

12 / 12  
કુલસચિવ

નં-એકે/અ.સ/૪૫૨/૨૦૨૪

તારીખ: ૨૫ / ૧૦ / ૨૦૨૪

પ્રતિ,

નકલ રવાના:-

૧. માન.કુલપતિશ્રી/કુલસચિવશ્રીનું કાર્યાલય હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૨. આચાર્યશ્રી, એમ.એન.કોલેજ, બસ સ્ટેશન રોડ, વિસનગર જિ.મહેસાણા
૩. શ્રી નમ્રતાબેન ગુપ્તા (ડીનશ્રી, મેનેજમેન્ટ વિદ્યાશાખા), હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૪. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ. (કાર્યવાહી સારૂ)
૫. ગ્રંથપાલશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ. (વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઇલ અર્થે)
૬. સિસ્ટમ એનાલીસ્ટશ્રી, કોમ્પ્યુટર (રીઝલ્ટ સેન્ટર) હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ. (વેબસાઇટ પર મુકવા સારૂ)
૭. પ્રવેશ પ્ર-શાખા, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ
૮. મહેકમ શાખા, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ. (૨ નકલ)
૯. સિલેક્ટ ફાઇલ

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

*"Accredited by NAAC with 'A' Grade (CGPA 3.02)"*

**Bachelor of Science (B.Sc.) (Computer Science)**

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**NATIONAL EDUCATION POLICY - 2020**

**(NEP-2020)**

*w. e. f. June 2023*



**Model Curriculum Structure for  
Bachelor of Science (B.Sc.) (Computer Science) Programme  
(Basic and Honors degree)**

*Submitted to*

**Hemchandracharya North Gujarat University, Patan.**

## **Bachelor of Science (B.Sc.) (Computer Science)**

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### **B.Sc. (Computer Science) (3 Year)**

- ✓ B.Sc. (Computer Science) Three Year is an undergraduate degree Programme that provides students with a solid foundation in computer science and its practical applications.
- ✓ It covers various aspects of the field, such as programming, data structures, algorithms, database management, and software development.
- ✓ The Programme prepares graduates for careers in software development, web design, database administration, and networking, among others.

### **B.Sc. (Computer Science) (4 Year)**

#### **B.Sc. (Computer Science) Honors with Research**

- ✓ B.Sc. (Computer Science) Hons with Research is an advanced undergraduate degree that focuses on in-depth research and academic exploration in computer science.
- ✓ Students engage in research projects, gaining valuable skills in problem-solving, critical thinking, and data analysis.
- ✓ This Programme prepares graduates for research-oriented careers in academia, industry research labs, or further academic pursuits.
- ✓ Students who have completed B.Sc. (Computer Science) Hons with Research are eligible to get admission in Ph.D. without Master Degree.

#### **B.Sc. (Computer Science) Honors without Research**

- ✓ B.Sc. (Computer Science) Hons without Research is a specialized undergraduate degree that offers a comprehensive understanding of computer science without extensive research components.
- ✓ It covers theoretical knowledge and practical skills necessary for careers in the IT industry, including software development, web design, database administration, system analysis, and cyber security.
- ✓ This degree also serves as a foundation for further studies in computer science or related disciplines.

# Hemchandracharya North Gujarat University, Patan

## Bachelor of Science (B.Sc. (Computer Science) (Honors))

*Under the Faculty of Science*

<b>Name of Program:</b>	Bachelor of Science in Computer Science (Honors)
<b>Abbreviation:</b>	B.Sc. (Computer Science): Four-year Integrated Program. With Multi-Level Entry and Exit option
<b>Multi-level Exit Criteria:</b>	<p>i) Under Graduate Certificate in Computer Science: If the student wish to exit after completion of First year (Semester-1 and Semeter-2) without any back-log and secure additional 4 credits from work-based skill-oriented university approved courses /vocational courses / summer internship / Apprenticeship in addition to 6 credits from skill-based courses earned during first and second semester.</p> <p>ii) Diploma in Computer Science: If the student wish to exit after completion of Second year (Semester-1 to Semeter-4) without any back-log and secure additional 4 credits from work-based skill-oriented university approved courses /vocational courses / summer internship / Apprenticeship offered at end of first or second year in addition to 6 credits from skill-based courses earned during first four semesters.</p> <p>iii) B.Sc. (Bachelors of Science in Computer Science): If the student wish to exit after completion of Third year (Semeste-1 to semester-6) without any back-log and secure additional 4 credits from work-based skill-oriented university approved courses /vocational courses / summer internship / Apprenticeship offered at end of first or second year in addition to 6 credits from skill-based courses earned during first four semesters.</p>
<b>Multi-Level Entry Criteria:</b>	As per the norms of the Hemchandracharya North Gujarat University, Patan
<b>Duration:</b>	4 year of B.Sc. (Computer Science) (Honors) degree program with multi-level exit options at 1st, 2nd and 3rd Year to obtain Certificate, Diploma, Degree and Honors Degree in Computer Application respectively.
<b>Eligibility:</b>	As per the norms of the Hemchandracharya North Gujarat University, Patan
<b>Objective of the Program:</b>	Bachelor of Science in Computer Science (B.Sc.) (Computer Science) (Honors) is undergraduate degree program in computer application area. Objective of the program is to open a channel of admission for courses in the field of Computer Science, Applications and all relevant fields of information technologies to build career for students who have completed standard 12th (H.S.C.) and are interested in taking computing/computer Application and Information Technology as a career. Main objective is to equip the students with strong foundation in computer programming languages, coding, database handling, software application developments, problem-solving skills and development of analytical and logical skills. The focus is to introduce various programming languages on different platforms and operating systems, interaction with databases available on various platforms, software testing, development and deployment techniques. It also aims to provide knowledge in latest trends and advancements in field of computer technologies. The program caters to the needs of the students aspiring to excel in the field of computer science, applications and technologies. The program is designed to develop computer professionals versatile in almost all field of computer application. It also aims to enhance communication and interpersonal skills.
<b>Program Outcome:</b>	<b>PO1:</b> Ability to analyze a problem, identify and define the Computing requirements appropriate to its solution.

	<p><b>PO2:</b> Enhancing the Understanding related to core ideas of computer, analytical thinking, logical abilities and computational fundamentals.</p> <p><b>PO3:</b> To generate Understanding regarding the core and fundamental ideas about the computer platforms, operating systems, software design concepts, networking concepts and advanced and emerging technologies.</p> <p><b>PO4:</b> Foster critical thinking and innovation: The program encourages students to think critically and creatively in the context of computer science. They are challenged to explore innovative approaches to problem solving, evaluate alternative solutions, and apply logical reasoning to make informed decisions.</p> <p><b>PO5:</b> Develop technical proficiency: The objective is to equip students with practical skills in software development, programming languages, databases, networking, and other relevant technologies. They gain hands-on experience in designing, implementing, and testing software systems using industry-standard tools and techniques.</p> <p><b>PO6:</b> Promote collaboration and communication skills: The program emphasizes the importance of teamwork and effective communication in the field of computer science. Students are encouraged to collaborate with peers on projects, participate in group discussions, and present their ideas clearly and professionally.</p> <p>These program objectives collectively aim to prepare students for diverse career paths in the field of computer science, including software development, systems analysis, data analysis, cybersecurity, and research.</p>
<b>Program Specific Outcome:</b>	<p>It will open field for the aspiring students to opt further career or masters' level study in the fields of Research, Design, Architecture and software development.</p> <p><b>PSO 1:</b> Develop and Strengthen the fundamental core computer science concepts that are required to solve complex problems.</p> <p><b>PSO 2:</b> Develop the professional skills that need independent logical and analytical thinking, teamwork for successful computer professionals.</p> <p><b>PSO 3:</b> Nurture the students for design and development of workable computer application solution for real world problems.</p> <p><b>PSO 4:</b> Develop students for self-learning and practicing computer science application problem solutions.</p> <p><b>PSO 5:</b> Develop ability to service and excel in fulfilling the modern day demands with their knowledge and skills.</p> <p><b>PSO 6:</b> Develop technical project and present them among the users.</p>
<b>Medium of Instruction:</b>	English
<b>Program Structure:</b>	Semester-wise Breakup of the course is given in the next section.



**Bachelor of Science (B.Sc.) (Computer Science)**

COURSE STRUCTURE w. e. f. June 2023

**Semester-1**

Sr. No.	Course Code	Study Components	Instruction/Hrs.	Examination			Credit	Exam Duration (Hours)
				Internal	Uni. Exam	Total		
Semester-1 Programme Code: SCIUG101								
Theory Course								
1.	SC23MJDSCCS101	Major-1: Discipline Specific Core Course	04	50	50	100	4	2:30
2.	SC23MIDSCCS102	Minor: Discipline Specific Course	02	25	25	50	2	2:00
3.	SC23MDCCS103	Inter/Multi-Disciplinary Course	02	25	25	50	2	2:00
Practical Courses								
4.	SC23MJDSCPCS101(A)	Major: Discipline Specific Core Courses	04	25	25	50	2	2:30
5.	SC23MJDSCPCS101(B)	Major: Discipline Specific Core Courses	04	25	25	50	2	2:30
6.	SC23MIDSCPCS102	Minor: Discipline Specific Core Courses	04	25	25	50	2	2:30
7.	SC23MDCPCS103	Inter/Multi-Disciplinary Courses	04	25	25	50	2	2:30
Ability Enhancement Courses (AEC)								
8.	SC23AECCS104	(AEC) (Languages)	02	25	25	50	2	1:30
Value Added Course (VAC)								
9.	SC23VACCS105	Value Added Courses (VAC)	02	25	25	50	2	1:30
Skill Enhancement Course (SEC)								
10.	SC23SECCS106	Skill Enhancement Courses (SEC)	02	25	25	50	2	1:30
Total			30	275	275	550	22	

# SEMESTER I

<b>Course Code</b>	<b>SC23MJDSCCS101</b>
<b>Course Title</b>	<b>Fundamentals of Computers, Networks &amp; Web Design</b>
<b>Credits</b>	<b>4</b>
<b>Course Category</b>	<b>Major Course</b>
<b>Level of Course</b>	<b>Level of Course 100-199 (Introductory Level)</b>
<b>Teaching per Week</b>	<b>4 Hrs./Week</b>
<b>Minimum weeks per Semester</b>	<b>15 (Including class work, examination, preparation etc.)</b>
<b>Purpose of Course</b>	<ul style="list-style-type: none"> <li>• This course imparts the knowledge of Fundamentals of computers. The concepts of related features of internal devices, input and output devices, introduction to internet browser understanding with required function to work with.</li> <li>• This course imparts the knowledge of HTML page development. Course offers concepts related to various tags of HTML 5.0. The course is aimed to give the inner depth of Cascading Style Sheets (CSS) to make web pages more interactive.</li> <li>• This course also covers Basics of Computer Networking, Networking Devices, protocols and working of Networks.</li> </ul>
<b>Course Objective</b>	<ul style="list-style-type: none"> <li>• To make students understand, Internet, web browser and network related hardware equipment.</li> <li>• To make students understand the fundamentals of developing websites using HTML Technology.</li> <li>• Students will be able to make web pages more interactive using Java Script.</li> <li>• Understand how the Computer Networks works.</li> </ul>
<b>Prerequisite</b>	<b>None</b>
<b>Course Content</b>	<p><b>Unit I: Computer Systems and Organization</b></p> <ul style="list-style-type: none"> <li>• Basic computer organization: Introduction to Computer System, hardware, software, input device, output device, CPU, memory (primary, cache and secondary), units of memory (bit, byte, KB, MB, GB, TB, PB)</li> <li>• Types of software: System software ( Operating systems, system utilities, device drivers),programming tools and language translators ( assembler, compiler, and interpreter),application software</li> <li>• Operating System(OS): functions of the operating system, OS user interface</li> <li>• Boolean logic: NOT, AND, OR, NAND, NOR, XOR, NOT, truth tables and De Morgan's Laws, Logic circuits</li> <li>• Number System: Binary, Octal, Decimal and Hexadecimal number system; conversion between number systems</li> <li>• Encoding Schemes: ASCII, ISCII, and Unicode (UTF8, UTF32)</li> </ul> <p><b>Unit-II Web Designing with HTML</b></p>

	<p>Introduction to HTML, the doctype, HTML Basic Formatting Tags, HTML-Grouping Using Div Span, HTML Lists, HTML Images, Absolute &amp; Relative URLs, HTML Hyperlink, HTML Tables, HTML Form, HTML Headers, The lang attribute, The meta tag &amp; the Unicode character set, HTML Miscellaneous</p> <p>HTML 5 Global Attributes, displaying a Search Input Field, Contact Information Input Fields, Utilizing Date and Time Input Fields, Number Inputs, Selecting from a Range of Number, Selecting Colors, Creating an Editable Drop-Down, Requiring a Form Field, Autofocusing a Form Field, Displaying Placeholder Text, Disabling Autocomplete, Restricting Values</p> <p><b>Unit III: Web Designing with CSS</b> Introduction, CSS Syntax, Embedding CSS into HTML document, CSS Basics (Selectors, Color, Background, Fonts, Text, Links, Lists, Tables), CSS Box Model ( Box Model, Dimension, Border, Padding, Margin )</p> <p><b>Unit IV: Computer Networks</b></p> <ul style="list-style-type: none"> <li>● Evolution of networking: introduction to computer networks, evolution of networking (ARPANET, NSFNET, INTERNET)</li> <li>● Data communication terminologies: concept of communication, components of data communication (sender, receiver, message, communication media, protocols), measuring capacity of communication media (bandwidth, data transfer rate), IP address, switching techniques (Circuit switching, Packet switching)</li> <li>● Transmission media: Wired communication media (Twisted pair cable, Coaxial cable, Fiber-optic cable), Wireless media (Radio waves, Microwaves, Infrared waves)</li> <li>● Network devices (Modem, Ethernet card, RJ45, Repeater, Hub, Switch, Router, Gateway, WIFI card)</li> <li>● Network topologies and Network types: types of networks (PAN, LAN, MAN, WAN), networking topologies (Bus, Star, Tree)</li> <li>● Network protocol: HTTP, FTP, PPP, SMTP, TCP/IP, POP3, HTTPS, TELNET, VoIP</li> <li>● Introduction to web services: WWW, Hyper Text Markup Language (HTML), Extensible Markup Language (XML), domain names, URL, website, web browser, web servers, web hosting</li> </ul>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. NCERT Textbook for Computer Science (Class XI)</li> <li>2. CBSE Textbook for Computer Science (Class XI)</li> <li>3. NCERT Textbook for Computer Science (Class XII)</li> <li>4. CBSE Textbook for Computer Science (Class XII)</li> <li>5. HTML 5 Black Book 2Ed, by Kogent Learning Solutions Inc.</li> <li>6. Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP by Ivan Bayross, BPB Publication.</li> <li>7. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed</li> <li>8. Web Technology, Moseley and Savaliya, Wiley India</li> </ol>
<b>Teaching Methodology</b>	Class Work/ Project/ Discussion/ Self-Study/ Seminars/ field works/ practical training/ field work and/or Assignments.
<b>Evaluation Method</b>	<p>As per Hemchandracharya North Gujarat University, Patan Rules &amp; Regulations.</p> <p>50% Continuous Internal Assessment</p> <p>50% External Assessment</p>

<b>Course Code</b>	<b>SC23MIDSCCS102</b>
<b>Course Title</b>	<b>Web Designing</b>
<b>Credits</b>	<b>2</b>
<b>Course Category</b>	<b>Minor Course</b>
<b>Level of Course</b>	<b>100-199 (Foundation / Introductory)</b>
<b>Teaching per Week</b>	<b>2 Hrs.</b>
<b>Minimum weeks per Semester</b>	<b>15 (Including class work, examination, preparation etc.)</b>
<b>Course Objective</b>	<p>This course imparts the knowledge of HTML page development. Course offers concepts related to various tags of HTML 5.0. The course is aimed to give inner depth of java script for client-side programming to make web pages more interactive.</p> <p>To make students understand the fundamentals of developing websites using HTML Technology.</p> <p>Students will be able to make web pages more interactive using Java Script</p>
<b>Prerequisite</b>	None
<b>Course Content</b>	<p><b>Unit-II Web Designing with HTML</b>  Introduction to HTML, the doctype, HTML Basic Formatting Tags, HTML-Grouping Using Div. Span, HTML Lists, HTML Images, Absolute &amp; Relative URLs, HTML Hyperlink, HTML Tables, HTML Form, HTML Headers, The Lang attribute, The meta tag &amp; the Unicode character set, HTML Miscellaneous</p> <p>HTML 5 Global Attributes, displaying a Search Input Field, Contact Information Input Fields, Utilizing Date and Time Input Fields, Number Inputs, selecting from a Range of Number, Selecting Colors, Creating an Editable Drop-Down, requiring a Form Field, autofocusing a Form Field, Displaying Placeholder Text, Disabling Autocomplete, Restricting Values</p> <p><b>Unit III: Web Designing with CSS</b>  Introduction, CSS Syntax, Embedding CSS into HTML document, CSS Basics (Selectors, Color, Background, Fonts, Text, Links, Lists, Tables), CSS Box Model (Box Model, Dimension, Border, Padding, Margin)</p>
<b>Reference Books</b>	1. HTML & CSS: The Complete Reference - Thomas Powell - McGraw Hill Education 2. HTML, XHTML, and CSS Bible - Steven M. Schafe - Wiley Publications 3. Web Enabled Commercial Web Application Development with HTML, DHTML, JavaScript and PHP by Ivan Bayross, BPB Publication
<b>Teaching Methodology</b>	Class Work/ Discussion/ Self-Study/ Seminars/ field works/ practical training/ field work and/or Assignments.
<b>Evaluation Method</b>	As per Hemchandracharya North Gujarat University, Patan Rules & Regulations.

<b>Course Code</b>	SC23MDCCS103
<b>Course Title</b>	Office Automation Tools
<b>Credits</b>	02
<b>Course Category</b>	Inter/Multidisciplinary Course
<b>Level of Course</b>	100-199 (Foundation / Introductory)
<b>Teaching per Week</b>	2 Hrs./Week
<b>Minimum weeks per Semester</b>	15 (Including class work, examination, preparation etc.)
<b>Course Objective</b>	This course imparts the knowledge of basic Application software like Word Processor and Spreadsheets. Understands how word processing & spreadsheet software works. Creating document and various types of charts.
<b>Prerequisite</b>	None
<b>Course Content</b>	<p><b>Unit-1 Word Processing</b>  <i>Word Processing Basics:</i> Opening Word Processing Package, Menu Bar, Using The Help, Using The Icons Below Menu Bar;  <i>Opening and closing Documents:</i> Opening Documents, Save and Save as, Page Setup, Print Preview, Printing of Documents;  <i>Text Creation and manipulation:</i> Document Creation, Editing Text, Text Selection, Cut, Copy and Paste, Spell check, Thesaurus;  <i>Formatting the Text:</i> Font and Size selection, Alignment of Text, Paragraph Indenting, Bullets and Numbering, Changing case;  <i>Formatting a document:</i> Set page margin, paragraphs and sections within a document, Adjust indents and hanging indents;  <i>Table Manipulation:</i> Draw Table, Changing cell width and height, Alignment of Text in cell, Delete / Insertion of row and column Border and shading, Table formulas; Inserting Graphic Elements: Insert a clip art picture, insert symbols and special characters, adding a watermark; Using word art; adding a drop cap;  <i>Mail Merge:</i> Using mail merge; printing mailing labels; merging for sending emails using outlook. Use of local language  <b>Macros</b></p> <p><b>Unit-2 Spreadsheet</b>  Elements of Electronic SpreadSheet: Opening of SpreadSheet, Addressing of Cells, Printing of SpreadSheet, Saving Workbooks;  Manipulation of Cells: Entering Text, Numbers and Dates, Creating Text, Number and Date Series, Editing Worksheet Data, Inserting and Deleting Rows, Column, Changing Cell Height and Width;  Formulas and Function: Using Formulas, Function, basic mathematical operators, using AutoSum etc., using formulas with multiple cell references, finding the right function, relative and absolute cell references, fixing formula errors; Charts: learning about charts, creating charts; Working with graphics; Clip Art; SmartArt.  Use of Pivot Table and Pivot Chart</p>

<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Microsoft Office 2019 for Dummies by Wallace Wang Willey India Publication</li> <li>2. Mastering MS Office by Bittu Kumar, V &amp; S Publisher</li> <li>3. Expert Computer Course ( ECC ) Made Simple by Prof. Satish Jain, BPB Publication</li> </ol>
<b>Teaching Methodology</b>	Class Work/ Project/ Discussion/ Self-Study/ Seminars/ field works/ practical training/ field work and/or Assignments.
<b>Evaluation Method</b>	<p>As per Hemchandracharya North Gujarat University, Patan Rules &amp; Regulations.</p> <p>50% Continuous Internal Assessment</p> <p>50% External Assessment</p>

# HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

## B. Sc. Computer Science - SEMESTER – I (PRACTICAL COURSE)

PROGRAMME CODE: SCIUG101 (Effective from June 2023 Under NEP – 2020)

Type of Course	Credit	Course Code
Major Discipline Core Course (MJDSCP)	2 (Group-A)	SC23MJDSCPCS101(A)
Major Discipline Core Course (MJDSCP)	2 (Group-B)	SC23MJDSCPCS101(B)
Minor Discipline Core Course (MIDSCP)	2	SC23MIDSCPCS102
Inter-Discipline Core Course (MDCP)	2	SC23MDCPCS103

### Teaching Hours

- Teaching Hours per Week: 08 Hours for 4 Credit practical (120 Hours per Semester)
- Teaching Hours per Week: 04 Hours for 2 Credit practical (60 Hours per Semester)

### Course Objective:

- ✓ Practical implementation of technologies covered as part of the syllabus using required software and learning application areas.
- ✓ Understanding of how Markup languages like HTML and CSS Works.
- ✓ Practical implementation of Web Designing Structuring and Formatting.



## EXPERIMENTS FOR MAJOR COURSE 2 Credit for Group A

### COURSE CODE: SC23MJDSCPCS101(A)

#### Group-A

1. Create a basic HTML page with paragraph.
2. Create a web page that demonstrates paragraph and basic formatting tags.
3. Create a web page that demonstrates various levels of headings.
4. Create a web page that demonstrates ordered list.
5. Create a web page that demonstrates unordered list.
6. Create a web page that demonstrates definition list.
7. Create a web page that demonstrates Anchor tag with linking two documents and target attributes.
8. Create a web page that demonstrates Table elements with associated tags.
9. Create a web page that demonstrates Table elements with *colspan* attribute.
10. Create a web page that demonstrates Table elements with *rowspan* attribute.
11. Create a web page that demonstrates division element.
12. Create a web page that demonstrates how to add images to web page.
13. Create a web page that demonstrates Image Map in HTML Document.
14. Create a web page that demonstrates HTML Forms with various input elements.
15. Create a web page that demonstrates HTML Forms with `<select>` element.

## EXPERIMENTS FOR MAJOR COURSE 2 Credit for Group B COURSE CODE: SC23MJDSCPCS101(B)

#### Group-B

1. Create a basic web page to implement *Internal CSS* with background color, font color of heading and alignment of a text.
2. Create a basic web page to implement *External CSS* with background color, font color of heading and alignment of a text.
3. Create a basic web page to implement *Inline CSS* with background color, font color of heading and alignment of a text.
4. Create a basic web page to set page font, text size, line height and double size paragraph.
5. Create a basic web page to set page font color, alignment and emphasizing text.
6. Create a basic web page to style ordered list with CSS.
7. Create a basic web page to style Unordered list with CSS.
8. Create a basic web page to style HTML tables.
9. Create a basic web page to enhance HTML forms with CSS.
10. Create a basic web page to style anchor tags.
11. Create a basic web page to demonstrate display property.
12. Create a basic web page to demonstrate z-index.
13. Create a basic web page to demonstrate float property.
14. Create a basic web page to demonstrate align property.
15. Create a simple webpage for yourself.

# HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B. Sc. Computer Science - SEMESTER – I (PRACTICAL COURSE)

PROGRAMME CODE: SCIUG101 (Effective from June 2023 Under NEP – 2020)

Type of Course	Credit	Course Code
Minor Discipline Core Course (MIDSCP)	2	SC23MIDSCPCS102

Teaching Hours per Week: 04 Hours for 2 Credit practical

Teaching Hours per Semester: 60 Hours

## Minor Discipline Core Course (MIDSCP) Practical

1. Create a basic HTML page with paragraph.
2. Create a web page that demonstrates paragraph and basic formatting tags.
3. Create a web page that demonstrates various levels of headings.
4. Create a web page that demonstrates ordered list.
5. Create a web page that demonstrates unordered list.
6. Create a web page that demonstrates definition list
7. Create a web page that demonstrates Anchor tag with linking two documents and target attributes.
8. Create a web page that demonstrates Table elements with associated tags.
9. Create a web page that demonstrates HTML Forms with various input elements.
10. Create a web page that demonstrates HTML Forms with <select> element.
11. Create a basic web page to implement *Internal CSS* with background color, font color of heading and alignment of a text.
12. Create a basic web page to implement *External CSS* with background color, font color of heading and alignment of a text.
13. Create a basic web page to implement *Inline CSS* with background color, font color of heading and alignment of a text.
14. Create a basic web page to set page font, text size, line height and double size paragraph.
15. Create a basic web page to set page font color, alignment and emphasizing text.
16. Create a basic web page to style ordered list with CSS.
17. Create a basic web page to style Unordered list with CSS.
18. Create a basic web page to style HTML tables.
19. Create a basic web page to enhance HTML forms with CSS.
20. Create a basic web page to style anchor tags.

# HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B. Sc. Computer Science - SEMESTER – I (PRACTICAL COURSE)

PROGRAMME CODE: SCIUG101 (Effective from June 2023 Under NEP – 2020)

Type of Course	Credit	Course Code
Inter-Discipline Core Course (MDCP)	2	SC23MDCPCS103

**Teaching Hours per Week: 04 Hours for 2 Credit practical and Teaching Hours per Semester: 60 Hours**

## **Multi Discipline Core Course (MIDSCP) Practical**

1. Create your bio-data with use bold, italic, underline tools and save that document set the alignment left, right & center with table.
  2. Create a Time table in Word document.
  3. Create a macro in Word Processing.
  4. Create a mail- merge with Word-Processing and Spreadsheet.
- 
1. Create a Pivot table in Spreadsheet.
  2. Demonstrate Macro facility in Spreadsheet
  3. Create Student mark sheet using formula & chart in Spreadsheet.
  4. Create Salary sheet using formula & chart in Spreadsheet.

<b>Course Code</b>	SC23SECCS106
<b>Course Title</b>	<b>Linear Algebra</b>
<b>Credits</b>	02
<b>Course Category</b>	<b>Skill Enhancement Courses</b>
<b>Level of Course</b>	<b>100-199 (Foundation / Introductory)</b>
<b>Teaching per Week</b>	2 Hrs./Week
<b>Minimum weeks per Semester</b>	15 (Including class work, examination, preparation etc.)
<b>Course Objective</b>	<p>The course objectives for learning Linear Algebra typically include:</p> <p>Understanding fundamental concepts like vectors, matrices, and vector spaces.</p> <p>Learning matrix operations and solving linear equations.</p> <p>Exploring applications in various fields.</p> <p>Understanding geometric interpretations of linear transformations.</p> <p>Studying eigenvalues, eigenvectors, and matrix factorizations.</p> <p>Developing problem-solving and computational skills.</p>
<b>Prerequisite</b>	Basic Mathematics
<b>Course Content</b>	<p><b>Unit I: Introduction to Linear Algebra</b>  Introduction, Matrices, Matrix Properties, Matrix Addition and Scalar Multiplication, Summation Symbol, Matrix Multiplication, Transpose of a Matrix, Square Matrices, Powers of Matrices, Polynomials in Matrices, Inverse of Matrices, Special Types of Square Matrices</p> <p><b>Unit II: Determinants</b>  The Determinant Formula, Permutations, Elementary Matrices and Determinants, Row Swap, Row Multiplication, Row Addition, Determinant of Products, Properties of the Determinant, Determinant of the Inverse, Adjoint of a Matrix, Applications of Determinants</p>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Schaum's Outline of Linear Algebra   3rd Edition by Seymour Lipschutz, Marc Lipson, McGraw Hill Education Publication</li> <li>2. Linear Algebra by David Cherney, Tom Denton, Rohit Thomas and Andrew Waldron</li> <li>3. Linear Algebra and Its Applications, 5th Edition, by David C. Lay, Steven R. Lay, Judi J. McDonald Pearson</li> </ol>
<b>Teaching Methodology</b>	Class Work/ Project/ Discussion/ Self-Study/ Seminars/ field works/ practical training/ field work and/or Assignments.
<b>Evaluation Method</b>	As per Hemchandracharya North Gujarat University, Patan Rules & Regulations. 50% Continuous Internal Assessment 50% External Assessment