હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

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

ફોનઃ(૦૨૭૬૬) ૨૩૭૦૦૦ ફેકસ : (૦૨૭૬૬) ૨૩૧૯૧૭

Email : regi@ngu.ac.in Website : www.ngu.ac.in

રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦

પરિપત્ર નં.- ૨૭૭ /૨૦૨૩

વિષયઃ 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 તારીખઃ ૧૪/૦૮/૨૦૨૩ની મળેલ સભાના નિર્દિષ્ટ ઠરાવોથી રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦ અંતર્ગત UGCની Guideline તથા રાજય સરકારશ્રીના શિક્ષણ વિભાગના તારીખઃ ૧૧/૦૭/૨૦૨૩ના ઠરાવ નં.કે.સી.જી./એડમીન/૨૦૨૩-૨૪/૦૬૦૭/ખ-૧ થી પ્રકાશિત કરેલ કોમન કરિકયુલમ 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 વર્ષઃ ૨૦૨૩-૨૪ થી ક્રમશઃ અમલમાં આવે તે રીતે મંજુર કરેલ છે, જેનો અમલ કરવા સારૂ સબંધિતોને 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. (ઝુલોજી)	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.

નોંધઃ

(૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજના / ડિપાર્ટમેન્ટના ગ્રંથાલયમાં મૂકવાની રહેશે.

(૨) આ પરિપત્ર યુનિવર્સિટીની વેબસાઇટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરવામાં આવેલ છે. આથી સંબંધિત કોલેજોને ડાઉનલોડ કરી ઉપયોગ કરવા સારૂ જણાવવામાં આવે છે.

(૩) <u>વિજ્ઞાન વિદ્યાશાખા</u> વિદ્યાશાખા હેઠળના સ્નાતક કક્ષાના પ્રોગ્રામ્સના અભ્યાસક્રમોનો પરિપત્ર નં.૧૩૦/૨૦૨૩, તારીખઃ૨૩/૦૬/૨૦૨૩ ૨૬ કરવામાં આવે છે.

કા. કુલસચિવ

બિડાણઃ ઉપરમુજબ

નં-એકે/અ×સ/૩૨૬૪/૨૦૨૩

તારીખઃ૩૧/૦૮/૨૦૨૩

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 સારૂ)
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)

Submittedon21st July 2023

Introduction:

The UniversityGrantsCommission (UGC)hasinitiatedseveralmeasuresto bringequity,efficiency and excellence in the Higher Education System of country. The important measurestaken to enhance academic standards and quality in higher education include innovation andimprovements in curriculum, teaching-learning process, examination and evaluation systems,besidesgovernanceandothermatters.

The UGC has formulated various regulations and guidelines from time to time to improve thehighereducationsystemandmaintainminimumstandardsandqualityacrosstheHigherEducational Institutions (HEIs) in India.The academic reformsrecommended by the UGCinthe recent past have led to overall improvementin the higher education system.However,dueto lot of diversity in the system of higher education, there are multiple approaches followed byuniversitiestowardsexamination,evaluation and grading system.While the HEIsmusthavethe flexibility and freedom in designing the examination and evaluationmethodsthat bestfitsthe curriculum,syllabi and teaching–learning methods,there is aneed to devise asensiblesystemforawardingthegradesbasedontheperformanceofstudents.

The National Education Policy (NEP)2020(hereafterreferred to as NEP or Policy)recognizesthathighereducation plays an extremelyimportantrole in promoting human aswellassocietalwell-beingandindevelopingIndiaasenvisionedinitsConstitution-ademocratic, just, socially conscious, cultured, and humane nation upholding liberty, equality,fraternity, andjusticefor all. It notes that "giventhe 21st-centuryrequirements,qualityhighereducationmustaimtodevelopgood,thoughtful,well-rounded,andcreativeindividuals". In accordance with the NEP2020, the UGC hasformulatedanewstudent-centric"CurriculumandCreditFrameworkforUndergraduateProgrammes(CCFUP)"incorporating a flexible choice-based credit system, multidisciplinary approach, and multipleentry and exit options. This will facilitate students to pursue their career path by choosing thesubject/fieldoftheirinterest.Thegradingsystemisconsideredtobebetterthantheconventional marks system and hence it has been followed in the top institutions in India andabroad. Soitisdesirable tointroduceuniform gradingsystem. This willfacilitate studentmobilityacrossinstitutionswithinandacrosscountriesandalsoenablepotentialemployersto assessthe performance ofstudents. To bringin the desired uniformity,in grading systemandmethodforcomputingthecumulativegradepointaverage(CGPA)basedontheperformanceofstudentsintheexaminations,theUGChasformulatedtheseguidelines.

NEP-2020

NEP,2020 aimsat a new and forward-looking Vision forIndia'sHigherEducation System.Thiscurriculum framework forthe bachelor-level program in PHYSICSisdeveloped keepingin view of the student centric learning pedagogy, which is entirely multidisciplinary outcome-orientedandcuriosity-driven.Toavoidrote-learningapproachandfosterimagination,thecurriculumismoreleanedtowardsself-discoveryofconcepts.Thecurriculumframeworkfocuses on pragmatist approach whereby practical application of theoretical concepts is taughtwithsubstantialcoverageofpracticalandfieldworks.

Theplatformaimsatequippingthegraduateswithnecessaryskillsfor PHYSICS-

relatedcareers,careerswithgeneralgraduate-level aptitudeandforhighereducationinPHYSICS.Augmentedinthisframeworkaregraduateattributesi ncludingcriticalthinking,basicpsychology,scientificreasoning,moralethicalreasoningandsoon.

Learningoutcomesforthetwoprogrammestheseframeworkshavebeendeveloped,learning outcomes for individual courses, pedagogical methods and assessment methods. Looking at allthese new concepts and progress,the detailed syllabus ofB.Sc.(Honours)–PHYSICShasbeendesignedanddecidedtobeimplementedfromtheacademicsessionfromJune 2023-24.

PROGRAMMESPECIFICOUTCOMESTOBEATTAINEDATTHEENDOFTHEPROGR AMME

AccordingtoGuidelineofNEP2020,theBoardofStudiesinPhysicsrecognizesthatcurriculum,cour se contentand assessmentofscholasticachievementsplay important rolesin shapingeducation.The committee isof the view thatassessmentshouldsupportandencourage the broad instructional goals such as basic knowledge of the discipline of Physicsincludingphenomenology,theoriesand techniques,conceptsandgeneral principles.Thisshould alsosupportthe abilityto ask subjective questionsand to obtainitssolutionsby useof qualitative andquantitative reasoning and by experimental investigation.Withthisinmind, we aim to provide a firm foundation in every aspect of Physics ranging from a broadspectrum of modern trends in Physics toexperimental,computationaland mathematicalskillsof students.Hence, theUG(B.Sc.)syllabihasbeenframedinsucha waythatitbridges the gap between the plus two and PG (M.Sc.) levels of Physics by providing a morecomprehensiveandlogicalframeworkinalmostallareasofbasicPhysics.

AimsofthetheProgramme:

- TomakestudentseligibleforHigherStudiesandprofessionalcourses.
- Todeveloptheskillsrequiredtogatherinformationfromresourcesandusethem.
- Todeveloptheabilitiestoread,understandandinterpretphysicalinformation–verbal, mathematicalandgraphical.
- Toprovideanintellectuallystimulatingenvironmenttodevelopskillsandenthusiasm sofstudentstothebestoftheirpotential.
- Togiveneedbasededucationinphysicsofthehighestqualityattheundergraduatelevel.
- Tooffercoursestothechoiceofthestudents.
- To enablestudentstoperformexperimentsandinterprettheresultsofobservation,includinganas sessmentofexperimentaluncertainties.
- Tomakestudentseligibleforgovernmentjob.

ObjectivesofProgramme:

Bytheendofthefirstyear(2ndsemester),thestudentsshouldhaveattainedacommonlevelinbasico fphysicstocomplementthecorefortheirfuturecoursesanddevelopedtheirexperimentalanddataa nalysisskillsthroughexperimentsatlaboratories.

OUTLINEOFCHOICEBASEDCREDITSYSTEM

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

themajordiscipline.

3. **Multidisciplinary Course (MDSC):** Generally,acoursewhich canbechosenfrom apool of courses and which may be very specific or specialized or advanced or supportive tothe discipline/ subject of study or which provides an extended scope or which enables anexposuretosomeotherdiscipline/subject/domainornurturesthecandidate'sproficiency/skilliscalledanElectiveCourse.
4. **Interdisciplinary Course (IDSC) Course:** Elective courses may be offered by the maindiscipline/subjectofstudyisreferredtoasDisciplineSpecificElective.The University/InstitutemayalsoofferdisciplinerelatedElectivecoursesofinterdisciplinarynature(tobeofferedbymaindiscipline/subjectofstudy).
5. **Ability Enhancement Courses (AEC):** Environmental Science, English Communication/MILCommunication aremandatoryforalldisciplines.
6. **SkillEnhancementCourses(SEC):**
   Thesecoursesmaybechosenfromapoolofcoursesdesignedtoprovidevalue-basedand/orskill-basedinstruction.
7. **ValueAddedCourses(VAC):**
   Thesecoursesmaybechosenfromapoolofcoursesdesignedtoprovidevalue-basededucation course instruction.
   The Proposed new course sinchemistry forunder graduate class esare reassignedin accordance to semester/CBCS/Grading system with new education policy.The new course is based on model curriculum of the university grants commission.

COURSES/ACTIVITIESUNDERTHEPROGRAM:

1. **Lecture courses**: Courses involving lectures relating to a field or discipline by an expertor qualifiedpersonnelinafieldoflearning,work/vocation,orprofessionalpractice.
2. **Tutorialcourses:**Coursesinvolving problem-solving and discussionsrelating to afieldordisciplineundertheguidanceofqualifiedpersonnelinafieldoflearning,work/vocation,orprofessionalpractice.
3. **Practicum or Laboratory work:** A course requiring students to participate in a project orpractical or lab activity that appliespreviously learned/studied principles/theory related tothe chosen field of learning,work/vocation,orprofessional practice underthe supervisionof an expert or qualified individual in the field of learning, work/vocation or professionalpractice
4. **Seminar:**Acourserequiringstudentstoparticipateinstructureddiscussion/conversationordebate focused on assigned tasks/readings,currentorhistorical events, orsharedexperiencesguidedorledbyanexpertorqualifiedpersonnelinafieldoflearning,work/vocation,orprofessionalpractice.
5. **Internship:** A course requiring students to participate in a professional activity or workexperience,orcooperativeeducationactivitywithanentityexternaltotheeducationinstitution, normally under the supervision of an expert of the given external entity. A keyaspectoftheinternshipisinductionintoactualworksituations.Internshipsinvolveworking with local industry, government or private organizations, business organizations,artists, crafts persons, and similar entities to provide opportunities for students to activelyengageinon-siteexperientiallearning.
6. **Studio activities:** Studio activities involve the engagement of studentsincreativeorartistic

activities. Every student is engaged in performing a creative activity to obtain aspecific outcome. Studio-based activitiesinvolve visual- or aestheticfocused experientialwork.

7. **Fieldpractice/projects:**Coursesrequiringstudentstoparticipateinfield-basedlearning/projectsgenerallyunderthesupervisionof anexpertof thegivenexternalentity.
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 externalentity.The curricularcomponentof 'communityengagementandservice'willinvolveactivities that would expose students to the socio-economic issues in society so that thetheoretical learning'scan be supplemented by actuallife experiencesto generate solutionstoreal-lifeproblems.

SILENT FEATURES:

- B.Sc. (Honours) Physics in UG Programme - Semester I and II shall be offered from theAcademicyear,June2023.
- Physicssubjectin the Universities/Affiliated Collegesshall offerundergraduate programmeinFacultyofSciencefromtheAcademicyear2023-24.
- ❖ A student will have to get enrolled a Discipline Specific Core Course (DSC) depending uponhis/her requirement of a degree in the said discipline of study. A student will have a choice ofselecting an Inter/MultidisciplinaryCourse(IDC/MDC),AbilityEnhancementCourse(AEC),SkillEnhancementCourse(SEC)aswellasValueAddedCourse(VAC)fromapoolofcourses.
- Eachcourse shallbe assignedaspecificnumberofCredits.
- Discipline SpecificCore Course(DSC) is the course which shouldcompulsorily be studiedby a candidate as a Major and Minor requirement so as to get degree in a said discipline ofstudy.
- There shall be One Major(MDSC) and Minor(MiDSC) Compulsory course (Theory)eachwith3creditineachsemesterandtheirpractical'seachwith2credit.
- One IDC/MDC course shall have to be offered. The credit weight-age for MD shall be of 2 creditineachsemesterandtheirpractical'seachwith2credit.
- In addition to the Major/Minorcourse,astudent willhave to choose IDC/MDC,AEC, SECaswellasVACfromapoolofcourses.
- SEC and VAC courses shall have to be offered. The credit weight-age for SEC shall be of 2 creditsandVACcourseshallbeof2credit.
- One AEC(Languages)course shall have to be offered.The creditweight-age forAbilityEnhancementCourse(AEC)shallbeof02credit.
- EachcourseshallhaveauniqueCoursecode.TheDisciplineSpecificCoreCourse,Inter/Multi-Disciplinary Course, Ability Enhancement Course, ValueAddedCourse andSkillEnhancementCourseshallbeabbreviatedrespectivelyas**DSC(Major/Minor),IDC/MDC,AEC,VACandSEC.**
    1. DisciplineSpecificCoreCourse**DSC(Major/Minor),** PracticalDiscipline SpecificCore Course**PDSC**
    2. Inter/Multi-Disciplinary Course**IDC/MDC,** PracticalInter/Multi-DisciplinaryCourse**PIDC/PMDC**
    3. AbilityEnhancementCourse(Languages)**AEC**
    4. ValueAddedCourse**VAC**
    5. SkillEnhancementCourse**SEC**
- EachAcademicyearshallconsistof**two**semesters,eachof**15weeks**ofteachingequivalentto **90 working days**. The Odd semester period shall be from **July to November** and the Evensemesterperiodshallbefrom**DecembertoApril**.
- The coursewith**4credit**shallbeof**60Hours**(15weeksx4credits)duration,
- Thecoursewith**3credit**shallbeof**45Hours**(15weeksx3credits)durationand

- Thecoursewith**2credit**shall beof**30Hours**(15weeksx2credits)duration.
- **Practicalwith2Credit**shallbeof**60Hours**(15weeksx4hours)duration.
- **Practicalwith4 Credit**shallbeof 120**Hours**(15weeksx8hours)duration.

ATTENDANCE:

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

MEDIUMOFINSTRUCTION:

TheMediumofInstructionshallbeof**Gujarati medium**. Studentisfree towriteanswerseitherin**Gujarati**and/or**English**language.

TEACHINGLEARNINGPROCESS:

Teachingandlearninginthisprogrammeinvolveclassroomlecturesaswelltutorials. Itallows-

- ❖ Thetutorialsallowacloserinteractionbetweenthe studentsandtheteacheraseachstudentgetsindividualattention.
- ❖ Writtenassignmentsandprojectssubmittedbystudents
- ❖ Project-basedlearning
- ❖ Groupdiscussion
- ❖ Homeassignments
- ❖ Quizzesand ClassTests
- ❖ PPTpresentations,Seminars,interactivesessions
- ❖ Diversitysurvey
- ❖ Co-curricularactivityetc.
- ❖ IndustrialTourorFieldvisit

LANGUAGEOFQUESTIONNPAPER:

Questionpapershouldbedrawnin**Gujarati**languageandits**English**versionshouldbegiven.

EVALUATIONMETHOD :

Academic performance in various courses *i.e.* **MJDSC, MIDSC, IDC/MDC,AEC, VAC** and **SEC** are to beconsideredas parameters forassessing the achievementof students inthe PHYSICS subject.Anumber of appropriate assessment methodsofPHYSICSwillbe used to determine the extent towhichstudentsdemonstratedesiredlearningoutcomes

Followingassessmentmethodologyshouldbeadopted:

- Theoralandwrittenexaminations(Scheduledandsurprisetests),
- Closed-bookandopen-booktests,
- Problem-solvingexercises,
- Practicalassignmentsandlaboratoryreports,
- Observationofpractical skills,
- Individualandgroupprojectreports,
- Efficientdeliveryusingseminarpresentations,
- Vivavoceinterviewsaremajorlyadoptedassessmentmethodsforthiscurriculum.
- The computerized adaptivetesting,literaturesurveysandevaluations,peersandself-assessment,outputsformindividualandcollaborativeworkarealsootherimportantapproachesforassessmentpurposes.
- AstudentshallbeevaluatedthroughComprehensive Continuous Assessment(**CCA**)/(***InternalEvaluation***)aswellastheEndofSemester **E xamination**(SEE ***ExternalEvaluation***).Theweight-ageofCCAshallbe50%,whereastheweight-

ageoftheSemesterendexaminationshallbe50%.Therewillbe**nointernalevaluationin practicalcourses.**

- InSemesterassessment(**CCA**)/(**InternalEvaluation**)isspreadthrough thedurationofthecourseandistobedonebytheTeacherteachingthecourse.BoSofthes ubjectswilldecidevariouscriteriaandtheirweight-ageforCCA.Theassessmentistobedonebyvariousmeansincluding:
    - Written Tests,MCQsbasedTests/Quiz
    - Presentations/Seminars
    - Groupdiscussions/Groupactivities
    - Assignmentsetc.,Projectwork/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

- ThedistributionofInternalEvaluation CEEisgivenaspercriteriagivenbelowfor15Marks.

WrittenTest/Weekly (2 Test Best out of 3)	20Marks
Quiz (2 Test Best out of 3)	10 Marks
Active Learning During whole Term	10 Marks
Home Assignments	05Marks
Attendance-Regularityin Learning, WrittenTestandActivity	05Marks
Total CEE	50 Marks

- **SCHEMEOFASSESMENTin Uni.ExaminationforEachPractical**

No.	Nameofthehead	Marks
1.	Understandingandapproachtotheexperiment,circuitlayout,use of apparatus	05
2.	Tabulationwithcorrectunitsandaccuracy ofreading,whichisread andnotedbythestudentandverifiedbyexaminer.	05
3.	OralquestionsRegardingtheexperiment(Viva)	07
4.	Calculationsbycorrectformulaandgraphwithscale.	05
5.	Accuracyoftheresultasjudgedbycomparingthestudentsresults withthosesuppliedbyexpertassistantwhohassettheexperiment.	01
6.	Marksforjournal.	02
Total		25

Therewill be two group of practicalseach 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**Endof Semesterexamination**(***ExternalEvaluation***)shallhavean assessmentbaseduponfollowingperspectivewithrespecttoallthecourses:
    - EvaluationwithrespecttoKnowledge,
    - EvaluationwithrespecttoUnderstanding,
    - EvaluationwithrespecttoSkill,

- EvaluationwithrespecttoApplicationand
- HigherOrderThinkingSkills.

- Withrespecttoalltheabovecomponents,thereshallbefollowingtypesofQuestionsfromeachunitofthecourse.
  - MCQs/Fillintheblanks/Matchthepairs,etc
  - Shortanswerquestions
  - Mediumanswerquestions
  - Longanswerquestions, Examples/Problems,etc.

- **CERTIFIED JOURNAL:**
  TheEndofSemesterExaminationwillbeconductedbytheUniversity.A***certifiedjournal***ofthe respectivepracticalcourse**mustbeproduced**atthe timeofpracticalexaminationbythestudent.

- Itwillbecompulsory foracandidate to obtain ***passingpercentage***in bothInternal aswellasExternalEvaluation.Thepassingmarksforeachcourseshallbe**40%**asdecided byconcernBoardofStudiesinPhysics.

- Promotion,Re-AdmissionandTimeforCompletionofCourse, Procedure forAwardingGrades,ProvisionforAppeal,etc.asdecidedbytheHemchandrachary aNorthGujaratUniversity.

AwardingCertificates,DiplomasandDegrees:

CertificateinScience:

Students who opt to exit after completion of the first year and have secured 48 credits will beawarded the Certificate in Science with the three disciplines chosen by student in the first year.Thus, for example, if a studentof B.Sc. program with Physicsas the Major discipline and MathsastheminordisciplinesandChemistryasinterdisciplinesoptstoexitaftersuccessfulcompletion of the firstyear, the studentwill be awarded *"Certificate in Science with Physics,MathsandChemistry".*

DiplomaofScience:

Students who opt to exit after completion of the second year and have secured 92 credits will beawarded the Diploma of Science in the principal discipline.Thus, for example,if a student ofB.Sc.program with Physicsas theMajordisciplineoptsto exitaftersuccessful completionoftwoyears,thestudentwillbeawarded*"DiplomaofScienceinPhysics".*

BachelorofScience:

Students who opts to exit after completion of the third year and have secured 132 credits will beawardedtheBachelorofScienceintheMajor(principal)discipline.

BachelorofScience(Honors):

Studentsof4-yearB.Sc.programwhosuccessfullycomplete4years,withoutarigorousresearch project/ dissertation will be awarded the Bachelorof Science (Honors) in the Majordiscipline(principaldiscipline).

BachelorofScience(HonorswithResearch):

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

researchproject/dissertationwillbe awarded the BachelorofScience (Honors with research)in theMajordiscipline(principaldiscipline).

- **Note:**During the preparation of this curriculum, ample care is taken for consideration of thefollowings:
  (a) NEP-2020
  (b) ModelcurriculumofU.G.C.
  (c) National CreditFrameworkReportofUGC,2023
  (d) Conceptofcontinuousevaluation
  (e) CGPA (CumulativeGradePointAverageCredit)
  (f) CBCS(Choice BasedCreditSystem)
  (g) Semesterapproach
  (h) RevisedrulesandregulationofHemchandracharyaNorthGujaratUniversity,Patan.

  Thereshallbecoverageofmaximum30%syllabusthroughonlinemodeofteaching.AsperdirectivesofUGC.

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 1st 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 2nd 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 3rd 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 4thYear	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

GeneralCredit-SubjectStructure and Examination Pattern /MarkingSchemeofstudy componentsalongwith22creditsinB.Sc.PHYSICS SEM – 1 and 2 are as below.

Sr. No.	Course Code	StudyComponents	InstructionHrs/	Examination			Credit	Exam Duration(Ho
				Internal	Uni .Exam	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–IIPROGRAMME CODE : SCIUG101

Sr. No.	CourseCode	StudyComponents	InstructionHrs/w	Examination			Credit	Exam Duration(Ho
				Internal	Uni .Exam	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.

Semester	First Year B Sc Sem I & II Credit and Theory –Practical Distribution						
	DisciplineSpecificCoreCourses		Inter/Multi Disciplinary Course (4)	AbilityEnhancementCourse (Languages) (2)	ValueAddedCourse (2)	SkillEnhancement Course (2)	TotalCredit
	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
TYPEOFCOURSE:MAJORDISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 **COURSECODE:SC23MJDSCPHY101**

COURSENAME:Mathematical,Thermodynamics, Waves-Sound and Electronics

(EffectivefromJune2023UnderNEP–2020)

TotalCredits:04 TeachingHoursperWeek:04TeachingHoursperSemester: 60	Theory	ExternalMarks-50 InternalMarks-50

CourseObjective:

1. ToUnderstandtheconceptsandsignificanceofScalarandVectorFields,operationswithoperator∇andGauss'sTheorem,Stoke'sTheorem
2. ToUnderstandtheapplicationsoflawsofThermodynamics&theconceptsofentropy.
3. ToteachhowtocalculatechangesinvariousThermodynamicprocesses.
4. Todevelopknowledgeabouttheoryofresonatoranditsapplication,ultrasonicwaves,its production and application
5. Todevelpoeknowledgeabout basic concepts, working of various rectifier and Filter circuits.

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

1. Understands the concepts and significance of Scalar and Vector Fields as well as operations of operator ∇,Gauss'sTheoremandStoke'sTheorem.
2. UnderstandstheThermodynamics,Carnot'stheoremandconceptsofentropy.
3. LearnsaboutUltrasonics, productionanditsapplications.
4. WillGetsufficientknowledgeofsoundandtheoryofresonator.
5. Learns sufficient knowledge of various rectifier, Filter circuits and applications of them.

Syllabus

Unit No.	Content	Credit	Lect. Hrs60
Unit-1	**MathematicalPhysics:** **VectorAlgebraandVectorAnalysis:** Dyadic(1.10),ScalarTripleproduct(1.11),Reciprocalvectors(1.12),VectorTripleproduct(1.13),PseudovectorsandPseudoScalars(1.16), SomeImportant DefinitionaboutVectors,Integrationofvector:LineIntegration,SurfaceIntegrationandVolume Integration(2.3a,b), Partial differentiation(2.4), Gradient of a scalarpoint function(2.5), Divergence of vector(2.6), Curl of a vector(2.8), MoreabouttheVectordifferentialOperator*A*(2.9),MultipleDelOperations(2.11),Someusefulidentities(2.13),Gauss'Theorem(2.14),StokesTheorem(2.17). (*RelatedExamples&Problems*) **BasicReference:***IntroductiontoClassicalMechanicsbyR.G.Takwale & P.S.Puranik*(TataMcGraw-HillPublishingCompanyLtd.)	1	15

Unit-2	**Thermodynamics:** **Thermodynamics of Refrigerator:** Second Law of Thermodynamics (2.8),Carnot'sTheorem(2.9),ThermodynamicabsoluteScaleoftemperature(2.10),ThermodynamicsofRefrigeration (4.2) **Entropy:**IntroductionofEntropy (2.13),ChangeofEntropyinaReversibleProcess (2.14),changeofentropyinanIrreversibleprocess(2.15), Principle of Increase of Entropy of Degradation of Energy (2.16),FormulationoftheSecondlawintermofEntropy(2.17),Entropyandsecondlaw(2.18),ThirdlawofThermodynamics(Nernst'sHeat Theorem)(2.19)*(RelatedExamples&Problem)* **BasicReference:***ThermodynamicsandStatisticalPhysicsbyDr.J.P.AgarwalandSatyaPrakash(PragatiPrakashan)*	1	15
Unit-3	**WavesandSound:** **Wave:**TheoryofResonator(6.16),DependenceoftheFrequencyofresonator on the size and shape of the mouth (6.17), Velocity of Transversewavesalongastretchedstring(7.1),law'sofTransverseVibrationofStrings(7.3),Melde'sExperiment(7.5),Kundt'sTube(7.13)(*RelatedExamples&Problem)* **Ultrasonicwaves:**Ultrasonics (11.23),ProductionofUltrasonics(11.24),Magneto-StrictionEffect (11.24.2),Piezo-ElectricEffectMethod-Oscillator(11.24.3),Detectionof UltrasonicWaves(11.25),ApplicationsofUltrasonicwaves(11.27)(*RelatedExamples&Problem)* **BasicReference:***WavesAndOscillationsbyN.Subhramanyam&Brijlal (VikasPublshingHousePvt.Ltd,–2nd RevisedEdition.*	1	15
Unit-4	**Electronics:** **RectifierandPowerSupply:**TheHalfWaveRectifier(4.1)-[AverageorD.C.outputVoltage,AverageorD.C.outputcurrent,RMSvalueofoutputcurrent,Rectifierefficiency(RatioofRectification),Ripplefactor,VoltageRegulation,Peak inverse voltage(PIV),Transformer Utilization Factor(TUF)], TheFullWaveRectifier(4.2)-[AverageorD.C.outputcurrent,RMSvalueofoutputcurrent,,AverageorD.C.outputVoltage,Rectifierefficiency(RatioofRectification),Ripplefactor, VoltageRegulation,PeakInverseVoltage(PIV),TransformerUtilizationFactor(TUF)],ComparisonofHalfandFullWaveRectifiersCircuit(4.3),TheBridgeRectifier(4.4), **Filter Circuits:**The Half Wave Rectifier with Series InductorFilter(4.7.1)andwithcapacitor filter(4.7.2),TheFull WaveRectifierwithSeriesInductorFilter(4.7.3),ChokeInputFilteror L-section Filter(L-C Filter)(4.7.4), Capacitor Input Filter(C-L-C Filter or π-Filter),[Comparison of L and π-section filtercircuits] **BasicReference:***HandbookofElectronicsbyGuptaandKumar*	1	15

	: Further Reading – Other References : 1) MathematicalMethodinphysicalsciencesbyM.L.Boas(johnWilley&Sons) 2) MathematicalPhysicsbyBDGupta(4th Edition) 3)MathematicalPhysicsbyH KDas 4) VectoranalysisbyProf.RNDesaiUni.GranthNirmanBoard,Gujarat 5) HeatandThermodynamicsbyZeemansky 6) UniversityPhysicsbySears,Zeemankkyandyoung(NarosaPublishingHouse) 7) HeatandThermodynamicsbyRichardH.Dittmon&MarkW.Zemansky(TMH) 8) HeatandThermodynamicsbyA.B.GuptaandH.P.Roy(NewCentralBook) 9) ElectronicDevice&CircuitsbyAllenMottershead,(PHIPvt.LTD) 10) ElectronicsandRadioEngineeringbyM.L.Gupta. 11) BasicElectronisandLinearcircuitsbyBhargvaKulshreshth&GuptaTMHEdition **12)** ElementsofElectronicsbyBagde&Singh

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–I

TYPEOFCOURSE:MINOR DISCIPLINE SPECIFIC COURSE

PROGRAMMECODE:SCIUG101 **COURSECODE:SC23MIDSCPHY102**

COURSENAME:Mathematical Physics and Heat-Thermodynamics

(EffectivefromJune2023UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02 Teaching Hours per Semester: 30	Theory	ExternalMarks-25 InternalMarks-25

CourseObjective:

- ToUnderstandtheconceptsandsignificanceofScalarandVectorFields,operationswithoperator∇andGauss'sTheorem,Stoke'sTheorem
- ToUnderstandtheapplicationsoflawsofThermodynamics&theconceptsofentropy.
- ToteachhowtocalculatechangesinvariousThermodynamicprocesses.

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

- Understands the concepts and significance of Scalar and Vector Fields as well as operations of operator ∇,Gauss'sTheoremandStoke'sTheorem.
- UnderstandstheThermodynamics,Carnot'stheoremandconceptsofentropy.
- CalculatechangesinvariousThermodynamicprocesses.

Syllabus

Unit No.	Content	Credit	Lect.Hrs60
Unit-1	**MathematicalPhysics:** **VectorAlgebraandVectorAnalysis:**Dyadic(1.10),ScalarTripleproduct(1.11),Reciprocalvectors(1.12),VectorTripleproduct(1.13),PseudovectorsandPseudoScalars(1.16), SomeImportant DefinitionaboutVectors,Integrationofvector:LineIntegration,SurfaceIntegrationandVolume Integration(2.3a,b), Partial differentiation(2.4), Gradient of a scalarpoint function(2.5), Divergence of vector(2.6), Curl of a vector(2.8), MoreabouttheVectordifferentialOperator*A*(2.9),MultipleDelOperations(2.11),Someusefulidentities(2.13),Gauss'Theorem(2.14),StokesTheorem(2.17).(*RelatedExamples&Problems*) **BasicReference:***IntroductiontoClassicalMechanicsbyR.G.Takwale & P.S.Puranik*(TataMcGraw-HillPublishingCompanyLtd.)	1	15

Unit-2	**Thermodynamics:** **Thermodynamics of Refrigerator:** Second Law of Thermodynamics (2.8),Carnot'sTheorem(2.9),ThermodynamicabsoluteScaleoftemperature(2.10),ThermodynamicsofRefrigeration (4.2) **Entropy:**IntroductionofEntropy (2.13),ChangeofEntropyinaReversibleProcess (2.14),changeofentropyinanIrreversibleprocess(2.15), Principle of Increase of Entropy of Degradation of Energy (2.16),FormulationoftheSecondlawintermofEntropy(2.17),Entropyandsecondlaw(2.18),ThirdlawofThermodynamics(Nernst'sHeat Theorem)(2.19)*(RelatedExamples&Problem)* **BasicReference:***ThermodynamicsandStatisticalPhysicsbyDr.J.P.AgarwalandSatyaPrakash(PragatiPrakashan)*	1	15
	: Further Reading – Other References : 3) MathematicalMethodinphysicalsciencesbyM.L.Boas(johnWilley&Sons) 4) MathematicalPhysicsbyBDGupta(4th Edition) 3)MathematicalPhysicsbyH KDas 5) VectoranalysisbyProf.RNDesaiUni.GranthNirmanBoard,Gujarat 5) HeatandThermodynamicsbyZeemansky 6) UniversityPhysicsbySears,Zeemankkyandyoung(NarosaPublishingHouse) 7) HeatandThermodynamicsbyRichardH.Dittmon&MarkW.Zemansky(TMH) 8) HeatandThermodynamicsbyA.B.GuptaandH.P.Roy(NewCentralBook)		

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–I

TYPEOFCOURSE:INTER/MULTIDISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 **COURSECODE:SC23MDSCPHY103**

COURSENAME: Waves-Sound and Electronics

(EffectivefromJune2023UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:2 TeachingHoursperSemester: 30	Theory	ExternalMarks-25 InternalMarks-25

CourseObjective:

- Todevelopknowledgeabouttheoryofresonatoranditsapplication,ultrasonicwaves,its production and application
- Todevelpoeknowledgeabout basic concepts, working of various rectifier and Filter circuits.

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

- LearnsaboutUltrasonics, productionanditsapplications.
- WillGetsufficientknowledgeofsoundandtheoryofresonator.
- Learns sufficient knowledge of various rectifier, Filter circuits and applications of them

Unit-1	**WavesandSound:** **Wave:**TheoryofResonator(6.16),DependenceoftheFrequencyofresonator on the size and shape of the mouth (6.17), Velocity of Transversewavesalongastretchedstring(7.1),law'sofTransverseVibrationofStrings(7.3),Melde'sExperiment (7.5),Kundt'sTube(7.13)(*RelatedExamples&Problem)* **Ultrasonicwaves:**Ultrasonics (11.23),ProductionofUltrasonics(11.24),Magneto-StrictionEffect (11.24.2),Piezo-ElectricEffectMethod-Oscillator(11.24.3),Detectionof UltrasonicWaves(11.25),ApplicationsofUltrasonicwaves(11.27)(*RelatedExamples&Problem)* **BasicReference:***WavesAndOscillationsbyN.Subhramanyam&Brijlal (VikasPublshingHousePvt.Ltd,–2nd RevisedEdition.*	1	15

Unit-2	**Electronics:** **RectifierandPowerSupply:**TheHalfWaveRectifier(4.1)-[AverageorD.C.outputVoltage,AverageorD.C.outputcurrent,RMSvalueofoutputcurrent,Rectifierefficiency(RatioofRectification),Ripplefactor,VoltageRegulation,Peak inverse voltage(PIV),Transformer Utilization Factor(TUF)], TheFullWaveRectifier(4.2)-[AverageorD.C.outputcurrent,RMSvalueofoutputcurrent, AverageorD.C.outputVoltage,Rectifierefficiency(RatioofRectification), Ripplefactor,VoltageRegulation,PeakInverseVoltage(PIV),Transformer UtilizationFactor(TUF)],ComparisonofHalfandFullWaveRectifiersCircuit(4.3),***TheBridgeRectifier***(4.4), **Filter Circuits:** The Half Wave Rectifier with Series InductorFilter(4.7.1)andwithcapacitor filter(4.7.2),TheFull WaveRectifierwithSeriesInductorFilter(4.7.3),ChokeInputFilteror L-section Filter(L-C Filter)(4.7.4), Capacitor Input Filter(C-L-C Filter or π-Filter),[Comparison of L and π-section filtercircuits] **BasicReference:***HandbookofElectronicsbyGuptaandKumar*	1	15

: Further Reading – Other References :

- UniversityPhysicsbySears,Zeemansky andYoung(NorosaPublishingHouse)
- ATextBookOnOscillations,WaveandAcousticsbyM.Ghosh&D.Bhattacharya(S.Chand Co)
- Vibration, Waves & Heat by Sears and Zeemansky
- ElectronicDevice&CircuitsbyAllenMottershead,(PHIPvt.LTD)
- ElectronicsandRadioEngineeringbyM.L.Gupta.
- BasicElectronisandLinearcircuitsbyBhargvaKulshreshth&GuptaTMHEdition
- ElementsofElectronicsbyBagde&Singh

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:

- Togainpracticalknowledgebyapplyingtheexperimentalmethodtocorrelatewiththe Physicstheory.
- Toprovidehandsonexperiencewithequipmentsuchas,spectrometer,Pendulum,Flywheelandelectroniccircuits.
- Tolearntheusageofelectricalandopticalsystemsofvariousmeasurements.
- Toimpartpracticalknowledgebyperformingexperimentsbasedontheprinciplesoftheorycourses.
- Toprovidetraininghow toanalyzetheexperimentaldataandgraphicalanalysis.
- Todevelopintellectualcommunicationskillsanddiscussthebasicprinciplesofscientificconceptsinthegroup.

LABORATORY

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

1. Determine aDampingcoefficient,Relaxationandqualityfactorinthedampedmotionofa simplePendulum.
2. StudyofResonator:Verificationofrelation$n^2(V+kv)$=constantanddeterminethe frequencyofunknownfork.
3. Determinationof angular acceleration (α) and find MI ofaFlywheel using plot α verses Tourqe
4. ArrangementofSpectrometerforparallelraysusingSchustermethod and to find Angle of Prizm
5. Calibrationofthe Spectrometeranddeterminesthewavelengthofunknownlineof Hg-spectrum.
6. To Find Refractiveindexofliquidusingconvexlens.
7. Analysisoferror.
8. VerificationofStefanBoltzmann'sfourthpowerlawusingA.C./D.C.Source
9. Melde's Experiment: (i) To prove P/L constant and (ii) P^2Tconstant
10. Least square Method
11. Study of Travelling Microscope, To determine Gauz eliment, Diameter of tube, width of auxiliary slit
12. 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)
COURSECODE: SC23MJDSC P PHY101(B)

1. V-IcharacteristicsofZenerdiode
2. Study of Zener Diode as a voltage Regulator.
3. StudyoftheSeriesResonancewithFrequencyVariation. (**C** constant)
4. Determinationofthecapacitance'C'ofacondenser.
5. P-NJunctiondiodeasHalfWaveRectifierWithoutfilter. CalculationofPercentageofRegulation.
6. P-NJunctiondiodeasHalf WaveRectifier(i) WithSeriesInductorFilter
   (ii)WithShuntCapacitorFilter.CalculationofPercentageofRegulation.
7. VerificationofThevenin'sTheorem.
8. StudyofLogicGates:AND,ORandNOT. Verification of Truth table and giving understanding of voltage level for "0" and "1" level.
9. ExperimentalMeasurementsofPowerSupply,Resistor,Diode,Transistorby 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)Withoutfilter(ii)WithSeriesInductorFilter
    (iii)WithShuntCapacitorFilter.CalculationofPercentageofRegulation.
12. Study of Maximum Power transfer Theorem

CourseOutcome:LearningOutcomes

Bytheendofthecourse,thestudentswillbeabletounderstand.

- ThebasicprinciplesofPhysicsrelatedtotheircoursesinthepracticalway.
- Theoperationaldetailsofspectrometer,electroniccircuitsetc.
- Theexperimentaldesign aspectstodeterminevariouspropertiesoflikegravity,qualifactor, Refractiveindex,determinationofCauchy'sConstants,analysisofspectra,Analysisof error,determinevalueofunknownfrequencyetc.
- Theprocesstoanalyzetheobservationsandinfertheoutcomeoftheexperiments.
- Howtoanalyzetheexperimentaldataandgraphicalanalysis.

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^2Tconstant
2. StudyofResonator:Verificationofrelation$n^2(V+kv)$=constantanddeterminethe frequencyofunknownfork.
3. Determinationof angular acceleration (α) and find MI ofaFlywheel using plot α 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 Spectrometeranddeterminesthewavelengthofunknownlineof Hg-spectrum.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN

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

PROGRAMMECODE:SCIUG101

(EffectivefromJune2023UnderNEP–2020)

TYPE OFCOURSE	CREDIT	COURSECODE
Multidisciplinary CoreCourse(MDSCP)	2	SC23MIDSC P PHY103

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

Multi DisciplineCoreCourse(MIDSCP) Practical

1. Determine aDampingcoefficient,Relaxationandqualityfactorinthedampedmotionofa simplePendulum.
2. StudyofResonator:Verificationofrelation$n^2(V+kv)$=constantanddeterminethe frequencyofunknownfork.
3. Determinationof angular acceleration (α) and find MI ofaFlywheel using plot α verses Tourqe
4. To Find Refractiveindexofliquidusingconvexlens.
5. VerificationofStefanBoltzmann'sfourthpowerlawusingA.C./D.C.Source
6. Study of Travelling Microscope, To determine Gauz eliment, Diameter of tube, width of auxiliary slit
7. V-ICharacteristicsofZenerdiode and Determine Breakdown voltage
8. Study of Zener Diode as a voltage Regulator.
9. P-NJunctiondiodeasHalfWaveRectifier(i)Withoutfilter.CalculationofPercentageofRegulation.
10. P-NJunctiondiodeasFull WaveRectifier(i)WithSeriesInductorFilter (ii)WithShuntCapacitorFilter.CalculationofPercentageofRegulation
11. StudyofLogicGates:AND,ORandNOT. Verification of Truth table and giving understanding of voltage level for "0" and "1" level.
12. Study of Bridge RectifierWithoutfilter. CalculationofPercentageofRegulation.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN

B.Sc.PHYSICS- SEMESTER–I

TYPE OF COURSE: SKILL ENHANCEMENT COURSE

PROGRAMME CODE: SCIUG101

COURSECODE:SC23SECPHY106

COURSENAME:INSTRUMENTATIONMEASUREMENTANDANALYSIS

(EffectivefromJune2023UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02 TeachingHoursperSemester: 30	Theory	ExternalMarks–25 InternalMarks-25

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 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	**Vernier Calipers:** Introduction, Theory, Figure, Description of theinstrument, Detail study of Least count, Errors, Positive error, negativeerror,Determinationofmagnitudeofpositiveandnegativeerrors. **MicrometerScrew:**Introduction,Theory,Figure,Description ofthe instrument, Definition of pitch and its determination, study of leastcount, Meaning of the error and explanation of positive and negativeerrors.Determinationofpositiveandnegativeerrors.Method oftaking observationwith thehelpofMicrometerScrew. **Spherometer:**Introduction,Theory,Figure,Descriptionoftheinstrument, To determine the pitch of the screw, To determine the leastcount of the spherometer, Zero error, Derivation of the formula for theradiusofcurvatureofacurvedsurface.	1	15

Unit-2	**WheatstoneBridge:**Introduction,Theory with figure, the figureofmeterbridgeusedinlaboratory,constructionofMeterbridge. Post-Office box: Introduction, Theory, Circuit Diagram, TheoreticalCircuitdiagram,explanationofworkingwithnecessaryformula. **Galvanometer:**Introduction,Theory,SensitivityandFigureofMeritofGalvanometer. **Spectrometer:**Introduction,Constructionandexplanationofthree main parts of Spectrometer,Mercury Discharge lamp,Sodium Dischargelamp,theadjustment,levelingandthemethodofrecordingtheobservationofSpectrometer.	1	15
Reference: BookforStudy:ExperimentalBookforPhysics			

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–I

TYPEOF COURSE:SKILL ENHANCEMENTCOURSE (SEC)

PROGRAMMECODE:SCIUG101 COURSECODE:SC23SECPHY106 (A)

COURSENAME:INTRODUCTIONTONANOTECHNOLOGY

(EffectivefromJune2023UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02T eachingHoursperSemester:30	Theory	ExternalMarks–25 InternalMarks-25

Sr. No	Contain	Credit	Lec. Hrs 30
Unit 1	**ConceptofNanotechnology:** Nanotechnology,NanotechGeneration,Nanoscience,Newformof Carbon,Nanocomposites,PolymerNanocomposites,Nanomaterials,Propertiesofnanomaterials-, One-, two- and three-dimensionalnanomaterials,Molecular nanotechnology,Nanostructuredmaterialsbyself-assembly,Nanocrystals,What nanodevicescan do inthemedicalfield? Nanopores,nanoionics,nano mechanics, Nanorobotics. **Tools to Make and measure a nano structure:** ToolsandTechniques,microscopy,Metrology,Simulation,Carbon Nanotube(CNT)–fabrication,PurificationofCNTs,Dispersion,ScanningProbeMicroscopes(SPM),AtomicForceMicroscopy(AFM),SingleMoleculeTechniques,MicrolithographyandMEMs,Electronbeamlithography andfocusedionbombardment	1	15
Unit 2	**ApplicationsofNanotechnology:** Identifiedpotentialapplications Expectedbenefitsfromnanotechnologies,cannanotechnologyhelpinaddressingvariouschallenges,Energy andEnergyEfficiency,newenergyproducers,Medicine,security,OtherApplications,Constructions. **Impactof Nanotechnology:** Societalimpactofnanotechnology,Socialandethicalimpact,Health andenvironmentalimpact,Risks withnanotechnology,IndianScenarioinnanotechnology	1	15
Reference Book: Nanotechnology:technologyRevolutionof21stCenturyRakeshRathi(S.Chand&Company,NewDelhi)			
Further Reading: IntroductiontoNanoscience,S.M.Lindsay(OxfordPress)Nano:TheEssentials, T.Pradeep(TataMcGrawHill)			

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 Communicationare 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 educationicoursesnstruction.

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 aestheticfocused 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 (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 (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 (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 Ist 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	
I	Major Discipline Specific course MJDSC-	Fundamentals of Chemistry- I	SC23MJDSCCHE101	4	50	50	2.30	100
	Minor Discipline Specific course MIDSC	To be Selected – I Basic chemistry -1	SC23MIDSCCHE102	2	25	25	2.00	50
	Multi/Inter disciplinary Course MDC/IDC	To be Selected (General chemistry-I/ Agricultural chemistry)	SC23MDCCHE103/ SC23MDCCHE103A	2	25	25	2.00	50
	Ability Enhancement Courses AEC	To be Selected (From languages)	SC23AECCHE104	2	25	25	2.00	50
	Value Added course VAC	To be Selected (pollution and environment protection law)	SC23VACCHE105	2	25	25	2.00	50
	Skill Enhancement Course SEC	To be selected SEC-I Analytical chemistry-1 or SEC-2 Soil analysis or SEC -3 Laboratory	SC23SECCHE106/ SC23SECCHE106A/ SC23SECCHE106B	2	25	25	2.00	50
	Practicals Major Discipline Specific course MJDSC Practicals Minor Discipline Specific course MIDSC Practicals Multi/Inter Disciplinary Course MDC/IDC	PMJDC Practical -I Lab Group A & Group B PMIDC Practical-II Lab PMDC/PIDC Practical-1II Lab	SC23PMJDSCCHE101 SC23PMIDSCCHE102 SC23PMDCCHE103	4 2 2	50 25 25	50 25 25	8 4 4	100 50 50
	Total Credits of Semester - I			22	275	275		550

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 Teaching Hours per Semester: 60		Theory	External 50 Marks 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	**CHEMICAL BONDING** **(A) Valence Bond Theory:**Introduction; Hitler-London theory (energy changes taking place during the formation of H_2 Molecule, Pauling-Slater's Theory (orbital Overlap theory of Covalent Bond). Types of Bond, Covent bond, ionic bond, Coordination covalent bond Coordination bond and Wanderwals force bond. Hybridization and types of hybridization. SP, Sp^2, Sp^3, dsp^2,sp^3d, sp^3d^2 **(B) Molecular Orbital Theory:** Introduction. M.O. Treatment for H_2 molecules Bonding molecular orbitals and Anti-boding molecular orbitals, Sigma and Pi Molecular orbitals. Formation and configuration of Molecular orbital in a Homo-nuclear diatomic species of A_2 type (H_2; H_2^+; N_2 ;N_2^+ ;O_2 ;O_2^+; O_2^{-2}) Formation and configuration of Molecular orbiral in a Hetero-nuclear diatomic species of AB type (CO; CN; CN^-; NO; NO^-)	1	15
2	**(A) Structure And Properties** 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, Anillinium ion, Acetate ion), Hyper conjugation (O,P-directing effect of Alkyl group, Stability of Carbonium ion and Free radicals) **(B) Reaction Mechanism** 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 & Electrophilic), Elimination reactions (E1& E2), Addition reactions (Nucleophilic & Electrophilic)	1	15
3	**Chemical Kinetics.** 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	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.	**Analytical Chemistry** 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. coilingEducational. 1983.

2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rd edn, ELPS Oxford University Press, 1999..

3. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.

4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.

5. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS,1991.

6. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

Organic Chemistry

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.

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. 3rdedn. 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^{th} edn.

Further Reading:

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4^{th} 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^{th} 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 Lab Teaching Hours per semester:60 Minimum Number Practicals to be Performed: 12	Practicals	External 25 Marks Internal 25 Marks

GROUP B

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum Number Practicals to be Performed: 08	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
GROUP A	**Organic Chemistry (Any twelve)** 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 **Acids**: Benzoic acid. Cinnainic acid, Phthalic acid.Oxalic	2	60

	acid.Succinic acid. **Phenols**: α-Napthol. β-Naphthol. **Bases**: *p*-Toludine, Diphenylamine. Aniline.Methyl aniline. **Neutrals:** Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene. Acetone, Benzaldehyde, Methy acetate, Ethyl acetate.Ethanol, 1-Propanol, Glycerol, Chloroform.Carbon tetrachloride, Chlorobenzene, Nitrobenzene.		
GROUP B	**Standardization (Any Eight)** 1. Identify laboratory glassware and equipments. 2. Calibration of burette, Pipette and measuring flasks. 3. Preparation of standard stock solution of HCI by v/v method and their different dilutions. 4. Preparation of standard solution of succinic acid and standardization of NaOH 5. Preparation of standard solution of oxalic acid and standardization of KOH 6. Preparation of standard solution of $Na_2S_2O_3$ and standardization of I_2 solution. 7. Preparation of standard solution of EDTA and estimation of Ca^{+2} in $CaCl_2$ solution. 8. Preparation of standard solution of EDTA and estimation of Mg^{+2} in $MgCl_2$ solution. 9. Preparation of standard solution of Oxalic acid and standardization of $KMnO_4$ solution. 10. Preparation of standard solution of $K_2Cr_2O_7$ and standardization of $FeSO_4$ solution. 11. Preparation of standard stock (i.e. 0.1 N NaOH solutions by w / v method and their different dilutions.	2	60
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) publisger 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 Teaching Hours per Semester: 30	Theory	External 25 Marks 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	**CHEMICAL BONDING** **(A) Valence Bond Theory:** Introduction; Hitler-London theory (energy changes taking place during the formation of H_2 Molecule, Pauling-Slater's Theory (orbital Overlap theory of Covalent Bond). Types of Bond, Covent bond, ionic bond, Coordination covalent bond Coordination bond and Wanderwals force bond. Hybridization and	1	15

	types of hybridization. SP, Sp^2, Sp^3, dsp^2,sp^3d, sp^3d^2 **(B) Molecular Orbital Theory:** Introduction. M.O. Treatment for H_2 molecules Bonding molecular orbitals and Anti-boding molecular orbitals, Sigma and Pi Molecular orbitals. Formation and configuration of Molecular orbital in a Homo-nuclear diatomic species of A_2 type (H_2; H_2^+; N_2 ;N_2^+ ;O_2 ;O_2^+; O_2^{-2}) Formation and configuration of Molecular orbiral in a Hetero-nuclear diatomic species of AB type (CO; CN; CN^-; NO; NO^-)		
2	**(A) Structure And Properties** 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, Anillinium ion, Acetate ion), Hyper conjugation (O,P-directing effect of Alkyl group, Stability of Carbonium ion and Free radicals) **(B) Reaction Mechanism** 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 & Electrophilic), Elimination reactions (E1& E2), Addition reactions (Nucleophilic & Electrophilic)	1	15

Books Recommended:

Inorganic Chemistry

1.Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.

2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rd edn, ELPS Oxford University Press, 1999..

3. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.

4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.

5. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS,1991.

6. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

Organic Chemistry

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.

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. 3rdedn. Macmillan.

Further Reading:

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^{th} edn.Oxferd 1994 7thedn-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	**Organic Chemistry (Any six)** 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 **Acids**: Benzoic acid. Cinnainic acid, Phthalic acid.Oxalic acid.Succinic acid. **Phenols**: α-Napthol. β-Naphthol. **Bases**: *p*-Toludine, Diphenylamine. Aniline.Methyl aniline. **Neutrals:** Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene. Acetone,	1	30

	Benzaldehyde, Methy acetate, Ethyl acetate.Ethanol, 1-Propanol, Glycerol, Chloroform.Carbon tetrachloride, Chlorobenzene, Nitrobenzene.		
2	**Standardization** : **(Any Four)** **1**. Preparation of standard solution of succinic acid and standardization of NaOH / KOH 2. Preparation of standard solution of Na_2S2O_3 and standardization of I_2 solution. 3 .Preparation of standard solution of EDTA and estimation of Ca^{+2} / Mg^{+2} in $CaCl_2$ / $MgCl_2$ solution. 4. Preparation of standard solution of Oxalic acid and standardization of $KMnO_4$ solution. 5. Preparation of standard solution of $K_2Cr_2O_7$ and standardization of $FeSO_4$ 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 HCI 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) publisger 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 Teaching Hours per semester: 30	Theory	External 25 Marks 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	**Chemical Kinetics.** 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	**Analytical Chemistry** 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:

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, 5thedn.

Further Reading:

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^{th} 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 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	**Organic Chemistry (Any six)** 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 **Acids**: Benzoic acid. Cinnainic acid, Phthalic acid.Oxalic acid.Succinic acid. **Phenols**: α-Napthol. β-Naphthol. **Bases**: *p*-Toludine, Diphenylamine. Aniline.Methyl aniline. **Neutrals:** Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene. Acetone,	1	30

	Benzaldehyde, Methy acetate, Ethyl acetate.Ethanol, 1-Propanol, Glycerol, Chloroform.Carbon tetrachloride, Chlorobenzene, Nitrobenzene.		
2	**Standardization (Any Four)** 1) Preparation of standard solution of succinic acid and standardization of NaOH / KOH 2) Preparation of standard solution of Na_2S2O_3 and standardization of I_2 solution. 3) Preparation of standard solution of EDTA and estimation of Ca^{+2} / Mg^{+2} in $CaCl_2$ / $MgCl_2$ solution. 4) Preparation of standard solution of Oxalic acid and standardization of $KMnO_4$ solution. 5) Preparation of standard solution of $K_2Cr_2O_7$ and standardization of $FeSO_4$ 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 HCI 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) publisger 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 : 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 Teaching Hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

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

Course Outcome:

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

Unit	Topic	Credit	Hr
1	**Organic Farming** 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	**Reinforced & Dry land Agriculture:** Introduction & history of Reinforced & Dry land Agriculture, Problem & prospects of rainfed and& Dry land Agriculture in India, Soil and climatic conditions prevalent in dry land areas. Definition of Fertilizer, Classification of Fertilizer, Nano fertilizer, Super Phosphate, Tripal Super Phosphate. Mix Fertilizer. 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	1	15

Books Recommended:

1. Principle of Organic farming: S R Ready, As per ICAR Syllabus
2. Prakrutik Kheti (Gujarati Version) June 2020 By Shree Acharya Devrat, Dr. A. R. Pathak

Further Reading:

1. Industrial Chemistry by B. K. Sharma, Pragati Prakashan, New Delhi.

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 Lab Teaching Hours per semester:60 Minimum Number Practicals to be Performed: 10	Practicals	External 25 Marks Internal 25 Marks

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 inour locality.
2. To know about preparation of organic fertilizers.
3. Interpretation of satellite data.

Sr.	List of Practicals	Credit	Hr
1	**(Any six)** 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	**(Any Four)** 8. Aerial photo and satellite data interpretation for soil and land. 9. Morphological properties of soil profile in different landforms 10. Grouping soils using available data base in terms of soil quality. 11. Field Project - Preparation of Organic farming fertilizers 12. Field Project - Appling and studying Organic Farming fertilizers.	1	15

Books Recommended:

1. Indian Society of Soil Science. 2002.
2. Fundamentals of Soil Science. ISSS, New Delhi Kirkham, D. and Powers, W. L. 1972.
3. Lal, R. and Shukla, M. K. 2004. Principles of Soil Physics. Marcel Dekker

Further Reading:

4. Brady N. C. and Weil R. R. 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.
5. Principles Plant Nutrition. International Potash Institute, Switzerland.

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 Teaching Hours per semester:30	Theory	External 25 Marks 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 willl 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	**Introduction:** 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	**Regulations:** The Noise Pollution (Regulation and Control)	1	15

	(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. Landmark cases on environment legislation in India 1. J.C. Galstaun v. DuniaLal Seal (1905) 2. M.C. Mehta & Another vs. Union of India & Others 3. Subhash Kumar v. State of Bihar (1991) 4.A global perspective on environment laws United Nations Conference on the Human Environment, Stockholm, 1972.		

Books Recommended:

1.Pollution Control Acts, Rules & Notifications Issued thereunder, Central Pollution Control Board (Ministry Of Environment, Forest & Climate Change, Government Of India) PariveshBhawan, East Arjun Nagar, Delhi – 110032 Website: Http://Www.Cpcb.Nic.In April, 2021.

2.Environmental Law In India, By P Leelakrishnan, 6th Edition 2021 By P Leelakrishnan**,** Publisher: Lexis Nexis.

3.Environmental Law and Policy in India,ShyamDiwan& Armin Rosencranz, Oxford University Press.

Further Reading:

1.Pollution Control Acts, Rules & Notifications Issued thereunder, Central Pollution Control Board (Ministry Of Environment, Forest & Climate Change, Government Of India) Parivesh Bhawan, East Arjun Nagar, Delhi – 110032 Website: Http://Www.Cpcb.Nic.In April, 2021.

2. Environmental Law and Policy in India,Shyam Diwan & Armin Rosencranz, Oxford University Press.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE106

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 Teaching hours per semester: 30	Theory	External 25 Marks 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	**Lab Apparatus** (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	**Laboratory Reagents And Solvents Reagents** 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) 5th Ed. The English Language Book Society of Longman

2. Willard, Hobert H. et. al: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing Company, Belmont, California, USA, 1988.

3. Christian, Gary D; Analytical Chemistry, 6th Ed. New York- John Willy, 2004.

4. Harris, Daniel C,Quantitative Chemical Analysis, 3rd 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, 6th Edition, Sauders 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

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 Teaching Hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. 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	**Laboratory assistant** – 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	**Fundamentals of laboratory management**, 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 . **Laboratory safety manual:** chemical management questions, Laboratory information system, Lab Collector LIMS,	1	15

Books Recommended:

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.
2. Laboratory Quality/Management by Parson Kenneth N, Publisher Xilbris, Atlantic publishers Hardcover, 2006.
3. Safe Storage of Laboratory Chemicals, Hardcover 2nd edition, Printed May 1991 by Wiley-Inter science.

Further Reading:

1. Laboratory Work in Chemistry by Keiser Edward H., Publisher: Forgotten Books
2. Laboratory Management System - General Requirements by Kumar Pawan Bharati) Publisher: Discovery Publishing House Pvt Ltd, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE106B

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. 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	**Introduction:** Definition of Soil, Formation of Soil, Types of Soils & Basic Concepts. Soil Components: Air, Water, inorganic and organic solids,	1	15

	Properties of Soil: 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.		
2	**Sample Collection and Processing:** Purpose of Soil testing and analysis, selection of field, Method of Soil Sample collection Methods of soil sample processing, precautions during soil collection & processing, Preservation labeling and Storage of soil samples, various types of boys used for collection. **Study of Instruments:** PH Meter, Conductivity meter, spectrometer, UV-Spectrophotometer, use of soil testing kit and mobile soil testing van. Kjeldahl's Assembly for determination of nitrogen. **Soil Test Report & Fertilizer Recommendation:** Preparation of Soil analysis and test report, Fertilizer recommendation, preparation of soil test summaries and fertility maps.	1	15

Books Recommended :

1. Soils and soil fertility, Troch, F.R. And Thompson, L.M. Oxford Press.
2. Fundamentals of soil science, foth, H.D. Wiley Books.
3. Soil Science and Management, Plaster, Edward J., Delmar Publishers.
4. Principles of Soil Chemistry (2Wed.) Marcel Dekker Inc., New York.

Further Reading:

5. Handbook of Agricultural Sciences, S.S.Singh, P.Gupta, A.k.Gupta, Kalyani Publication.
6. Soil Sampling, Preparation and analysis, Marcell Dekker, Inc, New York.
7. Soil Sampling and methods of analysis, carter M.R. and E.G.Gregorich, 2007, 2nd Ed..
8. Methods of soil analysis, Part, American society of Agronomy Inc., Kuete, A.Et.at., 1986.

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PATAN - 384 265

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ONE EARTH • ONE FAMILY • ONE FUTURE

पावका नः सरस्वती

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC "A" (3.02) State University

PATAN - 384 265

BOARD OF STUDIES (BOS) IN BOTANY

References: No. AK/AxS/2125/2020 Dt. 28/08/2020.
No. AK/AxS/2315/2020 Dt. 04/09/2020.
No. AK/AxS/3006/2020 Dt. 01/10/2020.

No.	Name of BoS Members	Designation
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14.	Dr. JAGDISHBHAI N. PATEL	CO-OPT MEMBER

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)	—

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)	—

CONTENTS

SUMMARY OF THE PROGRAMME

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

Framed according to National Education Policy (NEP) - 2020

Under Choice Based Credit System-Semester-Grading System pattern

UG (B. Sc.) Programme in Botany

Semester-I and II

PREAMBLE:

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

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

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

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

NEP-2020:

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

APPROACH TO CURRICULUM PLANNING:

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

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

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

NATURE AND EXTENT OF BACHELOR'S DEGREE PROGRAMME IN BOTANY (HONOURS):

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

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

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

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

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

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

AIMS:

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

PROGRAM LEARNING OUTCOMES:

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

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

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

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

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

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

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

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

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

SALIENT FEATURES:

- B.Sc. (Honours) Botany in UG programme - **Semester I and II** shall be offered from the Academic year, June **2023**.
- Botany subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2023-24.
- A student will have to get enrolled a **Discipline Specific Core Course (DSC)** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting a **Multi/ Inter disciplinary Course (MDC/ IDC), Ability Enhancement Course (AEC), Skill Enhancement Course (SEC)** as well as **Value Added Course (VAC)/Indian Knowledge System (IKS)** from a pool of courses.
- ***Academic Bank of Credits (ABC)*** is an academic service mechanism as a digital/virtual/online entity established and managed by MOE/UGC. This will facilitate students to become its academic account holders and paving the way for seamless student mobility between or within degree-granting Higher Education Institutions (HEIs) through a formal system of credit recognition, credit accumulation, credit transfers and credit redemption to promote distributed teaching- learning from various recognized institutions, approved ODL and other sources to increase their knowledge, capacities and skills. ABC shall be established on the lines of "National Academic Depository" (NAD) as a Special Purpose Vehicle (SPV). It shall have a dynamic website providing all details of ABC, operational mechanism for the use of all stakeholders of higher education.
- Each course shall be assigned a specific number of **Credits**.
- Discipline Specific Core Course **(DSC)** is the course which should compulsorily be studied by a candidate as a Major and Minor requirement so as to get degree in a said discipline of study.
- There shall be a **Major (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 V I	17% to 56%	-	0% to 9%	0% to 18%	-
Semester VII & VIII	**Major**	**With Research or without Research (RP/OJT)**			
	18% to 56%	0% to 26%			

ATTENDANCE:

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

MEDIUM OF INSTRUCTION:

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

TEACHING LEARNING PROCESS:

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

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

LANGUAGE OF QUESTION PAPER:

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

EVALUATION METHODS:

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

Following assessment methodology should be adopted:

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

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

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

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

NATURE AND OBJECTIVES OF VARIOUS TYPES OF EVALUATION:

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

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

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

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

MODELS OF EVALUATION:

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

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

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

14. ***CERTIFIED JOURNAL:***

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

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

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

STUDY TOUR:

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

COMPUTATION OF SGPA:

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

$$\mathbf{SGPA\ (Si) = \sum (Ci\ X\ Gi) / \sum Ci}$$

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.

$$\mathbf{CGPA = \sum (Ci\ X\ Si) / \sum Ci}$$

Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

CERTIFICATE COURSE								
Part/Class	Subject code	Study Components	Instruction Hrs/Week	Examination			Credits	Exam Duration (Hours)
				CCE	SEE	Total		
B.Sc. Semester -I		**Semester-I**						
		Discipline Specific Core Course(DSC)						
	SC23MJDSCBOT101	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	**02:30**
	SC23MiDSCBOT102	Minor Discipline Specific Core Courses (MiDSC)	2	25	25	50	2	**02:00**
	SC23MDCBOT103	Multi/Inter Disciplinary Courses (MDC/IDC)	2	25	25	50	2	**02:00**
		Practical Course(PDSC)						
	SC23PMJDSCBOT101 (Group A+B)	Major Discipline Specific Core Courses (PMJDSC)	8	50	50	100	4	**05:00**
	SC23PMiDSCBOT102	Minor Discipline Specific Core Courses (PMiDSC)	4	25	25	50	2	**02:30**
	SC23PMDCBOT103	Multi/Inter Disciplinary Courses (PMDC/PIDC)	4	25	25	50	2	**02:30**
		Ability Enhancement Course (AEC)						
	SC23AECBOT104	Ability Enhancement Courses (AEC) **(**Languages)	2	25	25	50	2	**02:00**
		Value Added Course (VAC)/ Indian Knowledge System (IKS)						
	SC23IKSBOT105	Indian Knowledge System (IKS)	2	25	25	50	2	**02:00**
		Skill Enhancement Course (SEC)						
	SC23SECBOT106	Skill Enhancement Course (SEC)	2	25	25	50	2	**02:00**
			30	**275**	**275**	**550**	**22**	
B.Sc. Semester -II		**Semester-II**						
		Discipline Specific Core Course(DSC)						
	SC23MJDSCBOT201	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	**02:30**
	SC23MiDSCBOT202	Minor Discipline Specific Core Courses (MiDSC)	2	25	25	50	2	**02:00**
	SC23MDCBOT203	Multi/Inter Disciplinary Courses (MDC/IDC)	2	25	25	50	2	**02:00**
		Practical Course(PDSC)						
	SC23PMJDSCBOT201 (Group A+B)	Major Discipline Specific Core Courses (PMJDSC)	8	50	50	100	4	**05:00**
	SC23PMiDSCBOT202	Minor Discipline Specific Core Courses (PMiDC)	4	25	25	50	2	**02:30**
	SC23PMDCBOT203	Minor Discipline Specific Core Courses (PMiDSC)	4	25	25	50	2	**02:30**
		Ability Enhancement Course (AEC)						
	SC23AECBOT204	Ability Enhancement Courses (AEC) **(**Languages)	2	25	25	50	2	**02:00**
		Value Added Course (VAC)/ Indian Knowledge System (IKS)						
	SC23VACBOT205	Value Added Courses (VAC)	2	25	25	50	2	**02:00**
		Skill Enhancement Course (SEC)						
	SC23SECBOT206	Skill Enhancement Course (SEC)	2	25	25	50	2	**02:00**
			30	**275**	**275**	**550**	**22**	

OPTION I BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)										
NCrF Credit Level	**Sem-ester**	**Major (Core) (72/ 116)**	**Minor (Electives) (32)**	**Multi/ Inter-disciplinary (10)**	**AEC (10)**	**SEC/ Internship (12)**	**VAC/ IKS (8)**	**RP/ OJT**	**Total Credits/ Sem. (144/176)**	**Qualification / Certificate**
Level		100	100	1 course	1 course	1 course	1 or 2 course	-	-	
4.5 1st Year	**I**	8	4	4	2	2 (SEC)	2 (IKS)	-	22	**UG Certificate**
	II	8	4	4	2	2 (SEC)	2 (VAC)	-	22	
1st 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	-	-	
5.0 2nd Year	**III**	12	-	4	2	2 (SEC)	2 (IKS)	-	22	**UG Diploma**
	IV	12	4	-	2	2 (SEC)	2 (VAC)	-	22	
2nd 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	-	-	-	
5.5 3rd Year	**V**	12	8	-	-	2 (SEC)	-	-	22	**UG Degree**
	VI	12	4	-	2	4(Internship)	-	-	22	
3rd 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)							
6.0 4th Year	**VII**	12	4	-	-	-	-	6 (OJT)	22	**UG Honours Degree**
	VIII	12	4	-	-	-	-	6 (OJT)	22	
4th 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	
4th 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.

MAJOR DISCIPLINE SPECIFIC CORE COURSE -THEORY (MJDSC) *Programme Code: SCIUG103*							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*THEORY*			
				Credits	*Lectures*	*CCE*	*SEE*
Certificate Course	*B.Sc. I*	*SC23MJ DSCBOT 101*	*Microbiology and Phycology*	**4**	**60hrs**	*50 Marks*	*50 Marks*

Course outcomes:

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

1. Develop understanding about the classification and diversity of different microbes including viruses & Algae and their economic importance.
2. Develop conceptual skill about identifying microbes and algae.
3. Gain knowledge about developing commercial enterprise of microbial products.
4. Learn host –pathogen relationship and disease management.
5. Learn Presentation skills (oral & writing) in Botany by usage of computer of computer & multimedia.
6. Gain Knowledge about uses of microbes in various fields.
7. Understand the structure and reproduction of certain selected bacteria and algae.
8. Gain Knowledge about the economic values of this lower group of plant community.
8. Gain laboratory skills such as microscopy, microbial cultures, staining, identification, preservation of microbes for their applications in research and industry.

Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.

UNIT	*TOPIC*	*NO. OF LECTURES* (60hrs)
Unit 1	**VIRUSES AND BACTERIA** • **Plant Viruses:** Discovery, physiochemical and biological characteristics; classification (Baltimore), RNA virus (**TMV**). • **Bacteria:** General characteristics of Bacteria; Cell structure-Salient features; Types of Bacteria based on flagella, Nutritional types (Brief explanation with suitable example). • **Reproduction:** Vegetative, Asexual and Recombination (conjugation and transformation).	**15**

	• Economic importance of Bacteria with reference to their role in agriculture, fermentation and medicine.	
Unit 2	**ALGAE** • General characteristics of algae, occurrence, and range of thallus organization (included types in syllabus); Classification system of Fritsch (included types up to family). • Cell structure and components: cell wall, pigment system, reserve food. • Reproduction in algae: Vegetative and Asexual methods. • Role of algae in the environment, agriculture, biotechnology and industry.	**15**
Unit 3	**CYANOPHYTA AND CHLOROPHYTA** • General characters of **Cyanophyta** and **Chlorophyta**. • Cell structure and components of ***Chlamydomonas***. • Life history of ***Nostoc*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction • Life history of ***Oedogonium*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction	**15**
Unit 4	**PHAEOPHYTA AND RHODOPHYTA** • General characteristics of **Phaeophyta** and **Rhodophyta**. • Life cycle types: Haplontic, Diplontic and Haplodiplontic. • Life history of ***Ectocarpus*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction • Life history of ***Batrachospermum*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction.	**15**

Suggested Readings:

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

<table>
<tr><td colspan="6">MAJOR DISCIPLINE SPECIFIC CORE COURSE -PRACTICAL (MJDSC)
Programme Code: SCIUG103</td></tr>
<tr><td rowspan="2">COURSE</td><td rowspan="2">SEMESTER</td><td rowspan="2">COURSE CODE</td><td rowspan="2">COURSE TITLE</td><td colspan="3">PRACTICAL</td></tr>
<tr><td>Credits</td><td>CCE</td><td>SEE</td></tr>
<tr><td>Certificate Course</td><td>B.Sc. I</td><td>SC23 PMJDSC BOT101</td><td>Microbiology and Phycology</td><td>4 (120 hrs)</td><td>50 Marks</td><td>50 Marks</td></tr>
<tr><td>Course outcomes:</td><td colspan="5">After the completion of the course the students will be able:
1. Understand the instruments, techniques, lab etiquettes and good lab practices for working in a microbiology laboratory.
2. Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes.
3. Practical skills in the field and laboratory experiments in Microbiology & Pathology.
4. Learn to identify Algae.
5. Can initiate his own Plant & Seed Diagnostic Clinic and
6. Can start own enterprise on microbial products.
Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</td></tr>
<tr><td colspan="5">PRACTICALS</td><td>NO. OF LECTURES (120 hrs)</td></tr>
<tr><td colspan="6">GROUP A</td></tr>
<tr><td colspan="5">• To study Bacteria using electron micrographs/ Models/ charts: Types of Bacteria based on flagella.
• To study cell structure of Chlamydomonas through chart/ permanent slide.
• To study the Life history of Nostoc through:
➢ Mounting - Thallus
➢ Mountings - Reproductive structure.
➢ Permanent Slide - Thallus
➢ Permanent Slide - Reproductive structure(Heterocyst).
• To study the Life history of Oedogonium through:
➢ Mounting - Thallus</td><td>60</td></tr>
</table>

➢ Mountings - Reproductive structure. ➢ Permanent Slide – Thallus, ➢ Permanent Slide – Cap cell, ➢ Permanent Slide – Sex organ - Oogonium.	
GROUP B	
• To study viruses using electron micrographs/ Models/ charts: **TMV**. • To study the Life history of ***Ectocarpus*** through: ➢ Mounting - Thallus ➢ Mountings - Reproductive structure ➢ Permanent Slide– Thallus, ➢ Permanent Slide– ***Ectocarpus unilocular*** sporangia. ➢ Permanent Slide– ***Ectocarpus plurilocular*** sporangia. • To study the Life history of ***Batrachospermum*** through: ➢ Mounting - Thallus ➢ Mounting - Reproductive structure. ➢ Permanent Slide– Thallus ➢ Permanent Slide– Cystocarp.	**60**

Suggested Readings:

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

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

B. SC. :: BOTANY PRACTICAL(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**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

<table>
<tr><td colspan="7">MINOR DISCIPLINE SPECIFIC CORE COURSE -THEORY (MIDSC)
Programme Code: SCIUG103</td></tr>
<tr><td rowspan="2">COURSE</td><td rowspan="2">SEMESTER</td><td rowspan="2">COURSE CODE</td><td rowspan="2">COURSE TITLE</td><td colspan="3">THEORY</td></tr>
<tr><td>Credits</td><td>Lectures</td><td>CCE</td><td>SEE</td></tr>
<tr><td>Certificate Course</td><td>B. Sc. I</td><td>SC23MiDSC BOT102</td><td>MICROBES AND ALGAE</td><td>2</td><td>30hrs</td><td>25 Marks</td><td>25 Marks</td></tr>
<tr><td>Course outcomes:</td><td colspan="6">After the completion of the course the students will be able to:
1. Develop understanding about the classification and diversity of different microbes including viruses and their economic importance.
2. Develop conceptual skill about identifying microbes.
3. Gain knowledge about developing commercial enterprise of microbial products.
4. Learn host –pathogen relationship and disease management.
5. Learn Presentation skills (oral & writing) in Botany by usage of computer of computer & multimedia.
6. Gain Knowledge about uses of microbes in various fields.
7. Understand the structure and reproduction of certain selected bacteria.
8. Gain Knowledge about the economic values of this lower group of plant community.
8. Gain laboratory skills such as microscopy, microbial cultures, staining, identification, preservation of microbes for their applications in research and industry.
Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</td></tr>
<tr><td>UNIT</td><td colspan="5">TOPIC</td><td>NO. OF LECTURES (30hrs)</td></tr>
<tr><td>Unit 1</td><td colspan="5"><u>VIRUSES AND BACTERIA</u>
• Plant Viruses: Discovery, physiochemical and biological characteristics; classification (Baltimore), RNA virus (TMV).
• Bacteria: General characteristics of Bacteria; Cell structure-Salient features; Types of Bacteria based on flagella, Nutritional types (Brief explanation with suitable example).</td><td>10</td></tr>
</table>

	• Reproduction: Vegetative, Asexual and Recombination (conjugation and transformation). • Economic importance of Bacteria with reference to their role in agriculture, fermentation and medicine.	
Unit 2	**<u>ALGAE</u>** • Life history of ***Nostoc*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction • Life history of ***Oedogonium*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction • Life history of ***Ectocarpus*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction	**20**

Suggested Readings:

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

MINOR DISCIPLINE SPECIFIC CORE COURSE -PRACTICAL (PMiDSC) *Programme Code: SCIUG103*						
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***		
				Credits	***CCE***	***SEE***
Certificate Course	**B.Sc. *I***	***SC23PMiDSC BOT102***	***MICROBES AND ALGAE***	**2 (60hrs)**	**25 *Marks***	***25 Marks***
Course outcomes:	After the completion of the course the students will be able: 1. Understand the instruments, techniques, lab etiquettes and good lab practices for working in a microbiology laboratory. 2. Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes. 3. Practical skills in the field and laboratory experiments in Microbiology & Pathology. 4. Can initiate his own Plant & Seed Diagnostic Clinic and Can start own enterprise on microbial products. **Pedagogy:** Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.					
UNIT	***TOPIC***					***NO. OF LECTURES*** **(60hrs)**
Unit 1	• To study viruses using electron micrographs/ Models/ charts: **TMV**. • To study **Bacteria** using electron micrographs/ Models/ charts: Types of Bacteria based on flagella.					**20**
Unit 2	• To study the Life history of ***Nostoc*** through: ➢ Mounting - Thallus ➢ Mountings - Reproductive structure. ➢ Permanent Slide - Thallus ➢ Permanent Slide – Reproductive structure(Heterocyst). • To study the Life history of ***Oedogonium*** through: ➢ Mounting - Thallus ➢ Mountings - Reproductive structure.					**40**

	➢ Permanent Slide – Thallus, ➢ Permanent Slide – Cap cell, ➢ Permanent Slide – Sex organ - Oogonium. • To study the Life history of ***Ectocarpus*** through: ➢ Mounting - Thallus ➢ Mountings - Reproductive structure ➢ Permanent Slide– Thallus, ➢ Permanent Slide– ***Ectocarpus:*** **unilocular** sporangia. ➢ Permanent Slide– ***Ectocarpus:*** **plurilocular** sporangia.	

Suggested Readings:

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

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

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

Programme Code: SCIUG103

MICROBES AND ALGAE

SC23PMiDSCBOT102

Date: **Place:**

Time: 02:30 Hrs **Total Marks: 25**

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

1. Identify and classify giving reasons up to family of given specimen **A**. **05**
2. Make a temporary slide of the reproductive organ from the given specimen **B**. Draw the labelled diagram of it and show your slide to the examiner. **06**
3. Identify and describe as per given instructions: **06**

I) Specimen – **C**: Electron micrographs/Models/charts (5 minute)
(TMV/Types of Bacteria based on flagella)

II) Specimen – **D**: Electron micrographs/Models/charts (5 minute)
(*Algae: Nostoc, Oedogonium & Ectocarpus*)

5. a. *Viva-voce* **04**

   b. Journal **04**

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

<table>
<tr><th colspan="8">MULTI/INTER DISCIPLINARY COURSE-THEORY (MDSC)
PROGRAMME CODE: SCIUG103</th></tr>
<tr><th rowspan="2">COURSE</th><th rowspan="2">SEMESTER</th><th rowspan="2">COURSE CODE</th><th rowspan="2">COURSE TITLE</th><th colspan="4">THEORY</th></tr>
<tr><th>Credits</th><th>Lectures</th><th>CCE</th><th>SEE</th></tr>
<tr><td>Certificate Course</td><td>B.Sc. I</td><td>SC23MDSCBOT103</td><td>PLANTS IN EVERYDAY LIFE</td><td>2</td><td>30hrs</td><td>25 Marks</td><td>25 Marks</td></tr>
<tr><td>Course outcomes:</td><td colspan="7">After the completion of the course the students will be able to:
1. This course is designed to give an overview of how plants are indispensable to humans. It gives a broad exposure to the various aspects of plant resource & its utilization.
2. Recall various economically and medicinally important plant species used in day-to-day life.
3. Explain the uses of economically important plants and illustrate the processing of various plant parts.
4. Analyze the utilization of various plant resources in day-to-day life.
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.

Pedagogy: Lectures/ Tutorials/Assignments/Presentation / Demonstration/Field visit/Team based learning.</td></tr>
<tr><td>UNIT</td><td colspan="6">TOPIC</td><td>NO. OF LECTURES (30hrs)</td></tr>
<tr><td>Unit 1</td><td colspan="6"><u>COMMON WILD PLANTS AND THEIR UTILIZATION:</u>
• Identification and utilization of following plants:
➢ Herde (Terminalia chebula)
➢ Behda (Terminalia bellirica)
➢ Amla (Phyllanthus emblica)
➢ Shimlo (Bombax ceiba)</td><td>15</td></tr>
</table>

	GRANDMA'S HERBAL POUCH: • Following plants to be studied with respect to botanical source, part of the plant used, and medicinal uses: ➢ Tulsi (*Ocimum sanctum*) ➢ Ardushi (*Adhatoda vasica*) ➢ Aadu (*Zingiber officinale*) ➢ Haldar (*Curcuma longa*)	
Unit 2	**PLANT RESOURCES AND UTILIZATION:** • Including brief description of plants and/or plant parts used of: ➢ Cereals: Rice and Wheat. ➢ Millets: Jowar and Bajra. ➢ Legumes: Green gram, Chickpea. ➢ Cash crops: Cashew, Sugarcane.	**15**

Suggested Readings:

1. Billings S and Collingwood S (2013). The Big book of home remedies. Lulu.com publisher.
2. Buckley, C (2020). Plant Magic: Herbalism in Real Life. Roost Books Publishers, New York.
3. Chrispeels, MJ and Sadava, DE (1994). Plants, Genes and Agriculture. Jones & Bartlett Publishers.
4. Fuller, KW and Gallon, JA (1985). Plant Products and New Technology. Clarendon Press, Oxford, New York.
5. Hill, AF (1952). Economic Botany: A Textbook of Useful Plants and Plant Products. McGraw Hill Publishing Company Ltd., New Delhi.
6. Kochhar, SL (2012). Economic Botany in the Tropics. MacMillan India Ltd., New Delhi.
7. Purohit, SS and Vyas, SP (2008). Medicinal Plant Cultivation: A Scientific Approach. Agrobios, India.
8. Rao, RS (1985-1986). Flora of Goa, Diu, Daman & Nagar-Haveli. 2 Volumes. Botanical Survey of India.
9. Shailesh, R (2019). Everyday Ayurveda: The complete book of Ayurvedic home remedies. Notion Press, India.

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

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

<table>
<tr><td colspan="7">MULTI/INTER DISCIPLINARY COURSE-PRACTICAL (PMDSC)
PROGRAMME CODE: SCIUG103</td></tr>
<tr><td rowspan="2">COURSE</td><td rowspan="2">SEMESTER</td><td rowspan="2">COURSE CODE</td><td rowspan="2">COURSE TITLE</td><td colspan="3">PRACTICAL</td></tr>
<tr><td>Credits</td><td>CCE</td><td>SEE</td></tr>
<tr><td>Certificate Course</td><td>B.Sc. I</td><td>SC23PMD SCBOT103</td><td>PLANTS IN EVERYDAY LIFE</td><td>2 (60hrs)</td><td>25 Marks</td><td>25 Marks</td></tr>
<tr><td>Course outcomes:</td><td colspan="6">After the completion of the course the students will be able to:
1. This course is designed to give an overview of how plants are indispensable to humans. It gives a broad exposure to the various aspects of plant resource & its utilization.
2. Recall various economically and medicinally important plant species used in day-to-day life.
3. Explain the uses of economically important plants and illustrate the processing of various plant parts.
4. Analyze the utilization of various plant resources in day-to-day life.
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.
Pedagogy: Lectures, Tutorials, Assignments, Demonstrations, live specimens, Herbarium specimens, Videos, Team based learning, Field visit and report writing.</td></tr>
<tr><td>UNIT</td><td colspan="5">TOPIC</td><td>NO. OF LECTURES (60hrs)</td></tr>
<tr><td>Unit 1</td><td colspan="5"><u>COMMON WILD PLANTS AND THEIR UTILIZATION:</u>
• Identification, Local and Botanical Name, Family, Useful Parts, Chemical constituents and utilization of following plants:
➢ Harde (Terminalia chebula)
➢ Behda (Terminalia bellirica)
➢ Amla (Phyllanthus emblica)
➢ Shimlo (Bombax ceiba)</td><td>30</td></tr>
</table>

	GRANDMA'S HERBAL POUCH: • Following plants to be studied with respect to Identification, Local and Botanical Name, Family, Useful Parts, Chemical constituents and utilization of ➢ Tulsi (*Ocimum sanctum*) ➢ Ardushi (*Adhatoda vasica*) ➢ Aadu (*Zingiber officinale*) ➢ Haldar (*Curcuma longa*)	
Unit 2	**PLANT RESOURCES AND UTILIZATION:** • Identification, Local and Botanical Name, Family, Useful Parts, Chemical constituents and utilization of following plants: ➢ Cereals: Rice and Wheat ➢ Millets: Jowar and Bajra ➢ Legumes: Green gram and Chickpea. ➢ Cash crops: Cashew and Sugarcane.	**30**

Suggested Readings:

1. Billings, S. and Collingwood, S. (2013). The Big book of home remedies. Lulu.com publisher.
2. Buckley, C (2020). Plant Magic: Herbalism in Real Life. Roost Books Publishers, New York.
3. Chrispeels, MJ and Sadava, DE (1994). Plants, Genes and Agriculture. Jones & Bartlett Publishers.
4. Fuller, KW and Gallon, JA (1985). Plant Products and New Technology. Clarendon Press, Oxford, New York.
5. Rao, RS (1985-1986). Flora of Goa, Diu, Daman & Nagar-Haveli. 2 Volumes. Botanical Survey of India.
6. Shailesh, R (2019). Everyday Ayurveda: The complete book of Ayurvedic home remedies. Notion Press, India.

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

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

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

(MULTI/INTER DISCIPLINARY COURSE)

Programme Code: SCIUG103

PLANTS IN EVERYDAY LIFE

SC23PMDSCBOT103

Date: **Place:**

Time: 02:30 Hrs **Total Marks: 25**

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

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

   b. Journal 03

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

SKILL ENHANCEMENT COURSE-THEORY (SEC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				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. **Pedagogy:** Lectures, Tutorials, Assignments, Demonstrations, live specimens, Videos, Team based learning, Garden visit and report writing.						
UNIT	***TOPIC***						***NO. OF LECTURES*** **(30 hrs)**
Unit 1	**HORTICULTURE-I** 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	**HORTICULTURE-II** 1. Landscape: Principles, Types and Planning 2. Floriculture and its implements 3. Bonsai 4. Important Horticulture crops of Gujarat						15

Suggested Readings:

1. C.R. Adams (2018). Principles of Horticulture. Amsterdam. Boston.

2. Michael A. Dirr (2009). Manual of Woody and land Plants. Stipes Pub .

3. Salaria and Salaria (2013).A2Z Solutions Horticulture at a glance Vol.I. Jain Bros.

4. Chadha K. L. (2003).Handbook of Horticulture. Indian Council of Agricultural Research.

SEMESTER II

MAJOR DISCIPLINE SPECIFIC CORE COURSE:

PROGRAMME CODE: SCIUG103

SEM- II: SC23MJDSCBOT201: BIOMOLECULES AND CELL BIOLOGY

Programme specific Learning Outcomes:

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

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

MINOR DISCIPLINE SPECIFIC CORE COURSE:

PROGRAMME CODE: SCIUG103

SEM- II: SC23MiDSCBOT202: ORGANIC MOLECULES AND CYTOLOGY

Programme specific Learning Outcomes:

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

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

MULTI/INTER DISCIPLINARY COURSE:

PROGRAMME CODE: SCIUG103

SEM- II: SC23MDSCBOT203: FRUITS AND VEGETABLE PROCESSING

Programme specific Learning Outcomes:

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

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

SKILL ENHANCEMENT COURSE:

PROGRAMME CODE: SCIUG103

SC23SECBOT206: NATURAL RESOURCE MANAGEMENT

Programme specific Learning Outcomes:

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

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

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

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

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 × 4). The theory courses with 3 credits shall have 45 hrs of teaching workload (15 weeks × 3) and the theory courses with 2 credits shall have 30 hrs of teaching workload (15 weeks × 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
	Total	**50**

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
	Total	**25**

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)
Total	**50**	

2. For SEE of 25 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	05	08 short questions must be drawn from both units, out of which any 05 must be answered (1 marks each)
Total	**25**	

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
Total			**30**	**275**	**275**	**550**	**22**	

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
Total			**30**	**275**	**275**	**550**	**22**	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCZOO101

FUNDAMENTALS OF ZOOLOGY-I

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 04 (04 Period/Week)		**Theory**	**External-50 Marks**
			Internal- 50 Marks

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.

Sr. No			Credit	Hr
1	Unit-1	• Principles of classification, Grades of body organization: level of organization, body symmetry, formation of germ layers, formation of coelom, body segmentation. • General characteristics and classification of protozoa (up to class) • Protozoan related diseases: infestation, symptoms and treatment (Malaria, Amoebiasis, Giardiasis, Kala-azar) • General characteristics and classification of phylum Porifera (up to class) • Canal system and types of spicules in sponges	1	15

2	**Unit-2**	• General characteristics and classification of phylum Cnidaria (up to class) • Type study *Hydra* (habit and habitat, external feature, locomotion, body wall, nervous system, reproductive system) • General characteristics and classification of phylum Platyhelminthes (up to class) • General characteristics and classification of phylum Nematoda (up to class) • Platyhelminthes and nematoda related diseases: Life cycle, infestation, symptoms and treatment (Cysticercosis, Ascariasis, Filariasis, Taeniasis)	**1**	**15**
3	**Unit-3**	• Cell discovery and cell theory (Robert Hook and Theodor Schwann), General cellular structure of prokaryotic and eukaryotic cell (Animal cell) • Structure of nucleus and chromosomes • Cell organelles structure and function: Ribosome, Golgi body, Endoplasmic Reticulum. Mitochondria, Centrioles, Lysosome • Cell cycle (normal cell and cancer cell) and Cell division (Amitosis, Mitosis & Meiosis)	**1**	**15**
4	**Unit-4**	• 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 • Wildlife protection: Reintroduction of wild animals and Wildlife Protection Act, 1972 and wildlife conservation methods (In situ and Ex situ conservation) • 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) • Tools and techniques used in study of wildlife biology	**1**	**15**

Reference:

1. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition

2. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.

Further Reading:

1. Verma PS and Agrawal VK, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.

2. 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 DISCPLINE SPECIFIC COURSE CODE: SC23PMJDSCZOO101
FUNDAMENTALS OF ZOOLOGY-I PRACTICAL
EFFECTIVE FROM JUNE 2023-24 UNDER NEP

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

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 quadrate 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 DISCPLINE SPECIFIC COURSE CODE: SC23MIDSCZOO102

BASICS OF ZOOLOGY-I
EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Period/Week)	**Theory**	**External-25 Marks**	
		Internal- 25 Marks	

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

Sr. No			Credit	Hr
1	Unit-1	• Principles of classification,Grades of body organization: level of organization, body symmetry, formation of germ layers, formation of coelom, body segmentation. • General characteristics and classification of protozoa (up to class) • Protozoan related diseases: infestation, symptoms and treatment (Malaria, Amoebiasis, Giardiasis, Kala-azar) • General characteristics and classification of phylum Porifera (up to class) • Canal system and types of spicules in sponges		15

2	**Unit-2**	• General characteristics and classification of phylum Cnidaria (up to class) • Type study *Hydra* (habit and habitat, external feature, locomotion, body wall, nervous system, reproductive system) • General characteristics and classification of phylum Platyhelminthes (up to class) • General characteristics and classification of phylum Nematoda (up to class) • Platyhelminthes and Nematoda related diseases: Life cycle, infestation, symptoms and treatment (Cysticercosis, Ascariasis, Filariasis, Taeniasis)	**1**	**15**

Reference:

1. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition

2. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.

Further Reading:

1. Verma PS and Agrawal VK, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.

2. Magguran, AE (1996). Ecological diversity and its measurements. Princeton University.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
PRACTICAL MINOR DISCPLINE SPECIFIC COURSE CODE: SC23PMIDSCZOO102

BASICS OF ZOOLOGY-I

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

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

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

Total Credits- 02 (02 Period/Week)		**Theory**	**External-25 Marks**
			Internal- 25 Marks

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.

Sr. No			Credit	Hr
1	**Unit-1**	• Cell discovery and cell theory (Robert Hook and Theodor Schwann), General cellular status of prokaryotic and eukaryotic cells Animal Cell) • Structure of nucleus and chromosomes • Cell organelles structure and function: Ribosome, Golgi body, Endoplasmic Reticulum. Mitochondria, Centrioles, Lysosome • Cell cycle (normal cell and cancer cell) and Cell division (Amitosis, Mitosis & Meiosis)	1	15
2	**Unit-2**	• 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 • Wildlife protection: Reintroduction of wild animals and Wildlife Protection Act, 1972 and Wildlife conservation	1	15

		methods (In situ and Ex situ conservation) • 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) • Tools and techniques used in study of wildlife biology		

Reference:

1. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition

2. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.

Further Reading:

1. Verma PS and Agrawal Vk, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.

2. 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 MULTIDISCIPLINARY SPECIFIC COURSE CODE: SC23PMDCZOO103

INTRODUCTION TO ZOOLOGY-I

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

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 quadrate 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

Total Credits- 02 (02 Period/Week)	**Theory**	**External- 25 Marks** **Internal- 25 Marks**

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.

Sr. No			Credit	Hr
1	Unit-1	• Introduction, history and importance of apiculture. • Classification, morphology and diversity of honey bees. • Life history and social organization in honey bee. • Selection criteria of honey bee for apiculture.	1	15
2	Unit-2	• A typical bee hive (natural) • Methods of Bee Keeping – Old and Modern. • Appliances for modern method. • Products of bee keeping: Honey & Bee Wax.	1	15

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, IIIinois.
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 DISCPLINE SPECIFIC COURSE

FUNDAMENTALS OF ZOOLOGY-I PRACTICAL

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

PRACTICAL SKELETON

Time: more than 3 Hours **Total Marks: 50**

Q 1	Prepare a temporary slide of onion root tip showing different stages of mitosis. **OR** Prepare a temporary slide of onion cells and describe the structure of cell.	**05**
Q 2	Prepare a temporary slide of Protista from given sample **OR** Prepare a temporary slide of Paramecium from given sample. **OR** Identify and describe the structure and function of given microtome	**05**
Q 3	Quantification of fauna using quadrate method	**07**
Q 4	Identify the disease and describe its cause, symptoms and cure **OR** Identify and map the distribution of rare and endangered animal species of Gujarat and India.	**05**
Q 5	**Do as directed** 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)	**18**
Q 6	Viva voce and field trip report	**05**
Q 7	Journal submission	**05**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
PRACTICAL MINOR DISCPLINE SPECIFIC COURSE

BASICS OF ZOOLOGY-I PRACTICAL

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

PRACTICAL SKELETON

Time: 3 Hours **Total Marks: 25**

Q 1	Examine the sample of pond water under microscope and show different Protists to examiner **OR** Prepare slide of Paramecium from given culture and show it to examiner	**04**
Q 2	Identify the disease and describe its cause, symptoms and cure	**03**
Q 3	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)	**12**
Q 4	Viva-voce	**03**
Q 5	Journal	**03**

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**

Q 1	Prepare a temporary slide of onion root tip showing different stages of mitosis. **OR** Prepare a temporary slide of onion cells and describe the structure of cell.	**04**
Q 2	Identify and describe the use of tools or technique in wildlife biology **OR** Quantification of fauna using quadrate method	**03**
Q 3	**Do as directed** 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	**12**
Q 4	Viva voce and Field trip report submission	**03**
Q 5	Journal submission	**03**

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

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

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 × 4). The theory courses with 3 credits shall have 45 hrs of teaching workload (15 weeks × 3) and the theory courses with 2 credits shall have 30 hrs of teaching workload (15 weeks × 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
	Total	**50**

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
	Total	**25**

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)
Total	**50**	

2. For SEE of 25 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	05	08 short questions must be drawn from both units, out of which any 05 must be answered (1 marks each)
Total	**25**	

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 withdifferent 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 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 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 theother 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 asacademician 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
Total			**30**	**275**	**275**	**550**	**22**	

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
Total			**30**	**275**	**275**	**550**	**22**	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER I

PROGRAM CODE: SCIUG105

MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCMIC101

FUNDAMENTALS OF MICROBIOLOGY

Total Credits- 04 (04 Period/Week)	**Theory**	**External-50 Marks**
		Internal- 50 Marks

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, Fluoresence Microscope,

- Satins 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 λ 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 – 5th Edition
3. Principle of microbiology by Ronald M. Atlas, 2nd Edition

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER - I

PROGRAM CODE: SCIUG105

PRACTICLS: SC23 PMJDSCMIC101 PART-A & PART B

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

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, 9thEdition.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 Edication (Singapore) Pvt. Ltd., (ISBN: 978-9332535190)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER - I

PROGRAM CODE: SCIUG105

MINOR DISCPLINE SPECIFIC COURSE CODE: SC23MIDSCMIC102

MICROBIOLOGICAL TECHNIQUES

Total Credits- 02 (02 Period/Week)		**Theory**	**External-25 Marks**
			Internal- 25 Marks

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

- Satins 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 – 5th Edition

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER I

PROGRAM CODE: SCIUG105

PRACTICAL MINOR DISCPLINE SPECIFIC COURSE CODE:SC23PMIDSCMIC102

MICROBIOLOGICAL TECHNIQUES

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

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

Total Credits- 02	**(02 Period/Week)**	**Theory**	**External-25 Marks**
			Internal- 25 Marks

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 – 5th 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

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

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

Total Credits- 02 (02 Period/Week)	**Theory**	**External- 25 Marks** **Internal- 25 Marks**

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 – 5th Edition
3. Principle of microbiology by Ronald M. Atlas, 2nd Edition

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER I

PROGRAM CODE: SCIUG105

PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE

FUNDAMENTALS OF MICROBIOLOGY PRACTICAL

PRACTICAL SKELETON (External Examination)

Time: more than 3 Hours **Total Marks: 50**

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

PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE

FUNDAMENTALS OF MICROBIOLOGY PRACTICAL

PRACTICAL SKELETON (Internal Examination)

Time: 3 Hours **Total Marks: 50**

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER I

PROGRAM CODE: SCIUG105

PRACTICAL MINOR DISCPLINE SPECIFIC COURSE

MICROBIOLOGICAL TECHNIQUES PRACTICAL

PRACTICAL SKELETON (External Examination)

Time: 3 Hours **Total Marks: 25**

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

PRACTICAL MINOR DISCPLINE SPECIFIC COURSE

MICROBIOLOGICAL TECHNIQUES PRACTICAL

PRACTICAL SKELETON (Internal Examination)

Time: 3 Hours **Total Marks: 25**

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

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**

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

PRACTICAL MULTIDISCIPLINARY COURSE

BASIC MICROBIOLOGY PRACTICAL

PRACTICAL SKELETON (Internal Examination)

Time: 3 Hours **Total Marks: 25**

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN

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

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

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	
Semester II								
Theory Course (DSC)								
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
Practical Course (PDSC)								
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
Ability Enhancement Course								
9	SC23AECBIO204	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	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

Total Credits- 04 (04 Periods/ Week)	**Theory**	External **50 marks**
		Internal **50 marks**

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 6th 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

Total Credits- 02 (02 Periods/ Week)	**Theory**	External **25 marks**
		Internal **25 marks**

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 6th 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

Total Credits- 02 (02 Periods/ Week)	**Theory**	External **25 marks**
		Internal **25 marks**

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 6th 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 **SC23SECBIO106**

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Periods/ Week)	**Theory**	External **50 marks**

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

Sr. No.			Credit	Hrs.
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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. (Mathematics)

Detailed Syllabus as per NEP with Effect from July 2023

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

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	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Major Discipline Theory Course-1**
COURSE CODE:	**SC23MJDSCMAT101**
PAPER NAME	**Calculus and Vector Analysis**
With Effect From :	**JULY 2023**
Total Theory Credits:	**04 (04 Period /Week)**
Exam Pattern:	**50 Marks (CCE) + 50 Marks (SEE) = 100 Marks**

Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**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.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**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.**

Course Outcome :	
1	**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.**
2	**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.**
3	**Understand the fundamental concepts of vector algebra, including scalar product and vector multiplication, co-planar vectors, and reciprocal vectors set.**
4	**Learn the concept of partial derivatives and vector analysis, including Understanding the properties of gradient, divergence, and curl, and Using them to solve problems.**

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 nth derivatives and all examples for this formula for some special functions: namely, $(ax+b)^m$; $\frac{1}{ax+b}$; Log$(ax+b)$; m^{ax+b}; e^{ax+b}; $Sin(ax+b)$; $Cos(ax+b)$; e^{ax}.Cos(bx +c) ; e^{ax}.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, sinx, cosx, , sinhx, coshx 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, 5th Edition, McGraw-Hill Education, ISBN: 978-0070178379**			

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Major Discipline Practical Course-1 (Group A) Practical on Calculus**
COURSE CODE:	**SC23PMJDSCMAT101 (A)**
With Effect From :	**JULY 2023**
Total Practical Credits:	**02 (04 Period /Week) (Batch of 15 Students)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**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.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**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.**

Course Outcome :	
1	**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.**
2	**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.**

No.	Practical DETAILS : Group A
1	**Successive Differentiation and Standard Results (Part 1)** **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	**Successive Differentiation and Standard Results (Part 2)** **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	**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 nth 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	B. S. Vatssa, Theory of Matrices, 2nd 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
Further Reading:	
1	Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732
2	Herry F. Davis, Introduction to Vector Analysis, 5th 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

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Major Discipline Practical Course-1 (Group B)**
COURSE CODE:	**SC23PMJDSCMAT101 (B)**
With Effect From :	**JULY 2023**
Total Practical Credits:	**02 (04 Period /Week) (Batch of 15 Students)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

The basic requirement for the smooth and better conduction of the practical program:

1. Must require a Computer operator and a peon for better conduction of the practical and maintenance of computer systems.
2. Must have a computer lab fully equipped with Microsoft Office tools and internet facility.

Program Outcome :	
1	The B.Sc. program in Mathematics aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.
2	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.
3	The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.
4	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.

Course Outcome :	
1	**Proficiency in Microsoft Word for Mathematical Writing:** • Students should be able to create and format mathematical documents using Microsoft Word, including equations, symbols, and mathematical notation. • They should understand how to use Word features to structure and organize their mathematical research papers effectively.
2	**Data Analysis with Microsoft Excel:** • Students should gain a good understanding of Excel functions and tools relevant to mathematical data analysis. • They should be able to use Excel for tasks like organizing data, generating charts, and performing basic statistical analyses.
3	**Creating Presentations with Microsoft PowerPoint:** • Students should be able to create engaging and informative presentations on mathematical topics using PowerPoint. • They should understand how to effectively use visual aids, diagrams, and graphs to communicate mathematical concepts.

No.	PRACTICAL DETAILS
Unit-1	**Microsoft Office Word Tools used in Mathematical Research**
1	**Text Basics for Math Type Equations, Text Formatting, and saving file** • Typing the text, Typing Math Type equations, Alignment of text • Editing Text: Cut, Copy, Paste, Select All, Clear • Find & Replace • New, Open, Close, Save, Save As • Formatting Text: Font Size, Font Style • Font Color, Use Bold, Italic, and Underline • Change the Text Case • Line spacing, Paragraph spacing • Shading text and paragraph • Working with Tabs and Indents **(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)**
2	**Working with Objects** • Shapes, Clipart and Picture, Word Art, Smart Art • Columns and Orderings - To Add Columns to a Document • Change the Order of Objects • Page Number, Date & Time • Inserting Text boxes • Inserting Word art • Inserting symbols • Inserting Chart **(Questions to be asked in Practical: Making a Word document for the best research paper style using charts, clipart, inserting figures, and formatting them)**
3	**Working with Data Tables** • Working with Tables, Table Formatting • Table Styles • Alignment option • Merge and split option * Headers & Footers **(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)**
Unit-2	**Microsoft Office Excel Tools used in Mathematical Research**
4	**Introduction to Excel** • Introduction to Excel interface • Understanding rows and columns, Naming Cells • Working with Excel workbook and sheets • New, Open, Close, Save, Save As • Formatting Text: Font Size, Font Style • Font Color, Use Bold, Italic, and Underline • Wrap text, Merge, and Centre • Currency, Accounting, and other formats • Modifying Columns, Rows & Cells

	(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)
5	**Perform Calculations with Functions** • Creating Simple Formulas • Setting up your own formula • Date and Time Functions, Financial Functions • Logical Functions, Lookup, and Reference • Functions Mathematical Functions • Statistical Functions, Text Functions. **(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)**
Unit-3	**Microsoft Office Excel Plotting Tools Used in Mathematical Research**
6	**Plotting of Graphs** • Plotting graphs of trigonometric functions • Plotting graphs of inverse trigonometric function • Plotting graphs of Polynomial equations **(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)**
7	**Sort and filter data** • Using number filter, Text filter • Custom filtering • Removing filters from columns • Conditional formatting **(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)**
Unit-4	**Microsoft Office Power Point Tools Used in Mathematical Research**
8	**Introduction to PowerPoint Environment** • New, Open, Close, Save, Save As • Typing the text, Alignment of text • Formatting Text: Font Size, Font Style • Font Color, Use Bold, Italic, and Underline • Cut, Copy, Paste, Select All, Clear text • Find & Replace • Working with Tabs and Indents
9	**Creating slides and applying themes** • Inserting a new slide • Changing the layout of slides • Duplicating slides • Copying and pasting slide • Applying themes to the slide layout • Changing theme color

	• Slide background • Formatting slide background Using slide views
10	**Working with bullets and numbering** • Multilevel numbering and Bulleting • Creating List • Page bordering • Page background • Aligning text • Text directions • Columns option
11	**Working with Objects** • Shapes, Clipart and Picture, Word Art, Smart Art • Change the Order of Objects • Inserting slide header and footer • Inserting Text boxes • Inserting shapes, using quick styles • Inserting Word art • Inserting symbols • Inserting Chart **(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.)**
References:	
1	"Excel Spreadsheet Manual for Applied Mathematics" by Stela Pudar-Hozo, Indiana University Northwest, Pearson Publication
2	"Microsoft PowerPoint 2019 Step by Step" by Joan Lambert and Joyce Cox:
3	"Microsoft Word 2019 For Dummies" by Dan Gookin:
4	"Microsoft Excel Data Analysis and Business Modeling" by Wayne L. Winston
Further Reading:	
1	"MathType Cookbook" by Richard L. Evans and W. J. “Jerry” Cody:
2	"Math into LaTeX" by George Grätzer:
3	Applied Mathematics with Microsoft Excel by Chester Piascik published by Brooks/Cole
4	Microsoft Office Book by Rouf published by Innovative Solutions

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Minor Discipline Theory Course-1**
COURSE CODE:	**SC23MIDSCMAT102**
PAPER NAME	**Introduction to Calculus**
With Effect From :	**JULY 2023**
Total Theory Credits:	**02 (02 Period /Week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**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.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**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.**
Course Outcome :	
1	**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.**
2	**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 derivative, repeat all formula of derivative) Successive Differentiation:** **Define Successive Differentiation, Derive Standard result for n^{th} derivatives and all examples for this formula for some special functions: namely, $(ax+b)^m$; $\frac{1}{ax+b}$; Log$(ax+b)$; m^{ax+b}; e^{ax+b}; $Sin(ax+b)$; $Cos(ax+b)$; e^{ax}.Cos(bx +c) ; e^{ax}.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, sinx, cosx, , sinhx, coshx** **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, 5th Edition, McGraw-Hill Education, ISBN: 978-0070178379

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Minor Discipline Practical Course-1** **Practical on Introduction to Calculus**
COURSE CODE:	**SC23PMIDSCMAT102**
With Effect From :	**JULY 2023**
Total Practical Credits:	**02 (04 Period /Week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**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.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**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.**
Course Outcome :	
1	**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.**
2	**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.**

No.	Practical DETAILS
1	**Successive Differentiation and Standard Results (Part 1)** **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	**Successive Differentiation and Standard Results (Part 2)** **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	**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 nth 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, 5th Edition, McGraw-Hill Education, ISBN: 978-0070178379**

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Multi-Disciplinary Theory Course-1**
COURSE CODE:	**SC23MDCMAT103**
PAPER NAME	**Mathematics-1**
With Effect From :	**JULY 2023**
Total Theory Credits:	**02 (02 Period /Week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**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.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**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.**

Course Outcome :	
1	**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.**
2	**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 nth derivatives of some functions like, $(ax+b)^m$; $\frac{1}{ax+b}$; Log$(ax+b)$; m^{ax+b}; e^{ax+b}; $Sin(ax+b)$; $Cos(ax+b)$; e^{ax}.Cos(bx +c) ; e^{ax}.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, sinx, cosx, , sinhx, coshxin 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, 5th Edition, McGraw-Hill Education, ISBN: 978-0070178379**			
2	**James Stewart, Calculus: Concepts and Contexts, 4th Edition, Thomson Brooks/Cole, 2018 ISBN: 978-1417687669**			

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Multi-Disciplinary Practical Course-1** **Practical on Mathematics-1**
COURSE CODE:	**SC23PMDCMAT103**
With Effect From :	**JULY 2023**
Total Theory Credits:	**02 (04 Period /Week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**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.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**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.**
Course Outcome :	
1	**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.**
2	**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.**

No.	Practical DETAILS
1	**Successive Differentiation and Standard Results (Part 1)** **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	**Successive Differentiation and Standard Results (Part 2)** **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	**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 nth 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**
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Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Skill Enhancement Theory Course-1**
COURSE CODE:	**SC23SECMAT106**
PAPER NAME	**Mathematics for Competitive Exams-1**
With Effect From :	**JULY 2023**
Total Theory Credits:	**02 (02 Period /Week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**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.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**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.**

Course Outcome :	
1	**Students get knowledge about mathematical rules, formulae and concepts for competitive examination.**
2	**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.**

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	1	**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** **Number Series: Types of Series, Types of Questions Asked on Number Series** **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**	1	15
2	2	**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** **Indices and Surds: Indices, Surds, Properties of surds, Operations on Surds, Short Cut Techniques.**	1	15
References:				
1	**Rajesh Verma, Fast Track objective Arithmetic, Arihant Publication India Ltd.**			
2	**Dr. R. S. Agrawal, Quantitative Aptitude, S. Chand Publication India Ltd.**			
Further Reading:				
1	**Satish Kumar, Maths in Moments, Arihant Publication India Ltd.**			
2	**Abhinay Sharma, Competitive Mathematics, Kiran Institute of Career Excellence.**			
3	જગદીશ પટેલ, લિબર્ટી સહાયક, લિબર્ટી કેરિયર એકેડેમી.			