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

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–II

TYPEOFCOURSE:MAJORDISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 COURSECODE:SC23MJDSCPHY201

COURSENAME: Electrostatics, Classical Mechanics, Electricity and Optics

EffectivefromJune2023UnderNEP–2020

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

Course Objective:

- To Learns the basics concepts and the law of electrostatics and electrostatic energy.
- ToLearntheconceptsofSimpleHarmonicOscillationsandcombinationofSHM.
- ToUnderstandtheconceptsofDamped&ForcedOscillationsanditsapplications
- To understands and recalls the basic concepts of DC Circuits and its functioning. Network
- theorems and principles of Network analysis.
- To develop foundation in optics. To learn the the knowledge of refraction through Lenses, Aberration and Interference
- To provide sufficient knowledge of Newton'S ring experiments and determine wavelength

Course Outcome:

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

- Understands basics concepts of electrostatics. Learns how to determine the charge of an electron.
- LearnstheconceptsofSimpleHarmonicOscillationsandcombinationofSHM.
- UnderstandstheconceptsofDamped&ForcedOscillationsanditsapplications
- Learns basic concepts of DC Circuits, its functioning and principles of Network analysis. Also apply theorems to construct and solve electrical circuits.
- Learns the the knowledge of various type of Aberration and Interference
- Get sufficient knowledge of Newton'S ring experiments and determine wavelength

: Syllabus :

Unit No.	Content	Credit	Lect.Hrs60
Unit-1	**Electrostatics:** Gauss'slaw (4.21),Gauss'slaw inDifferential form (4.22),Gauss'slawandCoulomb'slaw(4.23),ImportantExamplesonGauss'sLaw (onlyList): when do Gauss's Law apply? (4.24) Force on the Surface of a chargedConductor(4.25),ElectrostaticsEnergyinthemediumsurroundingthecharged conductor (4.26), Millikan's Oil Drop Method for Determination ofElectronicCharge(4.29)(***RelatedExamples &Problems***) **SteadyCurrent:** MetalElectrodeinanElectrolyte (8.1),Batteryonopencircuit (8.2),Definition of EMF (8.3), Definition of Potential difference (8.4), Current andCurrent density (8.6), Conservation of chargei.e.,ContinuityEquation(8.8), Ohm's Law at a point (8.11), Wiedmann and franz law (8.13), TheRelaxationTime(8.14)(***RelatedExamples&Problems***) **BasicReference:** *ElectricityandMagnetismByK.K.Tewari(S.Chand&CompanyLtd)*	1	15
Unit-2	**Classical Mechanics:** **SimpleHarmonicOscillations**:CompositionoftwosimpleHarmonicMotions along the same direction of the same frequency(2.8), Two simpleHarmonicMotionsactuponaparticlesimultaneouslyhavingnophasedifferencebuttheydifferinfrequencybyverysmallamount(2.9), CompositionoftwosimpleHarmonicMotionsactinguponaparticlesimultaneouslyatrightanglestoeachother,sametimeperiodbutdifferentinphase(2.10),Lissajousfigures(2.11),Experimentaldeterminationof LissajousFigures(2.12b&c). (*RelatedExamples&Problems*) **Damped and Forced Oscillations:** Motion Due to a constant force (3.2), TheForceactsforshorttimeandtofinditseffect (3.3),A Particleexecuting S.H.M. is acted upon by a harmonic force Fsinpt of frequency $P/2\pi$ (3.4), Motioninaresistingmedium (3.5) (*Related Examples&Problems*) **Pendulum:**CompoundPendulumandOscillations,Barpendulum **BasicReference:** *ATextBookonOscillations,WaveandAcousticsbyM.Ghosh& D. Bhattacharya(S.Chand&CompanyLTD.)*	1	15

Unit-3	**Electricity:** **D.C.Circuits:**SimpleR-LCircuit-GrowthanddecayofcurrentHelmholtzequitation (11.24),R-C Circuit (11.25), Measurement of HighResistancebymethod ofleakage (11.26),ComparisonofcapacitiesbyDe- Sauty 'sMethod(11.27),IdealL-C.Circuit (11.28),SeriesL-C-RCircuit (changecaseonly)(11.29)(*RelatedExamples&Problems*) **Network Theorems:**Thevenin's Theorem (18.6), MaximumPowerTheorem(18.8) **A.C.Bridges**.:ACBridges (17.5)A.C.Bridgesforthemeasurementofinductances (17.6)(1)MaxwellBridge (2) AndersonBridgeA.C.Bridgeforthemeasurementof*capacitance*(17.7) (1)De Sauty'sA.CBridge(2)ScheringBridge(*RelatedExamples&Problems*) **Basic Reference:** *Electricity and Magnetism by K.K.Tewari(S. Chand&CompanyLtd)*	1	15
Unit-4	**Optics:** **RefractionThroughLenses:**IntroductionofvariousshapeofLenses,Lenses(4.2),Lensequation(4.9),Smallestseparationofobjectandrealimageina ConvexLens(4.13),DeviationbyathinLenses(4.15),PowerofLens(4.15) ,EquivalentFocalLengthoftwothinlensesSeparatedbyafinitedistance (4.17), FocalLength(4.17.1),Cardinal points(5.2) **Aberrations:** Introduction (5.1), The Achromatic Doublet (5.2.1), Monochromatic aberration (5.3), Sphericalaberration(5.3.1) (*RelatedExamples&Problems*) **Interference:** InterferenceinThinFilms (8.15),InterferenceduetoReflected light (8.16), Interference due to Transmitted light (8.17), Newton'sRings (8.23),DeterminationoftheWavelengthofSodiumLightusingNewton's Rings (8.24), Refractive index of a liquid using Newton's Rings,RefractiveindexusingGraph(8.25)(*RelatedExamples&Problems*) **BasicReference:**1)*ATextbookofOPTICSByN.Subhramanyam&Brijlal (S.ChandCo. Ltd.)* *2) Optics by Ajay Ghatak (THM Edition)* ***(For Aberration)***	1	15

Other References – Further Readings

- Electricity and Magnetism by Mahajan and Rangavala
- Electricity and Magnetism by Berkley Physics Course Voll 2
- WavesandOscillationsByN.Subhramanyam&Brijlal(VikasPubl.HouseLtd,NewDelhi)
- IntroductiontoClassicalMechanicsbyR.G.Takwale&P.S.Puranik (TataMcGraw-HillPublishingCompanyLtd.)
- ElectricalCircuitAnalysisbySonyandGupta
- NetworkAnalysisbyG.K.Mittal.(KhannaPublications)
- ElectricityandMagnetismbyD.C.Tayal
- PrincipalofOpticsbyB.KMathur(S.Chand&CompanyLtd)
- OpticsandAtomicsPhysicsbyD.P.Khandelval(HimalayaPublishinghouse)
- A Text book of Optics by N Subhramanyan and Brijalal

HEMCHEMCHANDRACHARYANORTH GUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–II

TYPEOFCOURSE: MINOR DISCIPLINE SPECIFIC COURSE

PROGRAMMECODE: SCIUG101 COURSECODE: SC23MIDSCPHY202

COURSENAME: ELECTROSTATICS, CLASSICAL MECHANICS

EffectivefromJune2023UnderNEP–2020

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

Course Objective:

- To Learns the basics concepts and the law of electrostatics and electrostatic energy.
- ToLearntheconceptsofSimpleHarmonicOscillationsandcombinationofSHM.
- ToUnderstandtheconceptsofDamped&ForcedOscillationsanditsapplications.

Course Outcome:

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

- Understands basics concepts of electrostatics. Learns how to determine the charge of an electron.
- LearnstheconceptsofSimpleHarmonicOscillationsandcombinationofSHM.
- UnderstandstheconceptsofDamped&ForcedOscillationsanditsapplications.

:: Syllabus ::

Unit No.	Content	Credit	Lect.Hrs30
Unit-1	**Electrostatics:** Gauss'slaw (4.21),Gauss'slaw inDifferential form (4.22),Gauss'slawandCoulomb'slaw(4.23),ImportantExamplesonGauss'sLaw (onlyList): when do Gauss's Law apply? (4.24) Force on the Surface of a chargedConductor(4.25),ElectrostaticsEnergyinthemediumsurroundingthecharged conductor (4.26), Millikan's Oil Drop Method for Determination ofElectronicCharge(4.29)(***RelatedExamples &Problems***) **SteadyCurrent:** MetalElectrodeinanElectrolyte (8.1),Batteryonopencircuit (8.2),Definition of EMF (8.3), Definition of Potential difference (8.4), Current andCurrent density (8.6), Conservation of chargei.e.,ContinuityEquation(8.8), Ohm's Law at a point (8.11), Wiedmann and franz law (8.13), TheRelaxationTime(8.14)(***RelatedExamples&Problems***) **BasicReference:** *ElectricityandMagnetismByK.K.Tewari(S.Chand&CompanyLtd)*	1	15

	Classical Mechanics: **SimpleHarmonicOscillations**:CompositionoftwosimpleHarmonicMotions along the same direction of the same frequency(2.8), Two simpleHarmonicMotionsactuponaparticlesimultaneouslyhavingnophasedifferencebuttheydifferinfrequencybyverysmallamount(2.9), CompositionoftwosimpleHarmonicMotionsactinguponaparticlesimultaneouslyatrightanglestoeachother,sametimeperiodbutdifferentinphase(2.10),Lissajousfigures(2.11),Experimentaldeterminationof LissajousFigures(2.12b&c). (*RelatedExamples&Problems*) **Damped and Forced Oscillations:** Motion Due to a constant force (3.2), TheForceactsforshorttimeandtofinditseffect (3.3),A Particleexecuting S.H.M. is acted upon by a harmonic force Fsinpt of frequency $P/_{2\pi}$ (3.4), Motioninaresistingmedium (3.5) (*Related Examples&Problems*) **Pendulum:**CompoundPendulumandOscillations,Barpendulum **BasicReference:** *ATextBookonOscillations,WaveandAcousticsbyM.Ghosh& D. Bhattacharya(S.Chand&CompanyLTD.)*	1	15

Other References – Further Readings

- Electricity and Magnetism by Mahajan and Rangavala
- Electricity and Magnetism by Berkley Physics Course Voll 2
- WavesandOscillationsByN.Subhramanyam&Brijlal(VikasPubl.HouseLtd,NewDelhi)
- IntroductiontoClassicalMechanicsbyR.G.Takwale&P.S.Puranik (TataMcGraw-HillPublishingCompanyLtd.)

HEMCHEMCHANDRACHARYANORTH GUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–II

TYPEOFCOURSE: INTER/ MULTI DISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 COURSECODE:SC23MDCPHY203

COURSENAME:ELECTRICITY AND OPTICS

EffectivefromJune2023UnderNEP–2020

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

:: Syllabus ::

Unit No.	Content	Credit	Lect.Hrs 30
Unit-1	**Electricity:** **D.C.Circuits:**SimpleR-LCircuit-GrowthanddecayofcurrentHelmholtzequitation (11.24),R-C Circuit (11.25), Measurement of HighResistancebymethod ofleakage (11.26),ComparisonofcapacitiesbyDe- Sauty 'sMethod(11.27),IdealL-C.Circuit (11.28),SeriesL-C-RCircuit (changecaseonly)(11.29)(*RelatedExamples&Problems*) **Network Theorems:**Thevenin's Theorem (18.6), MaximumPowerTheorem(18.8) **A.C.Bridges**.:ACBridges (17.5)A.C.Bridgesforthemeasurementofinductances (17.6)(1)MaxwellBridge (2) AndersonBridgeA.C.Bridgeforthemeasurementof*capacitance*(17.7) (1)De Sauty'sA.CBridge(2)ScheringBridge(*RelatedExamples&Problems*) **Basic Reference:** *Electricity and Magnetism by K.K.Tewari(S. Chand&CompanyLtd)*	1	15
Unit-2	**Optics:** **RefractionThroughLenses:**IntroductionofvariousshapeofLenses,Lenses(4.2),Lensequation(4.9),Smallestseparationofobjectandrealimageina ConvexLens(4.13),DeviationbyathinLenses(4.15),PowerofLens(4.15),EquivalentFocalLengthoftwothinlensesSeparatedbyafinitedistance (4.17), FocalLength(4.17.1),Cardinal points(5.2) **Aberrations:** Introduction (5.1), The Achromatic Doublet (5.2.1), Monochromatic aberration (5.3), Sphericalaberration(5.3.1)(*RelatedExamples&Problems*) **Interference:** InterferenceinThinFilms (8.15),InterferenceduetoReflected light (8.16), Interference due to Transmitted light (8.17), Newton'sRings (8.23),DeterminationoftheWavelengthofSodiumLightusingNewton's Rings (8.24), Refractive index of a liquid using Newton's Rings,RefractiveindexusingGraph(8.25)(*RelatedExamples&Problems*) **BasicReference:** 1)*ATextbookofOPTICSByN.Subhramanyam&Brijlal (S.ChandCo. Ltd.)* *2) Optics by Ajay Ghatak (THM Edition)* ***(For Aberration)***	1	15

Other References – Further Readings

- ElectricalCircuitAnalysisbySonyandGupta
- NetworkAnalysisbyG.K.Mittal.(KhannaPublications)
- ElectricityandMagnetismbyD.C.Tayal
- PrincipalofOpticsbyB.KMathur(S.Chand&CompanyLtd)
- OpticsandAtomicsPhysicsbyD.P.Khandelval(HimalayaPublishinghouse)
- A Text book of Optics by N Subhramanyan and Brijalal

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

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

PROGRAMMECODE:SCIUG101

(EffectivefromJune2023UnderNEP–2020)

TYPE OFCOURSE	CREDIT	COURSECODE
MajorDisciplineCoreCourse(MJDSCP)	2(Group A)	SC23PMJDSC PHY201
MajorDisciplineCoreCourse(MJDSCP)	2 (Group B)	SC23PMJDSC PHY202
MinorDisciplineCoreCourse(MIDSCP)	2	SC23PMIDSC PHY203
Inter-DisciplineCoreCourse(MDSCP)	2	SC23PMDSC PHY204

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.

LABORATORYEXPERIMENTS Group A

MAJOR COURSE (2 Credit)

COURSECODE: SC23PMJDSC PHY201(A)

1. BarPendulum:Determinationof‘K’and‘g’
2. Melde’sExperiment. T/L^2 constant
3. FindoutRefractiveindexoftheprismusingspectrometer.
4. To determinetheratioofmagneticmomentsoftwomagnetsbyusingVibrational Magnetometer.
5. To determinethemagneticmomentofagivenBarmagnetusingDeflection MagnetometerinGaussAandBposition.
6. DeterminewavelengthofLASERLight.
7. NumericalAnalysis:JacobiinteractionMethod.
8. Plotting of a Graph and Error estimation on graphical plot. Linear and nonlinear graph, Logarithmic Graph Polar Graph
9. To Find the vertical distance between two points using Sextant.
10. Determine Modulus of Rigidity (Moment of Inertia) of Disk using Torsional pendulum
11. Numerical: Gauss Backward Interpolation Formula
12. Determinationof angular acceleration (α) and find MI ofaFlywheel using Formula
13. ToDeterminethevalueofCauchy’sConstantsof materialofPrism

LABORATORYEXPERIMENTS Group B

MAJOR COURSE (2 Credit)
COURSECODE: SC23PMJDSC PHY201(B)

1. Determinationofself-inductance'L'ofInductor.
2. StudyofParallelResonancewithvariable frequency and Fix capacity
3. P-NJunctiondiodeasFullWaveRectifierWithoutfilter. CalculationofPercentageofRegulation.
4. P-NJunctiondiodeasFullWaveRectifier(i)WithSeriesInductorFilter, (iii)WithShuntCapacitorFilter. CalculationofPercentageofRegulation.
5. Study of Characteristics of Tunnel Diode.
6. Studyof Series ResonancewithCapacitor variation and Fix Frequency
7. Studyof Parallel Resonancewithvariable capacitor and Fix Frequency
8. Decay of Potential across Condenser
9. LDRCharacteristics:obtainIVCharacteristicsofgivenLDRandcalculateitsresistor. (Forthreedifferentlightlevel)
10. To find the value of an unknown Inductor by using Owen's Bridge circuits
11. Measurement of Boltzmann constant using Diode.
12. PN Junction IV characteristics and Load Line analysis.
13. Study of Step Down Transformer. To determine Turn Ratio, % of Efficiency, Energy loss due to copper loss for a given transformer.

Course Outcome

Bytheendofthecourse,thestudentswillbeabletounderstand.

- ThebasicprinciplesofPhysicsrelatedtotheircoursesinthepracticalway.
- Theoperationaldetailsofspectrometer,electroniccircuitsetc.
- Theexperimentaldesignaspectstodeterminevariouspropertiesoflikegravity,qualityfactor, Refractiveindex,determinationofCauchy'sConstants,analysisofspectra,Analysisof error,determinevalueofunknownfrequencyetc.
- Theprocesstoanalyzetheobservationsandinfertheoutcomeoftheexperiments.
- Howtoanalyzetheexperimentaldataandgraphicalanalysis.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER – II (PRACTICAL COURSE)

PROGRAMMECODE: SCIUG101

(EffectivefromJune2023UnderNEP–2020)

TYPE OFCOURSE	CREDIT	COURSECODE
MinorDisciplineCoreCourse(MIDSCP)	2	SC23PMIDSC PHY202

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

LABORATORYEXPERIMENTS

MinorDisciplineCoreCourse(MIDSCP) Practical

1. BarPendulum:Determinationof'K'and'g'
2. Melde'sExperiment. T/L^2 constant
3. FindoutRefractive Indexoftheprismusingspectrometer.
4. To determinetheratioofmagneticmomentsoftwomagnetsbyusingVibrational Magnetometer.
5. To determinethemagneticmomentofagivenBarmagnetusingDeflection MagnetometerinGaussAandBposition.
6. Numerical: Gauss Backward Interpolation Formula
7. Determinationofself-inductance'L'ofInductor.
8. StudyofparallelResonancewithvariable frequency and Fix capacity
9. P-NJunctiondiodeasFullWaveRectifier (i)Withoutfilter. (ii)WithSeriesInductorFilter, (iii)WithShuntCapacitorFilter. CalculationofPercentageofRegulation.
10. Studyof Parallel Resonancewithvariable capacitor and Fix Frequency
11. Decay of Potential across Condenser
12. Study of Step Down Transformer. To determine Turn Ratio, % of Efficiency, Energy loss due to copper loss for a given transformer.

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

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

PROGRAMMECODE:SCIUG101

(EffectivefromJune2023UnderNEP–2020)

TYPE OFCOURSE	CREDIT	COURSECODE
Multi Discipline CoreCourse(MDSCP)	2	SC23PMDC PHY203

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

LABORATORYEXPERIMENTS

MultiDisciplineCoreCourse(MDSCP) Practical

1. NumericalAnalysis:JacobiinteractionMethod.
2. Plotting of a Graph and Error estimation on graphical plot. Linear and nonlinear graph, Logarithmic Graph , Polar Graph
3. To Find the vertical distance between two points using Sextant.
4. Determine Modulus of Rigidity (Moment of Inertia) of Disk using Torsional pendulum
5. Numerical: Gauss Backward Interpolation Formula
6. Determinationof angular acceleration (α) and find MI ofaFlywheel using Formula
7. ToDeterminethevalueofCauchy'sConstantsof materialofPrism
8. Studyof Parallel Resonancewithvariable capacitor and Fix Frequency
9. Decay of Potential across Condenser
10. Measurement of Boltzmann constant using Diode.
11. PN Junction IV characteristics and Load Line analysis.
12. Study of Step Down Transformer. To determine Turn Ratio, % of Efficiency, Energy loss due to copper loss for a given transformer

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN
B.Sc.PHYSICS-SEMESTER–II

Type Of Course:Skill enhancement Course
Programme Code:SCIUG101
COURSE CODE:SC23SECPHY206

COURSENAME:ElectronicCircuitElementsand EnergySources
(EffectivefromJune2023UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02T eachingHoursperSemester:30	Theor y	ExternalMarks–25 InternalMarks – 25

Unit No.	Content	Credit	Lect Hrs 30
Unit-1	**RESISTOR:**Generals (6.1),Resistortype,Wirewoundresistor,Carboncompositionresistor, Carbonfilmresistor,Cermetefilmresistor,Metalfilmresistor,Powerresistor,Valuetolerance,Variableresistor,PotentiometerandRheostats,Fusibleresistor.,Resistorcolor,resistor,Colorband,Resistorundertenohm, Resistor.Troubles,Checkingresistorwithohmmeter. **CAPACITOR:**Capacitors,Capacitorconnecttobattery,Capacitance,Factorscontrollingcapacitance,TypeofCapacitors,FixedCapacitor,Variablecapacitors,Voltageratingofcapacitors, Straycircuitcap.Leakageresistance,TroublesCapacitor,Checking capacitorwithohmmeter. **INDUCTOR:**Inductor,Comparison ofdifferent coils,Inductanceofaninductance,Anotherdefinitionofinductance,Mutualinductance, Coefficient of coupling, Variables inductors, Inductor inseriesandparallelwithoutM,Seriescombinationwithm, Strayinductance,Energystoragemagneticfield,DCResistanceofcoils.	1	15
Unit-2	**CELLS AND BATTERY:** Primary and Secondary cells and Battery's, Voltage and current of cell, Cell life, Different type of dry cells, Carbon zinc cell, Alkaline cell, Manganese alkaline cell, Nickel cadmium cell, Mercury cell, Silver oxide cell, Lead acid cell, Battery rating, Testing dry cell, Photo electric cell, Solar cell **TRANSFORMER:** Introduction, Type of Transformer, Constructionof Transformer,Transformerworking, Transformer impedance,CanaTransformerOperateonDCRFShielding,AutoTransformer	1	15
BasicReference:*BasicElectronicsbyB.L.Theraja,Pub.S.Chand&Company3rd Edition*			

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–II

TYPE OF COURSE:SKILLENHANCEMENTCOURSE

PROGRAMMECODE:SCIUG201 COURSECODE:SC23SECPHY206(A)

COURSENAME: MEASUREMENT SYSTEMS

(EffectivefromJune2023UnderNEP–2020)

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

:: Syllabus ::

Sr. No	Content	Credit	Lec. Hrs 30
Unit 1	**Instrumentation;** Measurement, Significance of measurement, Types of measurement: direct, indirect, analog, digital; Null and Detection Method; Functional block diagram of measurement system; Examples, Rudimentary Pressure Gauge; Bourdon Tube thermometer; Input-Output configuration; Desired interfacing and modifying input; General scheme; Examples; Method of corrections; Method of higher gain feedback; Signal filtering; Opposing inputs; computed correction and inherent sensitivity.	1	15
Unit 2	**Statics Characteristics:** Static calibration; Static characteristics; Accuracy & Precision; bias; Combination of Component error in overall system; Accuracy; Calculation; Addition; Subtraction; Multiplication; & Division Errors: Errors, Absolute and Relative; Types of error; Gross error; Systematic and Random error; Method of correction; Statistical analysis curve; Probable error limiting error.	1	15

Reference Book:

1) E.O. Dobelin, Measurement Systems, Mc Graw Hill,
2) A.K. Sawhney, Instrumentation,
3) Gopal Krishna Banerjee, Electrical and Electronic Measurement, PHI, New Delhi,
4) Introduction to Measurement and Instrumentation, 3" Ed, Arun K Ghose, PHI, New Delhi

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN
B.Sc.PHYSICS-SEMESTER–I&II

SemesterEndExamination (SEE)

(EffectivefromJune2023UnderNEP–2020)

FORMATFORQUESTIONPAPER4
CREDITCOURSEINPHYSICS(MAJORDISCIPLINESPECIFICCOURSE)

PROGRAMMECODE: SCIUG101

COURSECODE:SC23MJDSCPHY101or**SC23MJDSCPHY201**

Theuniversityexaminationpaperconsistsoffourquestions.

- Firstquestionisof12MarksandwillbefromUnit–I.
- Secondquestionisof13MarksandwillbefromUnit –II.
- Thirdquestionisof12MarksandwillbefromUnit–III.
- Fourthquestionisof13Marksandwillbefrom Unit-IV.

(1) Thisquestionpapercontainsfourquestions.Allquestionsarecompulsory. (2) Figuresatrightside indicate themarksofquestion. (3) Illustrateyouranswerwithproperfiguresanddiagram.		Marks
Que–1	(A) AttemptanyTwooutofThree.(TheoryLongQuestions) (B) AttemptanyOneoutofTwo(Application/Example/ShortNote)	08 04
Que–2	(A)AttemptanyTwooutofThree.(TheoryLongQuestions)(B)AttemptanyOneoutofTwo(Application/Example/ShortNote)	10 03
Que–3	(A) AttemptanyTwooutofThree.(TheoryLongQuestions) (B) AttemptanyOneoutofTwo.(Application/Example/ShortNote)	08 04
Que-4	(A) AttemptanyTwooutofThree.(TheoryLongQuestions) (B) AttemptanyOneoutofTwo(Application/Example/ShortNote)	10 03
	Total	50

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN
B.Sc.PHYSICS-SEMESTER–I&II

SemesterEndExamination (SEE)
(EffectivefromJune2023UnderNEP–2020)

FORMATFORQUESTIONPAPER2CREDITCOURSEINPHYSICS(MINOR AND INTERDISCIPLINERYSPECIFICCOURSE)

PROGRAMMECODE:SCIUG101

COURSE CODE:SC23MIDSCPHY103 (MINOR) or SC23MDCPHY104 (Inter/Multi)
SC23MIDSCPHY203 **(MINOR)** or SC23MDCPHY204 (Inter/Multi)

Theuniversityexaminationpaperconsistsoffourquestions.
Firstquestionisof12marksandwillbefromUnit–I.
Secondquestionisof13marksandwillbefromUnit–II.

1. Thisquestion papercontainsthree questions.Allquestionsarecompulsory. 2. Figuresatrightsideindicatethemarksofquestion. 3. Illustrateyouranswerwithproperdiagram/figure		Marks
Que–1	(A) AttemptanyTwooutofThree.(TheoryLongQuestions) (B) AttemptanyOneoutofTwo.(Example/Shortnote)	08 04
Que – 2	(A) AttemptanyTwooutofThree.(TheoryLongQuestions) (B) AttemptanyOneoutofTwo.(Example/Shortnote)	10 03
	Total	25

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–I&II

SemesterEndExamination (SEE)

(EffectivefromJune2023UnderNEP–2020)

FORMATFORQUESTIONPAPER2 CREDITCOURSEINPHYSICS

(SKILLENHANCEMENTCOURSE)

PROGRAMMECODE:SCIUG101

COURSECODE:SC23SECPHY106 or 106(A) (SEM-1)
SC23SECPHY206 or 206(A) (SEM-2)

Theuniversityexaminationpaperconsistsoffourquestions.

Firstquestionisof12marksandwillbefromUnit–I.

Secondquestionisof13marksandwillbefromUnit–II.

1. Thisquestion papercontainsthree questions.Allquestionsarecompulsory. 2. Figuresatrightsideindicatethemarksofquestion. 3. Illustrateyouranswerwithproperdiagram/figure		Marks
Que–1	A. AttemptanyTwooutofThree.(TheoryLongQuestions) B.AttemptanyOneoutofTwo.(Example/Shortnote)	08 04
Que – 2	A. AttemptanyTwooutofThree.(TheoryLongQuestions) B. AttemptanyOneoutofTwo.(Example/Shortnote)	10 03
	Total	25

ઊઠો, જાગો અને ધ્યેય પ્રાપ્તિ સુધી અવિરત પ્રયત્નશીલ રહો–સ્વામી વિવેકાનંદ

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

II	**Major Discipline Specific course MJDSC**	**Fundamentals of Chemistry-II**	**SC23MJDSCCHE201**	**4**	**50**	**50**	**2.30**	**100**
	Minor Discipline Specific course MIDSC	**To be Selected – II Basics of chemistry -II**	**SC23MIDSCCHE202**	**2**	**25**	**25**	**2.00**	**50**
	Multi/Inter disciplinary Course MDC/IDC	**To be Selected (General chemistry -II/ Climate change and Pollution)**	**SC23MDDSCCHE203/ SC23MJDSCCHE203A**	**2**	**25**	**25**	**2.00**	**50**
	Ability Enhancement Courses AEC	**To be Selected (From languages)**	**SC23AECCHE204**	**2**	**25**	**25**	**2.00**	**50**
	Value Added course VAC	**To be Selected (VAC II- Ethics in chemistry)**	**SC23VACCHE205**	**2**	**25**	**25**	**2.00**	**50**
	Skill Enhancement Course SEC	**To be Selected SEC-1Analytical chemistry II or SEC-2 Water analysis or SEC-3 Food analysis or SEC-4 Store management**	**SC23SECCHE206/ SC23SECCHE206A/ SC23SECCCHE206B/ SC23SECCCHE206C**	**2**	**25**	**25**	**2.00**	**50**
	Practical Major Discipline Specific course, MJDSC Practical Minor Discipline Specific course, MIDSC Practical Multi/Inter Disciplinary Course, MDC/IDC	**PMJDC Practical -I Lab Group A & Group B PMIDC Practical-II Lab PMDC/ IDC Practical-1II Lab**	**SC23PMJDSCCHE201 SC23PMIDSCCHE202 SC23PMDCCHE203**	**4 2 2**	**50 25 25**	**50 25 25**	**8 4 4**	**100 50 50**
		Total Credits of Semester - II		**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 : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MJDSCCHE201

Type of course : Major Discipline Specific course MJDSC
Name of course : Fundamentals of chemistry II
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 concepts of inorganic chemistry in terms of coordination compounds, p lock elements.
2. To apply Stereo chemistry and spatial arrangement of some compounds.
3. To understand Thermodynamics as basis of general laws of sustainable equilibrium.
4. To know about the Volumetric titrations and calculations for estimation various ions.

Course Outcomes:

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. Majors to be certified by the American Chemical Society will have extensive laboratory work and knowledge of Biological Chemistry.
2. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
3. 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.
4. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.
5. Students will be able to function as a member of an interdisciplinary problem solving team.

Unit	Topic	Credit	Hr
1	**Coordination Compounds** Werner,s Theory; Explain the structure of Co(III) ammines on the basics of Werner's theory, Experimental evidence in favor of Werner's theory Sidgwick's effective atomic number (EAN) rules, Application of EAN rules, Nomenclature of Coordination compounds. Nature of Metal legend bonding VB theory, Limitation of VB theory. Isomerism in Coordination Compounds, Structural, Conformation, Ionization, Hydrate, Coordination, Linkage, Coordination position, Ligand and Polymerization isomerism. Stereo isomerism, Geometrical isomerism and Optical isomerism.	1	15
2.	**Stereochemistry** Introduction of Stereo Isomers; **(A) Optical isomerism :** General, Discussion of elements of symmetry, Molecular chirality, Enantiomers, Optical activity, Properties of enantiomers, Chiral and achiral molecules with two stereogenic centers, Diastereomers, R-S Nomenclature, Threo and Erythro diastereomers, Meso compounds. **(B) Geometrical isomerism:** Definition and general discussion of geometric isomers, General Methods of structure determination (physical methods), E-Z nomenclature, (Simple illustration should be given). **(C) Conformational isomerism:** Definition, Conformational analysis of ethane, n-butane with rotationalAnd tortional diagram, Conformation of cyclohexane, Axial and Equitorial bonds, Newmann projection, Show horse formula, Fisher &flying wedge formula, Difference between conformation and configuration.	1	15
3.	**Thermodynamics** Thermodynamics (only introduction) : System and surrounding- work & heat, state function, thermodynamic process, internal energy,	1	15

	enthalpy, free energy, maximum work function. First law of thermodynamics heat capacity, specific and molar heat capacity, heat capacity at constant volume and pressure and their relationship, Work done in adiabatic and isothermal reversible expansion of an ideal gas. Second law of thermodynamics, Carnot cycle and its efficiency , Concept of entropy; entropy change for an ideal gas under different conditions, entropy change for mixture of ideal gases. Gibbs- Helmholtz equation, Vant hoff isochore equation, Vant hoff isotherm equation, Numerical.		
4.	**(A) Introduction To Volumetric Analysis** Principle, Mechanism and Applications of Acid-Base Titrations (Only strong acid Vs strong Base), Redox Titrations (Only Fe(II) Vs $KMnO_4$), Complexo metric Titrations (Only $Ca^{+2/}Mg^{+2}$Vs EDTA), Precipitation Titrations (Only Vs $AgNO_3$), Related Numerical. **(B) Complexometric titrations** Introduction, EDTA :An important chelating Agents Types of EDTA titration metallochromic indicators, Factors Affecting on stability of complexes, masking and de masking, selectivity of titration construction of the titration curve.	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, 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 : II**

PROGRAM CODE : SCIUG102

COURSE CODE : SC23PMJDSCCHE201

Type of course : Practicals Major Discipline Specific Course PMJDSC

Name of Course : Practical's for Fundamentals of chemistry II

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 of 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 of practicals to be performed: 08	Practicals	External 2 5Marks Internal 25 Marks

Course Objectives:

1. To identify the cationic and .anionic ions in mixture.
2. Preparation of solutions for volumetric solutions.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of cations and anions.
2. Students will have basic knowledge of volumetric titrations.

Sr.No.	List of Practicals **(Any twelve)**	Credit	Hr
GROUP A	**Inorganic Chemistry Semi micro Analysis:** Cation analysis: separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B. Anion analysis like (Water Soluble and insoluble). Candidate should perform the analysis of at least 12 compounds.	2	60
GROUP B	**Volumetric Titrations (Any Eight)** 1. To determine the strength of NaOH and Na_2CO_3 present in	2	60

	the mixture of NaOH & Na_2CO_3 solution and to find out their percentage composition. 2. To determine the strength of $NaHCO_3$ and Na_2CO_3 present in the solution mixture of $NaHCO_3$ & Na_2CO_3 solution and to find out their percentage composition. 3. To determine the Normality, gram/liter and molarities of $H_2C_2O_4.2H_2O$ and H_2SO_4 present in the mixture of $H_2C_2O_4.2H_2O$ and H_2SO_4 solution by using X N NaOH and Y N $KMnO_4$ solutions. 4. To determine the Normality, gram/liter and molarity of $H_2C_2O_4$.$2H_2O$ and $K_2C_2O_4$ present in the mixture of $H_2C_2O_4$. $2H_2O$ & $K_2C_2O_4$ solution by using X N NaOH and Y N $KMnO_4$ solutions. 5. To determine the amount of Ca^{2+} and Mg^{2+} ion by EDTA solution from the mixture of $CaCl_2$ and $MgCl_2$ solution. 6. Determination of chloride ions in the given solution by titrating against the standardized solution of silver nitrate. 7. To determine the concentration/molarity of $KMnO_4$ solution by titrating it against Standard solution of ferrous ammonium sulphate. 8. Preparation of standard stock solution of NaOH by W/V method and their different dilutions. 9. Preparation of standard stock solution of $K_2Cr_2O_7$ by W/V method and their different dilutions. 10. To determine molar mass of unknown acid by titration with NaOH.		

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 : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MIDSCCHE202

Type of course : Minor (Elective) Discipline Specific course MIDSC

Name of course : Fundamentals of chemistry II

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 concepts of inorganic chemistry in terms of coordination compounds, p lock elements
2. To apply Stereo chemistry and spatial arrangement of some compounds.

Course Outcomes:

1. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Inorganic and Physical Chemistries.
2. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
3. 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.
4. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.

Unit	Topic	Credit	Hr
1	**Coordination Compounds** Werner,s Theory; Explain the structure of Co(III) ammines on the basics of Werner's theory, Experimental evidence in favor of Werner's theory Sidgwick's effective atomic number (EAN) rules, Application of EAN rules, Nomenclature of Coordination compounds. Nature of Metal legend bonding VB theory, Limitation of VB theory. Isomerism in Coordination Compounds, Structural, Conformation, Ionization, Hydrate, Coordination, Linkage, Coordination position, Ligand and Polymerization isomerism. Stereo isomerism, Geometrical isomerism and Optical isomerism.	1	15
2	**Stereochemistry** Introduction of Stereo Isomers; **(A) Optical isomerism :** General, Discussion of elements of symmetry, Molecular chirality, Enantiomers, Optical activity, Properties of enantiomers, Chiral and achiral molecules with two stereogenic centers, Diastereomers, R-S Nomenclature, Threo and Erythro diastereomers, Meso compounds. **(B) Geometrical isomerism:** Definition and general discussion of geometric isomers, General Methods of structure determination (physical methods), E-Z nomenclature, (Simple illustration should be given). **(C) Conformational isomerism:** Definition, Conformational analysis of ethane, n-butane with rotationalAnd tortional diagram, Conformation of cyclohexane, Axial and Equitorial bonds, Newmann projection, Show horse formula, Fisher &flying wedge formula, Difference between conformation and configuration.	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 Education2003.

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. 5th 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 : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMIDSCCHE202

Type of course : Practicals Minor (Elective) Discipline Specific Course PMIDSC
Name of Course : Practical's for Fundamentals of chemistry II
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 of practicals to be performed: 10	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

1. To identify the cationic and .anionic ions in mixture.
2. Preparation of solutions for volumetric solutions.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of cations and anions.
2. Students will have basic knowledge of volumetric titrations.

Sr.No.	List of Practicals	Credit	Hr
1	**Inorganic Chemistry Semi micro Analysis: (Any six)** Cation analysis: separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B. Anion analysis like (Water Soluble and insoluble). Candidate should perform the analysis of at least 08 compounds.	1	30
2	**Volumetric Titrations (Any four)** 1) To determine the strength of NaOH and Na_2CO_3 present in the solution mixture of NaOH & $Na_2CO_3$and to find out their percentage composition. 2) To determine the strength of $NaHCO_3$ and Na_2CO_3 present in the solution mixture of $NaHCO_3$ & Na_2CO_3 and to find out their	1	30

	percentage composition. 3) To determine the Normality, gram/liter and molarities of $H_2C_2O_4$ $2H_2O$ and H_2SO_4 present in the solution mixture of $H_2C_2O_4$ $2H_2O$ and H_2SO_4 by using X N NaOH and Y N $KMnO_4$ solutions. 4) To determine the Normality, gram/liter and molarity of $H_2C_2O_4$ $2H_2O$ and $K_2C_2O_4$ present in the solution mixture of $H_2C_2O_4$ $2H_2O$ & $K_2C_2O_4$ by using X N NaOH and Y N $KMnO_4$ solutions. 5) To determine the amount of Ca^{+2} and Mg^{+2} ion by EDTA solution from the mixture solution of $CaCl_2$ and $MgCl_2$. 6) Calibration of burette Pipette and measuring flasks.		

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 : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MDCCHE203

Type of course : Multidisciplinary course MDC

Name of course : General chemistry II

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 Thermodynamics as basis of general laws of sustainable equilibrium.
2. To know about the Volumetric titrations and calculations for estimation of various ions.

Course Outcomes:

1. Students will be able to explore new areas of research in both medicinal 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	**Thermodynamics** Thermodynamics (only introduction) : System and surrounding- work & heat, state function, thermodynamic process, internal energy, enthalpy, free energy, maximum work function.	1	15

	First law of thermodynamics heat capacity, specific and molar heat capacity, heat capacity at constant volume and pressure and their relationship, Work done in adiabatic and isothermal reversible expansion of an ideal gas. Second law of thermodynamics, Carnot cycle and its efficiency , Concept of entropy; entropy change for an ideal gas under different conditions, entropy change for mixture of ideal gases. Gibbs- Helmholtz equation, Vant hoff isochore equation, Vant hoff isotherm equation, Numerical.		
2	**(A) Introduction To Volumetric Analysis** Principle, Mechanism and Applications of Acid-Base Titrations (Only strong acid Vs strong Base), Redox Titrations (Only Fe(II) Vs $KMnO_4$), Complexo metric Titrations (Only $Ca^{+2/}Mg^{+2}$Vs EDTA), Precipitation Titrations (Only Vs $AgNO_3$), Related Numerical. **(B) Complexometric titrations** Introduction, EDTA :An important chelating Agents Types of EDTA titration metallochromic indicators, Factors Affecting on stability of complexes, masking and de masking, selectivity of titration construction of the titration curve.	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. 5th 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 : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMDCCHE203

Type of course : Practicals Multi Disciplinary Course PMDC
Name of course : Practical's General chemistry II
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 of practicals to be performed: 10	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

1. To identify the cationic and .anionic ions in mixture.
2. Preparation of solutions for volumetric solutions.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of cations and anions in inorganic mixtures.
2. Students will have basic knowledge of volumetric titrations.

Sr.No.	List of Practicals	Credit	Hr
1	**Inorganic Chemistry Semi micro Analysis: (Any six)** Cation analysis: separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B. Anion analysis like (Water Soluble and insoluble). Candidate should perform the analysis of at least 08 compounds.	1	30
2	**Volumetric Titrations (Any four)** 1) To determine the strength of NaOH and Na_2CO_3 present in the solution mixture of NaOH & $Na_2CO_3$and to find out their percentage composition. 2) To determine the strength of $NaHCO_3$ and Na_2CO_3 present in the	1	30

	solution mixture of $NaHCO_3$ & Na_2CO_3 and to find out their percentage composition. 3) To determine the Normality, gram/liter and molarities of $H_2C_2O_4$ $2H_2O$ and H_2SO_4 present in the solution mixture of $H_2C_2O_4$ $2H_2O$ and H_2SO_4 by using X N NaOH and Y N $KMnO_4$ solutions. 4) To determine the Normality, gram/liter and molarity of $H_2C_2O_4$ $2H_2O$ and $K_2C_2O_4$ present in the solution mixture of $H_2C_2O_4$ $2H_2O$ & $K_2C_2O_4$ by using X N NaOH and Y N $KMnO_4$ solutions. 5) To determine the amount of Ca^{+2} and Mg^{+2} ion by EDTA solution from the mixture solution of $CaCl_2$ and $MgCl_2$. 6) Calibration of burette Pipette and measuring flasks.		

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 : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MDCCHE203A

Type of course : Multi Disciplinary Course MDC
Name of course : Pollution and Climate change
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. The course on Climate Change has been framed with an intention to provide a general concept within the dimensions of climate changes.
2. It is to equip the learners with appropriate tools and techniques for interpreting the impacts of climate change, and evaluating & implementing measures that reduce vulnerability of systems.
3. It offers an opportunity to interact with administrators, community leaders, NGOs and professionals helping the students to understand the broad framework of Climate Change in India in general and Gujarat in particular.

Course Outcomes:

1.To know the impacts that climate change is having on the natural environment; understand how climate change has the potential to exacerbate air pollution , soil erosion with potentially life threatening consequences
2. To understand how climate change can lead to habitat destruction and how habitat destruction can interact with other aspects of climate change to threaten the survival of some animal species.
3. Recognize how systems work by seeing the relationships between climate and other forms of environmental change.

Unit	Topic	Credit	Hr
1	**Pollution:** Environment pollution: Causes, effects and control measures of, Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear hazards Climate change, Causes of climate change, Climate Change and Water , Forest and Biodiversity , Coastal Ecosystem , Agriculture and Food Security. Issues due to climate change: Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and Holocaust, Vertical temperature.	1	15
2	**Status due to climate change:** Sustainable Development Goals: An Climate Change and Sustainable Development, World, National and State Policies for Achieving Sustainable Development Goals, Role of Various Stakeholders , Building Partnership for Climate Change and Sustainable Development. Calculation of global mean temperature, Climate change threats in India, CCPI climate change Performance Index, Some Case Studies.	1	15

Books Recommended:

1. Textbook for Environmental Studies Bharati Vidyapeeth Institute of Environment Education and Research Pune. Online available: https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf
2. Environmental Chemistry by H Kaur, Pragati prakashan, 2020

Further Reading:

1. The Climate Solution: India's Climate-Change Crisis and What We Can Do About It by Mridula Ramesh, Hachette book publications, Gurugram , New Delhi 2018
2. The New Climate War, The Fight to Take Back Our Planet By Michael E. Mann , scribe publishers. Co. Uk, 2021.
3. The Nutmeg's Curse: Parables for a Planet in Crisis by Amitav Ghosh, University of Chicago Press, 2021.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMDCCHE203A

Type of course : Practicals Multi Disciplinary Course PMDC
Name of course : Practicals For Climate change and Pollution
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 of practicals to be performed: 10	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

1. To learn about climate change mapping.
2. To Prepare the data for carbon dating.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of various parameters for climate change.
2. Students will have basic knowledge about instruments needed for climate change.
3. To relate pollution parameters toclimate change.

Sr.No.	List of Practicals	Credit	Hr
1	**(Any five)** 1. Conventional Measurements Of Pressure, Temperature, Humidity, Wind, Precipitation, Visibility, Clouds, Soil Temperature, Moisture. 2. Fieldwork and checking climatic conditions In Nearest Climate in Farm or Forest or Desert or Water body, Analysis and interpretation of surface meteorological data. 3. Introduction to MATLAB in climate change. 4. To demonstrate the concept of thermal expansion of water when heated, as an analogy to thermal expansion of oceans due	1	30

	to global warming. 5. Showing windy, animated weather map using GIS interface using current and projected wind and other weather conditions for any location in country. 6. Global temperature projections with increasing and decreasing greenhouse gas emissions. 7. The animation showing changes in temperature across the cities, countries, relative to pre industrial level under two different emissions in climate change model. The first emission increasing continuously in a period and second showing decrease in emission in different period or state or country.		
2	**(Any Five)** 8. Two experiments showing role of plants in mitigationg the acidification caused by dissolution of CO2 in water: Uptake of Carbon dioxide from water by plants 9. Useof Carbon Footprint Calculator to study Climate Change for three sectors home energy use, local transportation and home waste generation. 10. To study Comparison of the Effects of Increased CO2 in the Air to Seawater and Distilled Water **11.** To study detailed information on low-carbon lifestyles**.** 12. To develop data for your area on save energy.To arrange and assess data on Walk, bike, or take public transport. And shift to electric vehicles to save climate. 13. Demonstrate save food and environ protection by throwing less food or no food. 14. Prepare report on Environmental Policy Debate at National level or at international agreements, or Montreal protocol 1987 Kyoto protocol 1997, or Convention on Climate Change, or Carbon credit and carbon	1	30

	trading, or Clean development mechanism.		

Books Recommended:

1. Practical Agricultural Meteorology: Srivastava A.K. and P. K. Thyagi; New India Publishing Agency, New Delhi

2. The Practice of Weather Forecasting: Wickham P.G; HMSO, London 3. Weather and Climate: Woodcock R. G., Macdonald and Evans

Further Reading:

1. A guide to matlab: Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg. Kevin R. Coombes, John E. Osbom, Garrett J. Stuck.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23VACCHE205

Type of course : Value Added course VAC
Name of course : Ethical and Social Dimensions of 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. Understanding basic Philosophy of chemistry and applying it in daily research activity.
2. Increasing knowledge on theory, conduct and communication of science.
3. Applying Ethics to chemistry Practice.
4. Developing a sense of right and wrong leading to practical ethical behavior.

Course Outcomes:

1. Development of a positive character, empathetic human being, responsible citizen, a compassionate and empathetic being.
2. Learning concepts of responsibility and sustainability in S&T.
3. Promoting a sustainable life style for the individual, community and environment protection.
4. Inculcating a positive work culture respecting professional ethics.

Unit	Topic	Credit	Hr
1	**Introduction:** Science conduct, logic and theory of science, experimentation, writing publications, dealing with uncertainty, social impact of scientific activity. Applying the fundamentals in philosophy of science and research ethics to the particular conduct of science and its internal and	1	15

	external domains of responsibility is expected to sharpen and solidify the students' awareness for the theory of research practice, their knowledge of Ethics and their ability to exploit ethical thinking for the application in the social sphere , science and technology as a field of human activity that impacts the quality of life of people all over the planet.		
2	**Applied Ethics:** Applied Ethics in Science and Technology, domains of Bioethics, Medical Ethics, Environmental Ethics, Profession Ethics and Business Ethics. Some examples from chemistry, science in general, research, engineering, R&D, etc. in the history of societies worldwide, the students should get a sense for the Ethos of science conduct, on the one hand, challenges in society and environment with a higher degree of sustainability. Qualities of good citizen, volunteerism, building chemistry through volunteerism, Patriotic values and ingredients of nation building,	1	15

Books Recommended:

1. Indian Culture Values and Professional Ethics (For Professional Students) by P. S. R. Murty, Edition, 2nd Edition, publisher
2. A Foundation Course in Human Values and Professional Ethics by R.R. Gaur (Author), R. Sangal (Author), G.P. Bagaria , publisher KirtiPrakashan,30 April 2010.
3. The Power of Ethics: How to Make Good Choices When Our Culture Is on the Edge by Simon and Schuster · Narrated by Susan Liautaud, publisher :The Little Book of Big Ethical Questions,Susan Liautaud, Jan 2021.
4. Ethics in chemistry from poison gas to climate engineering by Joachim Schummer and TomBorsen (Aalborg University, Denmark), https://doi.org/10.1142/12189 | March 2021.

Further Reading:

1. International ethics in chemistry: Developing common values across cultures by Susan M. Schelbe and Kelly M. Elkins, Publication American chemical Society, United states, Nov 21, 2021.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE206

Type of course : Skill Enhancement Course SEC
Name of course : Analytical Chemistry-II
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

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

Course Outcomes:

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	**BASICS OF NANOMATERIALS** Basics of Nanomaterials: Definition, size-shape dependent properties, top-down and bottom-up approaches for nanomaterials, synthesis, general applications of nanomaterials, names of techniques for analysis of nanomaterials.	1	15

2	**POLYMERS:** Introduction, natural and synthetic polymers, Degradation in polymer, issues related degradation, biodegradable and non-degradable polymers. The RCI codes for plastic: Use in recycling. Applications of polymers, single use plastic. Status of polymer degradation at national and international level.	1	15

Books Recommended:

1. Poole, Jr.; Charles, P.; Owens, Frank, J. (2003), Introduction to Nanotechnology, a. John Wiley and Sons.

2. Chattopadhyay, K. K.; Banerjee, A. N. (2009), Introduction to Nanoscience and a. Technology, PHI. 3. Carraher, C. E. Jr. (2013), Seymour's Polymer Chemistry, Marcel Dekker, Inc.

4. Ghosh, P. (2001), Polymer Science and Technology, Tata Mcgraw-Hill.

5. Gwarikar, Polymer Science (2009), New India publisher.

6. Billmeyer, Text book of Plymer science, Tata Mcgraw-Hill. 1998.

Further Reading:

1.https://www.youtube.com/watch?v=0k4ryWpwhmo

2. https://en.wikipedia.org/wiki/Cement

3. https://nptel.ac.in/courses/118104008

4. https://ccsuniversity.ac.in/bridge-library/pdf/L3%20Synthesis%20of%20Nanostructured%20Materials%20Prof%20BPS.pdf

5. https://www.tutorialsduniya.com/notes/chemistry-of-cosmetics-perfumes-notes

6. https://pharmacy.hebmu.edu.cn/trywhx/resources/43/2019624163611.pdf

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE206A

Type of course : Skill Enhancement Course SEC
Name of course : Food Analysis and Quality Control
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 develop the skills on the standardization of food products with respect to quality maintain according to universal food standards worldwide.
2. To learn principles of analysis.
3. To know about chemical properties of food components in food industries..
4. To manage the long term quality of foods in storage.

Course Outcomes:

1.Students will have a thorough understanding on the quality attributes, their measurement principle andϖ instrumentation of various instruments used in food quality analysis.

2. The students will know the importance of various methods to identify any adulteration aspect of food.

3. Students will have a thorough understanding on various food laws with their amendments and regulationϖ guidelines followed in national and international.

Unit	Topic	Credit	Hr
1	**Concept of quality:** Quality attributes: physical, chemical, nutritional and microbial evaluation and measurement, physiochemical method, microscopic examination and physical method; Sensory evaluation: Sensory characteristics of food, sensory requirements, Types of sensory evaluation. Objective evaluation: Tests used for objective evaluation,	1	15

	application and limit, Instruments used for quality assessment-color & gloss, size & shape, defects, texture, Viscosity & consistency, **Food adulteration and food toxins:** Common adulterant in food (milk and milk products, edible oils, cereals&pulses, prepared foods, spices, beverages); simple screening, control of food adulteration. Food Toxins: Natural antinutritional factors, microbial toxins.		
2	**Measurement of toxicants and toxicity:** Assessment of toxicity of evaluation of limits of contaminants in contexts of food safety. Food associated carcinogenesis, Food chemical carcinogens-sources and mechanism, food allergens, Industrial food processing and Packaging contaminants. **Food laws and regulation:** Mandatory and voluntary food laws, International quality systems and standards like ISO and Food Codex, BRC; International trades & federal agencies, Indian act-Food Safety and Standards Act, 2006, Various food acts- PFA,FPO,AGMARK, MMPO,MFPO, edible oil acts, standard weight acts.	1	15

Books Recommended:

1. Subash. C Jain, International Marketing, 6th edition.

2. Varshney, R.L and Bhattacharya, B International markaetying management and Indian perspective, Sultan chand and sons, New Delhi.

3. Kohler P, Keller K.L, Koshy A, Jha M, 13th edition 2009, Marketing Management- A South Africa Perspective, Pearson Education, New Delhi.

Further Reading:

4. Ramaswamy, V.S and Namakumari ,S.; 4th edition Marketing Manangement –Global Perspective- Indian Content, McMillan Publishers India Ltd, New Delhi.

5. Saxena, Rajan, 3rd edition; Marketing management, Tata McGraw Hill Publishing Company Ltd, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE206B

Type of course : Skill Enhancement Course SEC
Name of course : Chemical Storage 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. To understand and appreciate the importance of store keeper in storage of chemicals.
2. Safety in storage of chemicals.
3. To manage the long term quality of chemicals in storage.

Course Outcome:

1. Students will gain a comprehensive knowledge and skills in assessing the role of store keeper in chemical sciences.

2. Explores the problems that can arise during storage of chemicals in a storage.

3. Chemical Store management is a valuable tool for smooth functioning of chemical laboratories.

4. A proper store management will help in safety of chemical sciences department and success to reach applications

Unit	Topic	Credit	Hr
1	**Storing Chemicals:** General rules for storing chemicals, General requirements, Segregation of incompatible chemicals, Specifications for chemical storerooms, Chemical storage in laboratories (outside of chemical storerooms) , Additional storage requirements and recommendations for specific hazard chemical classes. Organization and types of chemicals to be	1	15

	stored. **Store Keeper:** Qualities of store keeper, duties of store keeper, Responsibilities of storekeeper, functions of storekeeper, skills of storekeeper, management ofinventory,Trade exemption, Tendering for new purchase.		
2	**Classification of laboratory Chemicals:**, Classification of Chemicals on the basis of hazard level**,** (Explosive, Oxidizing, Flammable, toxic, Harmful), Chemical segregation, storage limitations, storage cabinets and safety cabinets, Guidance on Safe Storage of Chemicals in Laboratories: Principles of Safe Storage, Storage Facilities, Acid cabinets, Flammable solvent cabinets, Ventilated cabinets T, Storage of Different Materials, Carcinogens and Mutagens (class 1 and 2) and Substances Toxic to Reproduction - Substances subject to special security & licensing requirements, Novel /experimental substances.	1	15

Books Recommended:

1. The Merck Index : An Encyclopedia of Chemicals, Drugs, and Biologicals, Hardcover, 14th edition, Printed Nov. 2006.
2. Safe Storage of Laboratory Chemicals, Hardcover2nd edition, Printed May 1991 by Wiley-Interscience.

Further Reading:

1. Safe Laboratories : Principles and Practices for Design and Remodeling, Hardcover (January 1991), prepared with the assistance of American Chemical Society Committees.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE206C

Type of course : Skill Enhancement Course SEC
Name of course : Water Quality Assessment
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 obtain quantitative information on the physical, chemical, and biological characteristics of water via statistical sampling
2. The type of information sought depends on the objectives of the monitoring program.

Course Outcomes:

1. Explain the general properties of water and understand water resources and water conservation.
2. Develop awareness about water quality criteria and standards, and their relation to public health and environment
3. Understand important parameters for measuring water quality.
4. Know about the methods for the determination of water quality parameters
5. Learn how to run accurate water quality tests and to determine how the parameters relate to each other.

Unit	Topic	Credit	Hr
1	**Water Quality Fundamentals:** Chemistry of water, Physical and chemical properties, Water recourses, water pollution, Important water Quality parameters and methods for their determination - turbidity, color, taste, pH, acidity, alkalinity,	1	15

	chemical constituents, hardness, dissolved oxygen etc., water sampling, standard for drinking water as per BIS specifications, household water treatment and safe storage. **Water quality standards** in India, Industrial water quality standard in India, Water management. Water control Agency and Laws to monitor and enforce water quality standards in India, Water Pollution Act.		
2	**Laboratory tests for water quality monitoring:** Determination of pH and conductivity, Test for acidity and alkalinity, Test for total hardness, Test for chloride, calcium, iron etc., calculation of magnesium content and total solids. III. Project Quality assessment of water samples collected from different localities.	1	15

Books Recommended:

1. Subash. C Jain, International Marketing, 6th edition.

2. Varshney, R.L and Bhattacharya, B International markaetying management and Indian perspective, Sultan chand and sons, New Delhi.

3. Kohler P, Keller K.L, Koshy A, Jha M, 13th edition 2009, Marketing Management- A South Africa Perspective, Pearson Education, New Delhi.

Further Reading:

4. Ramaswamy, V.S and Namakumari ,S.; 4th edition Marketing Manangement –Global Perspective- Indian Content, McMillan Publishers India Ltd, New Delhi.

5. Saxena, Rajan, 3rd edition; Marketing management, Tata McGraw Hill Publishing Company Ltd, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC "A" (3.02) State University

PATAN - 384 265

वसुधैव कुटुम्बकम्
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
1.	Dr. NARENDRAKUMAR K. PATEL	CHAIRMAN
2.	Dr. YOGESHKUMAR B. DABGAR	MEMBER
3.	SHRI PRADIPKUMAR P. MEHTA	MEMBER
4.	Dr. JITENDRABHAI S. PATEL	MEMBER
5.	Dr. YOGESHKUMAR M. PATEL	MEMBER
6.	Dr. HAMIRBHAI M. ANT	MEMBER
7.	Dr. NITINKUMAR G. TRIVEDI	MEMBER
8.	Dr. ABBASHBHAI R. SELIYA	MEMBER
9.	Dr. NEETABEN B. GOL	MEMBER
10.	Dr. PURVESHBHAI B. BHARVAD	MEMBER
11.	Dr. VASANTBHAI A. PATEL	CO-OPT MEMBER
12.	Dr. MUKESHBHAI M. PRAJAPATI	CO-OPT MEMBER
13.	Dr. MADHUSUDAN S. JANGID	CO-OPT MEMBER
14.	Dr. JAGDISHBHAI N. PATEL	CO-OPT MEMBER

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										

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

MAJOR DISCIPLINE SPECIFIC CORE COURSE 1-THEORY (MJDSC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.SC. II***	***SC23MJDSCBOT201***	***Biomolecules and Cell Biology***	**4**	**60 hrs**	***50 Marks***	***50 Marks***
Course outcomes :	After the completion of the course the students will be able to: 1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged. 2) This will provide inside into the organization of cell, its features and regulation at different levels. 3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life. **Pedagogy:** Lectures, Tutorials, Assignments, Demonstrations, Videos, Team based learning.						
UNIT	***TOPIC***						***NO. OF LECTURES* (60hrs)**
Unit 1	**Biomolecules- I** • **Carbohydrates:** ➢ Definition, classification and significance. ➢ Structure and functions of Monosaccharides (trioses, pentoses and hexoses). ➢ Structure and functions of Disaccharides (maltose and sucrose). ➢ Structure and functions of Polysaccharides (cellulose). • **Lipids**: ➢ Definition, classification and significance ➢ Structure and functions of Fatty acids: Saturated and Unsaturated						**15**

	➢ Essential fatty acids ➢ **Simple and Conjugated Lipids:** Structure and functions of Triglycerides and waxes. Conjugated lipids with examples.	
Unit 2	**Biomolecules - II** • **Amino acids**: ➢ Definition and classification (based on polarity) ➢ Properties of amino acids. Peptide bond, Dipeptide and polypeptide. • **Proteins**: ➢ Definition, classification and significance ➢ General (Physical) properties of Proteins. Levels of protein structure-primary and secondary. • **Nucleic acids**: ➢ Definition, classification and significance. ➢ Structure of nitrogenous bases; Structure and function of nucleotides. ➢ Structure of DNA (Watson and Crick's model); Types of RNA.	**15**
Unit 3	**Cell Biology – I** • **Cell**: as a basic unit of structure and function, Characteristics and comparison of Prokaryotic and Eukaryotic cell. • **Cell wall:** Ultrastructure, chemical composition and functions. • **Plasma membrane:** Ultrastructure, chemical composition and functions, sandwich and fluid mosaic model. • **Nucleus:** Structure-nuclear envelope, nuclear lamina, molecular organization of chromatin.	**15**
Unit 4	**Cell Biology – II** • **Chloroplast:** Structural organization and Functions. • **Mitochondria:** Structural organization and Functions.	**15**

	• **Endoplasmic Reticulum:** Structural organization and Functions. • **Cell division:** Eukaryotic Cell Cycle, Mitosis, Meiosis and their significance	

Suggested Readings:

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

MAJOR DISCIPLINE SPECIFIC CORE COURSE 1-PRACTICAL (PMJDSC)							
PROGRAMME CODE: SCIUG103							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.Sc. II***	***SC23PMJDSCBOT201***	***Biomolecules and Cell Biology***	**4(2+2) (GROUP: A+ B)**	**120hrs**	***50 Marks***	***50 Marks***
Course outcomes:	After the completion of the course the students will be able to: 1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged. 2) This will provide inside into the organization of cell, its features and regulation at different levels. 3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life. **Pedagogy:** Lectures, Tutorials, Assignments, Demonstrations, Videos, Team based learning.						

PRACTICALS	***NO. OF LECTURES*** **(120 hrs)**
GROUP A	
1) Preparation of solutions and plant juices to determine their pH using Universal indicator/pH meter. 2) Estimation of Free Fatty acids by titration method. 3) Bio-Molecules: Tests for detection of Carbohydrates: The following tests are to be performed to detect the nature of carbohydrates available in the supplied sample (Glucose, Fructose, Maltose & Sucrose). 1. Molisch's test, 2. Benedict's test, 3. Barfoed's test, 4. Seliwanoff's test, 5. Iodine test, 6. Cobalt chloride test. 4) Akaryota - Bacteriophage, Prokaryota - Cyanophycean cell & Eukaryota - typical Animal & Plant cell.	**60**

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

Suggested Readings:

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

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

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

PROGRAMME CODE: SCIUG103

BIOMOLECULES AND CELL BIOLOGY

SC23PMJDSCBOT201

Date: *Place:*

Time: 5 Hrs **Total Marks: 50**

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

GROUP A

1. Measure the pH of the given sample **A**. Mention its nature and show it to the examiner. **04**

2. Perform tests for detection of organic molecule (Carbohydrates) in given solution **B**. Show your result to the examiner. **08**

3. Identify and describe as per given instructions: **06**

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

   (5 minute)

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

4. a. *Viva-voce* **03**

   b. Journal **04**

GROUP B

1. Perform tests for detection of organic molecule (Lipid/Protein) in given solution **E**. Show your result to the examiner. **06**

2. Prepare a temporary mounting of Mitosis from given material **F**. Using squash method. Show stage(s) of cell division to the examiner with diagram(s). **06**

3. Identify and describe as per given instructions: **06**

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

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

4. a. *Viva-voce* **03**

   b. Journal **04**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

MINOR DISCIPLINE SPECIFIC CORE COURSE 1-THEORY (MiDSC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.SC. II***	***SC23MiDSCBOT202***	***ORGANIC MOLECULES AND CYTOLOGY***	**2**	**30 hrs**	***25 Marks***	***25 Marks***
Course outcomes :	After the completion of the course the students will be able to: 1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged. 2) This will provide inside into the organization of cell, its features and regulation at different levels. 3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life. **Pedagogy:** Lectures, Tutorials, Assignments, Demonstrations, Videos, Team based learning.						
UNIT	***TOPIC***						***NO. OF LECTURES*** **(30hrs)**
Unit 1	• **Carbohydrates:** ➢ Definition, classification and significance. ➢ Structure and functions of Monosaccharides (trioses, pentoses and hexoses). ➢ Structure and functions of Disaccharides (maltose and sucrose). ➢ Structure and functions of Polysaccharides (cellulose). • **Lipids**: ➢ Definition, classification and significance ➢ Structure and functions of Fatty acids: Saturated and unsaturated						**15**

	➢ Essential fatty acids ➢ **Simple and Conjugated Lipids:** Structure and functions of Triglycerides and waxes. Conjugated lipids with examples.	
Unit 2	**Cell Biology – II** • **Chloroplast:** Structural organization and Functions. • **Mitochondria:** Structural organization and Functions. • **Endoplasmic Reticulum:** Structural organization and Functions. • **Cell division:** Eukaryotic Cell Cycle, Mitosis, Meiosis and their significance	**15**

Suggested Readings:

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

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

MINOR DISCIPLINE SPECIFIC CORE COURSE 1-PRACTICAL (MiDSC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.Sc. II***	***SC23PMiDSCBOT201***	***ORGANIC MOLECULES AND CYTOLOGY***	**2**	**60hrs**	***25 Marks***	***25 Marks***
Course outcomes:	After the completion of the course the students will be able to: 1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged. 2) This will provide inside into the organization of cell, its features and regulation at different levels. 3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life. **Pedagogy:** Lectures, Practicals, Tutorials, Assignments, Demonstrations, Videos, Team based learning.						
UNIT	***TOPIC***					***NO. OF LECTURES*** **(60 hrs)**	
Unit 1	1) Preparation of solutions and plant juices to determine their pH using Universal indicator/pH meter. 2) Estimation of Free Fatty acids by titration method. 3) Bio-Molecules: Tests for detection of Carbohydrates: The following tests are to be performed to detect the nature of carbohydrates available in the supplied sample (Glucose, Fructose, Maltose & Sucrose). 1. Molisch's test, 2. Benedict's test, 3. Barfoed's test, 4. Seliwanoff's test, 5. Iodine test, 6. Cobalt chloride test.					**30**	

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

Suggested Readings:

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

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

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

PROGRAMME CODE: SCIUG103

MOLECULES AND CYTOLOGY

SC23PMiDSCBOT202

(CREDIT 2)

Date: ***Place:***

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

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

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

   b. Journal **03**

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

MULTI/INTER DISCIPLINARY COURSE-THEORY (MDC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.Sc. II***	***SC23MDC BOT203***	***FRUITS AND VEGETABLE PROCESSING***	**2**	**30hrs**	***25 Marks***	***25 Marks***
Course outcomes:	After the completion of the course the students will be able to: 1) This course is designed to give an overview of different types of fruits and vegetables, their composition and methods used in processing and preservation. 2) The practical component of this course deals with imparting skills in preparation of various processed products. **Pedagogy:** Lectures, Practicals, Assignment, Presentations, Field visit.						
UNIT	***TOPIC***						***NO. OF LECTURES*** **(30hrs)**
Unit 1	• **Fruits and Vegetables: Methods of processing and processed products** ➢ Fruits - Definition, types of fruits (fleshy and dry) with examples. ➢ Vegetables - Definition, types of vegetables (leafy, stem, root, flower and fruit) with examples. • **Principles of processing and preservation.** ➢ Methods of processing: Drying, pickling, fermentation, freezing and dehydration, canning. ➢ Scope and importance of processing and preservation.						**15**
Unit 2	• **Preparation of the following products:** ➢ Frozen vegetables - Carrots (*Daucus carota*) - Pea (*Pisum sativum*). ➢ Dehydrated products - Potato (*Solanum tuberosum*) chips and Garlic (*Allium sativum*) powder.						**15**

	➢ Preparation of pickles from fruits - Mango and Lemon. ➢ Juices & Squashes - Amla (*Phyllanthus emblica*) juice, Kokum (*Garcinia indica*) juice.	

Suggested Readings:

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

MULTI / INTER DISCIPLINARY COURSE-PRACTICAL(PMDC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.Sc. II***	***SC23PMDCBOT 203***	***FRUITS AND VEGETABLE PROCESSING***	**2**	**60hrs**	***25 Marks***	***25 Marks***
Course outcomes:	After the completion of the course the students will be able to: On completion of this course students will be able to: 1) Recall the types of fruits and vegetables used for processing. 2) Explain the principles of fruits and vegetable processing. 3) Analyse the different methods used in processing of fruits and vegetables. 4) Apply the skills in preparation of various processed products for entrepreneurial opportunity. **Pedagogy:** Lectures, Practicals, Assignment, Presentations, Field visit.						
UNIT	***TOPIC***					***NO. OF LECTURES*** **(60hrs)**	
Unit 1	1. Study of fruits (banana, mango, papaya, pineapple, cashew), their composition and use in value-added products. 2. Study of Vegetables (Cucumber, tomato, ladyfinger, radish and brinjal), their composition and use in value-added products. 3. Determination of pH of any Citrus fruit. 4. Preparation of any one type of pickle. 5. Preparation of fruit juice and squash.					**30**	
Unit 2	1. Preparation of tutti fruity from raw papaya. 2. Preservation of green peas and carrots by freezing. 3. Preparation of amla and ginger candy. 4. Preparation of chutney from fruit and vegetable. 5. Field visit to a distillation unit or a food processing unit.					**30**	

Suggested Readings:

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

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

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

PROGRAMME CODE: SCIUG103

FRUITS AND VEGETABLE PROCESSING

SC23PMDCBOT203

Date: **Place:**

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

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

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

   b. Journal **03**

SKILL ENHANCEMENT COURSE-(THEORY)(SEC) *PROGRAMME CODE: SCIUG103*							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.Sc. II***	***SC23SEC BOT206***	***NATURAL RESOURCE MANAGEMENT***	**2**	**30 hrs**	***25 Marks***	***25 Marks***
Course outcomes:	After the completion of the course the students will be able: 1. Understand the importance, benefits and services of biodiversity. 2. To learn the strategies for the conservation of biodiversity. 3. This knowledge is critical in evolving strategies for sustainable natural resource management and biodiversity conservation. **Pedagogy:** Lectures, Practicals, Assignment, Presentations, Field visit.						
UNIT	***TOPIC***						***NO. OF LECTURES*** **(30 hrs)**
Unit 1	**NATURAL RESOURCE MANAGEMENT - I** • Natural Resource: Definition, types and management. • Sustainable utilization: Concept, approaches (economic, ecological and socio-cultural). • Land Utilization: (agricultural, pastoral, horticultural, silvicultural). • Soil degradation and management.						**15**
Unit 2	**NATURAL RESOURCE MANAGEMENT - II** • Fresh water: rivers, lakes, groundwater, aquifers, watershed. • Marine Water: Estuarine; Wetlands. • Forests: Definition, Cover and its significance (with special reference to India). • Major and minor forest products; Depletion; Management.						**15**

Suggested Readings:

1. Vasudevan, N. (2006). Essentials of Environmental Science. Narosa Publishing House, New Delhi.
2. Singh, J. S., Singh, S.P. and Gupta, S. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications, New Delhi.
3. Rogers, P.P., Jalal, K.F. and Boyd, J.A. (2008). An Introduction to Sustainable Development. Prentice Hall of India Private Limited, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B.Sc Programme (CBCS - Semester - Grading Pattern)
(Effective from June 2023-24 UNDER NEP-2020
B. Sc.:: BOTANY :: SEMESTER END EXAMINATION
PROGRAMME CODE: SCIUG103
FORMAT FOR QUESTIONS PAPER FOR 4 CREDITS COURSE IN BOTANY

(B.Sc. Sem. – I & II)

The university examination paper consists of four questions.

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

No. of Printed Pages:___

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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B.Sc Programme (CBCS - Semester - Grading Pattern)
(Effective from June 2023-24 UNDER NEP-2020
B. Sc.:: BOTANY :: SEMESTER END EXAMINATION
PROGRAMME CODE: SCIUG103
FORMAT FOR QUESTIONS PAPER FOR 2 CREDITS COURSE IN BOTANY

(B.Sc. Sem. – I & II)

The university examination paper consists of three questions.

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

No. of Printed Pages:___

Name of Subject : BOTANY	**Paper Code :** **MiDSCBOT-102 & 202** **MDCBOT- 103 & 203** **AEC -104 & 204** **VAC/IKS- 105 & 205** **SECBOT- 106 & 206**
Name of Paper :	
Total Hours : 02:00 Hrs	**Total Marks : 25**

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

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

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

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

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

Semester II

B. Sc. Semester II (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 ZOO201	Fundamentals of Zoology-II	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC ZOO202	Basics of Zoology-II	2	25	25	50	2	2
Multi Disciplinary Course	SC23MDC ZOO203	Introduction to Zoology-II	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC ZOO201	Fundamentals of Zoology-II 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-II Practical Part B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC ZOO202	Basics of Zoology-II Practical	4	25	25	50	2	More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC ZOO203	Introduction to Zoology-II Practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC ZOO204	English	2	25	25	50	2	2
Value added courses	SC23VAC ZOO205		2	25	25	50	2	2
Skill Enhancement Course	SC23SEC ZOO206	Practices of Livestock Based Farming	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER II
PROGRAM CODE: SCIUG104
MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCZOO201

FUNDAMENTALS OF ZOOLOGY-II

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 04 (04Period/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 genetics.
2. The student shall have basic knowledge about general topics of animal physiology
3. The student shall have basic knowledge about general topics of classification of kingdom Animalia.
4. 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

Sr. No			**Credit**	**Hr**
1	**Unit-1**	• General characteristics and classification of phylum Mollusca (up to class) • Type study: *Pila* (habit and habitat, external features, digestive system, respiratory system, blood vascular system, excretory system, nervous and sensory system and reproductive system) • General characteristics and classification of phylum Annelida (up to class) • General characteristics and classification of phylum Arthropoda (up to class)	**1**	**15**

2	**Unit-2**	• Type study: Cockroach (habit and habitat, external features, body wall, endoskeleton, locomotion, digestive system, respiratory system, blood vascular system, excretory system, nervous and sensory system and reproductive system) • Useful and harmful insects • General characteristics and classification of phylum Echinodermata (up to class) • Type study: Star fish (habit and habitat, external features, water vascular system, digestive system) • General characteristics and classification of phylum Hemichordata (up to class)	**1**	**15**
3	**Unit-3**	• Introduction to gene concept (general structure of gene) • Introduction to Mendelian laws of Heredity: Mendel's monohybrid and dihybrid cross. • Incomplete dominance (e.g. *Mirabilis jalapa*) & Co-dominance (e.g. Roan cattle). • Multiple alleles e.g. ABO blood group system in humans & Rh factor- Erythroblastosis fetalis	**1**	**15**
4	**Unit-4**	• Definition and scope of Ecology • Importance and biological effect of abiotic factors (temperature and light) and biotic factors: producer, consumer, decomposers. Functions of ecosystem: food chain, food web, trophic levels, energy flow, ecological pyramids • Animal relationships: mutualism, commensalism, antagonism (antibiosis, parasitism, predation and competition) • Principle and function of ecological tools: sechi disc, anemometer, hygrometer, lux meter, rain gauge and thermometer • Pond ecosystem	**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: SC23PMJDSCZOO201
FUNDAMENTALS OF ZOOLOGY-II 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 phylum Mollusca (up to class) using laboratory specimens, models, slides, charts (Chiton, Dentalium, Pila, Mitilus, Octopus).
2. Study of classification of phylum Annelida and Hemichordata (up to class) using laboratory specimens, models, slides, charts (Earthworm, Nereis, Leech, Balanoglossus).
3. Study of classification of phylum Arthropoda (up to class) using laboratory specimens, models, slides, charts (Peripatus, Limulus, Prawn, Spider, Centipede, Cockroach).
4. Study of classification of phylum Echinodermata (up to class) using laboratory specimens, models, slides, charts (Starfish, Brittle star, Sea urchin, Sea cucumber, Feather star).
5. Study of anatomy of digestive system of *Pila* using charts and models
6. Study of anatomy of nervous system of *Pila* using charts and models
7. Study of anatomy of reproductive system of *Pila* using charts and models
8. Study of anatomy of digestive system of Cockroach using charts and models
9. Study of anatomy of blood vascular system of Cockroach using charts and models
10. Study of anatomy of excretory system of Cockroach using charts and models
11. Study of anatomy of nervous system of Cockroach using charts and models
12. Study of anatomy of reproductive system of Cockroach using charts and models
13. Study of anatomy of digestive system of star fish using charts and models
14. Study of anatomy of water vascular system of star fish using charts and models
15. Mounting of mouth parts of housefly, honey bee and mosquito.
16. Study of respiratory spiracles of cockroach and radula of Pila.

PART B

List of Practicals

1. To solve genetic problem: Mendel's monohybrid cross
2. To solve genetic problem: Mendel's dihybrid cross
3. To solve genetic problem: incomplete dominance
4. To solve genetic problem: co-dominance
5. To solve genetic problem: multiple alleles (ABO blood group system)
6. Principle and function of ecological tools: secchi disc, anemometer, hygrometer, lux meter, rain gauge and thermometer
7. Study of relationships among organisms (any Two example of mutualism, commensalism, parasitism)
8. Study of relationships among organisms (any two example of antibiosis, parasitism)
9. Study of relationships among organisms (any two example of predation, competition)
10. To study food chain in relation to pond ecosystem.
11. To study food web in relation to pond ecosystem.
12. To study different ecological pyramids.
13. To study freshwater planktons by preparing temporary slide.
14. To study of energy flow using models, charts
15. To study of abiotic factors temperature and light using models, charts
16. To study of biotic factors: producer, consumer and decomposers using models, charts

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER II
PROGRAM CODE: SCIUG104
MINOR DISCPLINE SPECIFIC COURSE CODE: SC23MIDSCZOO202

BASICS OF ZOOLOGY-II
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. Characteristics and classification of phylum Mollusca and Annelida up to class level.
2. Economic importance of Annelida and Mollusca
3. Characteristics and classification of phylum Arthropoda and Echinodermata up to class level.
4. Economic and ecological importance of arthropods and echinoderms.

Sr. No			**Credit**	**Hr**
1	**Unit-1**	• General characteristics and classification of phylum Mollusca (up to class) • Type study: *Pila* (habit and habitat, external features, digestive system, respiratory system, blood vascular system, excretory system, nervous and sensory system and reproductive system) • General characteristics and classification of phylum Annelida (up to class) • General characteristics and classification of phylum Arthropoda (up to class)	**1**	**15**

2	**Unit-2**	• Type study: Cockroach (habit and habitat, external features, body wall, endoskeleton, locomotion, digestive system, respiratory system, blood vascular system, excretory system, nervous and sensory system and reproductive system) • Useful and harmful insects • General characteristics and classification of phylum Echinodermata (up to class) • Type study: Star fish (habit and habitat, external features, water vascular system, digestive system) • General characteristics and classification of phylum Hemichordata (up to class)	**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 II
PROGRAM CODE: SCIUG104
PRACTICAL MINOR DISCPLINE SPECIFIC COURSE CODE: SC23PMIDSCZOO202

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

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

List of practical

1. Study of classification of phylum Mollusca (up to class) using laboratory specimens, models, slides, charts (Chiton, Dentalium, Pila, Mitilus, Octopus).
2. Study of classification of phylum Annelida and Hemichordata (up to class) using laboratory specimens, models, slides, charts (Earthworm, Nereis, Leech, Balanoglossus).
3. Study of classification of phylum Arthropoda (up to class) using laboratory specimens, models, slides, charts (Peripatus, Limulus, Prawn, Spider, Centipede, Cockroach).
4. Study of classification of phylum Echinodermata (up to class) using laboratory specimens, models, slides, charts (Starfish, Brittle star, Sea urchin, Sea cucumber, Feather star).
5. Study of anatomy of digestive system of *Pila* using charts and models
6. Study of anatomy of nervous system of *Pila* using charts and models
7. Study of anatomy of reproductive system of *Pila* using charts and models
8. Study of anatomy of digestive system of Cockroach using charts and models
9. Study of anatomy of blood vascular system of Cockroach using charts and models
10. Study of anatomy of excretory system of Cockroach using charts and models
11. Study of anatomy of nervous system of Cockroach using charts and models
12. Study of anatomy of reproductive system of Cockroach using charts and models
13. Study of anatomy of digestive system of star fish using charts and models
14. Study of anatomy of water vascular system of star fish using charts and models
15. Prepare a temporary mounting of mouth parts of housefly, honey bee and mosquito.
16. Study of respiratory spiracles of cockroach and radula of Pila.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER II
PROGRAM CODE: SCIUG104
MULTI DISCIPLINARY SPECIFIC COURSE CODE: SC23MDCZOO203

INTRODUCTION TO ZOOLOGY-II

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 genetics.
2. The student shall have basic knowledge about general topics of ecology.

Sr. No			Credit	Hr
1	**Unit-1**	• Introduction to gene concept (general structure of gene) • Introduction to Mendelian laws of Heredity: Mendel's monohybrid and dihybrid cross. • Incomplete dominance (e.g. *Mirabilis jalapa*) & Co-dominance (e.g. Roan cattle). • Multiple alleles e.g. ABO blood group system in humans & Rh factor- Erythroblastosis fetalis	**1**	**15**
2	**Unit-2**	• Definition and scope of Ecology • Importance and biological effect of abiotic factors (temperature and light) and biotic factors: producer, consumer, decomposers. Functions of ecosystem: food chain, food web, trophic levels, energy flow, ecological pyramids • Animal relationships: mutualism, commensalism, antagonism (antibiosis, parasitism, predation and	**1**	**15**

		competition) • Principle and function of ecological tools: secchi disc, anemometer, hygrometer, lux meter, rain gauge and thermometer • Pond ecosystem		

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 II
PROGRAM CODE: SCIUG104
PRACTICAL MULTI DISCIPLINARY SPECIFIC COURSE CODE: SC23PMDCZOO203

INTRODUCTION TO ZOOLOGY-II

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

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

List of Practicals

1. To solve genetic problem: Mendel's monohybrid cross
2. To solve genetic problem: Mendel's dihybrid cross
3. To solve genetic problem: incomplete dominance
4. To solve genetic problem: co-dominance
5. To solve genetic problem: multiple alleles (ABO blood group system)
6. Principle and function of ecological tools: secchi disc, anemometer, hygrometer, lux meter, rain gauge and thermometer
7. Study of relationships among organisms (any two example of mutualism, commensalism, parasitism)
8. Study of relationships among organisms (any two example of predation, antibiosis, competition)
9. To study food chain and food web in relation to pond ecosystem.
10. To study different ecological pyramids.
11. To study freshwater planktons by preparing temporary slide.
12. To study of energy flow using models, charts.
13. To study of abiotic factors temperature and light using models, charts.
14. To study of biotic factors: producer, consumer and decomposers using models, charts.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER II
PROGRAM CODE: SCIUG104
SKILL ENHANCEMENT COURSE CODE:
SC23SECZOO206

PRACTICES OF LIVESTOCK BASED FARMING

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Period/Week)	**Theory**	**External-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 importance of cow in natural farming.
2. The student shall have basic knowledge about benefits of practicing natural farming and different aspects related to it.

Sr. No			**Credit**	**Hr**
1	**Unit-1**	• History of rearing of cow in India • Indian breeds of cow • Tools of cow based natural farming: Enriching the soil/ preparation of healthy soil • Jivamrut & Bijamrut: preparation and application, uses of Ghan Jivamrut, Bramhastra, Neemastra in brief.	**1**	**15**
2	**Unit-2**	• Technique of mulching, types of mulching and benefits of mulching • Agroforestry: introduction and application • Vermicomposting, role of pollinators in farming and conservation of pollinators, • Useful birds, Insect and microorganism in farming	**1**	**15**

Reference:

1. □ાકૃતિક કૃિષ :આચાય દેવ□ત, રાજ્યપાલ Rી, ગુજરાત રાજ્ય, □કાશક :િનયામક, સમેિત અને એસ.એન.ઓ ,

આત્મા કૃિષ, ખેડૂત કલ્યાણ અને સહકાર િવભાગ, ગુજરાત.

2. The Natural Way of Farming: Masanobu Fukuoka, Bookventure , Madras

Further Reading:

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

FUNDAMENTALS OF ZOOLOGY-II PRACTICAL
EFFECTIVE FROM JUNE 2023-24 UNDER NEP

PRACTICAL SKELETON

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

Q 1	Prepare a temporary mounting of mouth parts of housefly/honey bee/mosquito.	**10**
Q 2	Draw, label the diagram of given system of particular animal and describe location and functions of different organs in brief. **OR** Identify and describe the relationship of organisms/principle and function of given ecological tool	**08**
Q 3	Solve given genetic problem as per slip.	**07**
Q 4	**Do as directed** 1. Identify and classify the specimen up to class and describe its morphological characters (Mollusca) 2. Identify and classify the specimen up to class and describe its morphological characters (Annelida) 3. Identify and classify the specimen up to class and describe its morphological characters (Arthropoda) 4. Identify and classify the specimen up to class and describe its morphological characters (Echinodermata / Hemichordata) 5. Identify and describe the function of ecological tool/ ecological model	**15**
Q5	Viva voce	**05**
Q 7	Journal submission	**05**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

BASICS OF ZOOLOGY-II PRACTICAL

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

PRACTICAL SKELETON

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

Q 1	Draw, describe and mount mouth part of housefly/honey bee/mosquito	**04**
Q 2	Draw, label the diagram of given system of particular animal and describe location and functions of different organs in brief. **OR** Identify and describe the usefulness/harmfulness of the given insect.	**03**
Q 3	Do as directed 1. Identify and classify the specimen up to class and describe its morphological Characters. (Mollusca) 2. Identify and classify the specimen up to class and describe its morphological Characters. (Annelida) 3. Identify and classify the specimen up to class and describe its morphological Characters. (Arthropoda) 4. Identify and classify the specimen up to class and describe its morphological Characters. (Echinodermata/Hemichordata)	**12**
Q 4	Viva-voce	**03**
Q 5	Journal	**03**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

INTRODUCTION TO ZOOLOGY-II PRACTICAL

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

PRACTICAL SKELETON

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

Q 1	Solve the given genetic problem of Mendel's monohybrid cross/ Mendel's dihybrid cross/ incomplete dominance/ Co-dominance/ multiple alleles (ABO blood grouping)	**05**
Q 2	Identify and describe the relationship of organisms/principle and function of given ecological tool	**05**
Q 3	**Do as directed** 1. Identify and explain the given ecological model. 2. Identify and explain the given food chain/food web of pond ecosystem. 3. Identify and describe the function of ecological tool	**09**
Q 5	Viva voce	**03**
Q 6	Journal submission	**03**

Semester II

B. Sc. Semester II (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 MIC201	Cell Biology	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC MIC202	Cell and Biomolecules	2	25	25	50	2	2
Multi Disciplinary Course	SC23MDC MIC203	Biomolecules	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC MIC201	Cell Biology Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Cell biology PracticalPart B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC MIC202	Cell and Biomolecules Practical	4	25	25	50	2	More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC MIC203	Biomolecules Practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC MIC204	English	2	25	25	50	2	2
Value added courses	SC23VAC MIC205	To be select from Basket	2	25	25	50	2	2
Skill Enhancement Course	SC23SEC MIC206	Microbial quality control	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCMIC201

CELL BIOLOGY

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

Objective

To understand student with concept of cell and its components and their functions

Unit-1 Structure of Cell

- Difference between plant cell and animal cell
- Plasma membrane: Structure and function
- Cell Wall: Structure of Eukaryotic cell wall and prokaryotic cell wall, Function of cell wall
- Cytoskeleton: Structure and organization of actin filaments, association of actin filaments with plasma membrane, cell surface protrusions, intermediate filaments, microtubules

Unit-II Cell organelles

- Structure and function of Mitochondria, Golgi complex, chloroplasts and peroxisomes
- Cellular function of Ribosomes, vacuoles, Lysosomes, nucleus and nuclear membrane
- Types and functions of Endoplasmic reticulum
- Cell-Cell Interactions - adhesion junctions, tight junctions, gap junctions, and plasmodesmata (only structural aspects)

Unit-III Cell cycle and regulation

- Cell division: Process of Mitosis and meiosis
- Eukaryotic cell cycle and its regulations with check points
- Cell signaling concept, signaling through G-protein coupled receptors
- Programmed cell death

Unit-IV Biology of cancer

- Introduction to cancer biology
- Cancer and cell cycle
- Development of cancer: cause, Types and cure

Reference

1. Microbiology- Michael J Pleczar – 5th Edition
2. Hardin J, Bertoni G and Kleinsmith LJ. (2010). Becker's World of the Cell. 8th edition. Pearson.

Outputs

- ✓ Student will understand basic structure of cell
- ✓ Student will know about different cell organelles and their functions
- ✓ students will understand process of cell cycle and will have hands on experience to know about mitosis and meiosis stages
- ✓ student will have basic knowledge of cancer and its relation with cell cycle also student will understand basic knowledge of development of cancer and its cure

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

PRACTICLS: SC23 PMJDSCMIC201 PART-A & PART B
CELL BIOLOGY

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 Practicals

1. Study a representative plant and animal cell by microscopy.
2. Study of the structure of cell organelles through electron micrographs
3. Cytochemical staining of DNA – Feulgen
4. Demonstration of the presence of mitochondria in striated muscle cells/ cheek epithelial cell using vital stain Janus Green B
5. Study of polyploidy in Onion root tip by colchicine treatment.
6. Identification and study of cancer cells by photomicrographs.
7. Study of different stages of Mitosis.
8. Study of different stages of Meiosis.
9. Isolation of Mitochondria
10. Cell wall staining in plant cells
11. Buccal smear – Identification of Barr Body

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

MINOR DISCPLINE SPECIFIC COURSE CODE: SC23MIDSCMIC202

CELL AND BIOMOLECULES

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

Objective

To understand basic concept of cell and their biomolecules

UNIT-I Cell organelles

- Structure and function of Mitochondria, Golgi complex,
- Structure and function of chloroplasts and peroxisomes
- Cellular function of Ribosomes, vacuoles, Lysosomes, nucleus and nuclear membrane
- Types and functions of Endoplasmic reticulum

UNIT-II Biochemicals of cell

- Function of Carbohydrates, Classification of carbohydrates
- Classification of Amino acids, Functions of proteins, Structure of proteins
- Classification of functions of Lipids, Importance of cholesterol
- Structure of nucleotides – Purines and pyrimidines
- Functions of Vitamins and minerals

Reference

1. Biochemistry by U. Sathyanarayana and chakrapani 4th Edition (2013)
2. Hardin J, Bertoni G and Kleinsmith LJ. (2010). Becker's World of the Cell. 8th edition. Pearson.

Outcomes

- ✓ Students will understand basic cell organelles and their structure
- ✓ Student will well verse with biomolecules and their importance for life

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

PRACTICAL MINOR DISCPLINE SPECIFIC COURSE CODE:SC23PMIDSCMIC202

CELL AND BIOMOLECULES

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

LIST OF PRACTICALS

- Study a representative plant and animal cell by microscopy.
- Study of the structure of cell organelles through electron micrographs
- Qualitative tests for carbohydrates, reducing sugars, non reducing sugars
- Qualitative tests for lipids and proteins
- Study of protein secondary and tertiary structures with the help of models
- Demonstration of DNA models with help of monograph or digital image
- Estimation of protein by Folin-lawry method
- Protein estimation by Bradford method
- Estimation of carbohydrate by DNS and anthron method

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

MULTIDISCIPLINARY SPECIFIC COURSE CODE: SC23MDCMIC203

BIOMOLECULES

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

Objective

To understand student about basic importance of biomolecules

UNIT-I Carbohydrate and Protein

- General functions and classification of carbohydrates
- Stereo isomerism of monosaccharides, D and L forms, epimers, Mutarotation and anomers of glucose, Storage polysaccharides - starch and glycogen (structure and function)
- Function of proteins and basic classification of Amino acids based on function, structure and properties.
- Structure of proteins: Primary, secondary, Tertiary and quaternary structures of proteins.

UNIT-II Lipids and Nucleic acid

- General functions of Lipids, Classification of Lipids
- Fatty acids: Occurrence, Even and odd carbon FA, Saturated and unsaturated FA, Nomenclature of FA
- Properties of Triacylglycerols, Phospholipids: Glycerophospholipids and sphingophospholipids, Functions of Phospholipids, General introduction of Glycolipids, Steroids: Structure and occurrence of Cholesterol
- Nucleotides: Structure of nucleotides – Purine and pyrimidines, Structure of DNA, Structure and types of RNA – mRNA, tRNA and rRNA.

Reference:

1. Biochemistry by U. Sathyanarayana and chakrapani 4th Edition (2013)
2. Fundamentals of Biochemistry by Jain & Jain, S. Chand Publications (2009)

Output

- ✓ Student will understand about biomolecules and its importance for life

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

PRACTICAL MULTIDISCIPLINARY SPECIFIC COURSE CODE:SC23PMDCMIC203

BIOMOLECULES

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

LIST OF PRACTICALS

- Qualitative tests for carbohydrates, reducing sugars, non reducing sugars
- Qualitative tests for lipids and proteins
- Study of protein secondary and tertiary structures with the help of models
- Demonstration of DNA models with help of monograph or digital image
- Demonstration of types of RNA with help of monograph or digital image

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

SKILL ENHANCEMENT COURSE CODE: SC23SECMIC206

MICROBIAL QUALITY CONTROL

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

Objective

To develop microbiology laboratory oriented skills

Unit 1 Microbiological Laboratory and Safe Practices

- Good laboratory practices - Good laboratory practices, Good microbiological practices
- Biosafety cabinets – Working of Biosafety cabinets, using protective clothing, specification for BSL1, BSL-2, BSL-3.
- Discarding biohazardous waste – Methodology of Disinfection, Autoclaving & Incineration

Unit 2 Determining Microbes in Food / Pharmaceutical Samples

- Culture and microscopic methods - Standard plate count, Most probable numbers, Direct microscopic counts, Biochemical and immunological methods: Limulus lysate test for endotoxin, gel diffusion,
- Sterility testing for pharmaceutical products Molecular methods - Nucleic acid probes, PCR based detection, biosensors.
- Detection of specific microorganisms - on XLD agar, Salmonella Shigella Agar, Manitol salt agar, EMB agar, McConkey Agar, Saboraud Agar
- Ascertaining microbial quality of milk by MBRT, Rapid detection methods of microbiological quality of milk at milk collection centers

Outputs

- ✓ Student will know about GLP, Biosafety and biohazardous wastes
- ✓ Student will learn skill related to microbes determination in food and pharmaceutical samples

Reference

1. Harrigan WF (1998) Laboratory Methods in Food Microbiology, 3rd ed. Academic Press

2. Garg N, Garg KL and Mukerji KG (2010) Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.
3. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer
4. Baird RM, Hodges NA and Denyer SP (2005) Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II
PROGRAM CODE: SCIUG104

PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE
CELL BIOLOGY 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
CELL BIOLOGY 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 II
PROGRAM CODE: SCIUG105

PRACTICAL MINOR DISCPLINE SPECIFIC COURSE

CELL AND BIOMOLECULES 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

CELL AND BIOMOLECULES 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 II
PROGRAM CODE: SCIUG105
PRACTICAL MULTI DISCIPLINARY SPECIFIC COURSE

BIOMOLECULES 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 MULTI DISCIPLINARY SPECIFIC COURSE
BIOMOLECULES 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

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER II

Cell Biology **SC23MJDSCBIO201**

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. Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially membranes, and organelles
2. Students will understand how these cellular components are used to generate and utilize energy in cells
3. Students will understand the cellular components underlying mitotic cell division.
4. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function.

Sr. No.			Credit	Hrs.
1	UNIT-1	What is cell? discovery and historical development of cell biology Types of cell, prokaryotic and eukaryotic cell Prokaryotic cell structure Overview of eukaryotic cell structure Vacuoles in plants	1	15
2	UNIT-2	Cell membrane, Fluid mosaic model of cell membrane Function of cell membrane: types of transport process across cell membrane Cell wall : chemical composition and function Cytoskeleton	1	15
3	UNIT-3	Endoplasmic reticulum: types, structure and function Golgi apparatus: structure and function Lysosome : origin , structure and function Ribosome : structure and function, Centrioles		
4	UNIT-4	Mitochondria, Chloroplast: Grana and stroma Nucleus : Nuclear membrane , Nucleolus and Chromatin material, Introduction to chromosome structure		

References:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.

Further Reading:

1. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
2. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

SC23PMJDSCBIO201 Cell Biology Practicals

Group A

1. Microscopy- Simple & Compound- Basic components & Principle
2. Stains, their types and principal
3. Dyes and their principal
4. Block preparation for plant samples
5. Block preparation for animal tissue samples
6. Microtomy and its types
7. Fixation techniques for plant, animal tissue and bacteria
8. Mounting the sample on slide: various chemicals used as mount
9. Simple staining
10. Negative staining

Group B

11. Gram staining
12. Capsule staining
13. Nuclear Mitochondrial staining
14. Study structure of Prokaryotic cell
15. Study structure of Eukaryotic cell.
16. Cell division in onion root tip
17. Cell fractionation and determination of enzyme activity in organelles using sprouted seed or any other suitable source.
18. Study, observation and identification of various permanent slides
19. Preparation of Nuclear, Mitochondrial & cytoplasmic fractions.
20. SEM/ TEM

Note: In case a hand on experiment is not possible, models can be used.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER II

Cell Biology **SC23MIDSCBIO202**

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. Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially membranes, and organelles
2. Students will understand how these cellular components are used to generate and utilize energy in cells
3. Students will understand the cellular components underlying mitotic cell division.
4. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function.

Sr. No.			Credit	Hrs.
1	UNIT-1	Cell Theory Prokaryotic cell structure Eukaryotic cell structure Vacuoles in plants Cell membrane as semi and selectively permeable membrane Fluid mosaic model of cell membrane Function of cell membrane Cell wall Cytoskeleton	1	15
2	UNIT-2	Endoplasmic reticulum: rough endoplasmic reticulum and smooth endoplasmic reticulum Golgi apparatus: structure and function Lysosome : origin , structure and function Ribosome : structure and function Centrioles Mitochondria & Chloroplast Nucleus Chromosome structure Nucleolus	1	15

References:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.

Further Reading:

1. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
2. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

SC23PMIDSCBIO202 Cell Biology Practicals

1. Microscopy- Simple & Compound- Basic components & Principle
2. Stains, their types and principal
3. Dyes and their principal
4. Block preparation for plant samples
5. Block preparation for animal tissue samples
6. Microtomy and its types
7. Fixation techniques for plant, animal tissue and bacteria
8. Mounting the sample on slide: various chemicals used as mount
9. Simple staining
10. Negative staining
11. Gram staining
12. Capsule staining
13. Nuclear Mitochondrial staining
14. Study structure of Prokaryotic cell
15. Study structure of Eukaryotic cell.
16. Cell division in onion root tip
17. Cell fractionation and determination of enzyme activity in organelles using sprouted seed or any other suitable source.
18. Study, observation and identification of various permanent slides
19. Preparation of Nuclear, Mitochondrial & cytoplasmic fractions.
20. SEM/ TEM

Note: In case a hand on experiment is not possible, models can be used.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER II

Cell Biology **SC23MDCBIO203**

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. Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially membranes, and organelles
2. Students will understand how these cellular components are used to generate and utilize energy in cells
3. Students will understand the cellular components underlying mitotic cell division.
4. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function.

Sr. No.			Credit	Hrs.
1	UNIT-1	Cell Theory Prokaryotic cell structure Eukaryotic cell structure Vacuoles in plants Cell membrane as semi and selectively permeable membrane Fluid mosaic model of cell membrane Function of cell membrane Cell wall Cytoskeleton	1	15
2	UNIT-2	Endoplasmic reticulum: rough endoplasmic reticulum and smooth endoplasmic reticulum Golgi apparatus: structure and function Lysosome : origin , structure and function Ribosome : structure and function Centrioles Mitochondria & Chloroplast Nucleus Chromosome structure Nucleolus	1	15

References:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.

Further Reading:

1. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
2. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

SC23PMDCBIO203 Cell Biology Practicals

1. Microscopy- Simple & Compound- Basic components & Principle
2. Stains, their types and principal
3. Dyes and their principal
4. Block preparation for plant samples
5. Block preparation for animal tissue samples
6. Microtomy and its types
7. Fixation techniques for plant, animal tissue and bacteria
8. Mounting the sample on slide: various chemicals used as mount
9. Simple staining
10. Negative staining
11. Gram staining
12. Capsule staining
13. Nuclear Mitochondrial staining
14. Study structure of Prokaryotic cell
15. Study structure of Eukaryotic cell.
16. Cell division in onion root tip
17. Cell fractionation and determination of enzyme activity in organelles using sprouted seed or any other suitable source.
18. Study, observation and identification of various permanent slides
19. Preparation of Nuclear, Mitochondrial & cytoplasmic fractions.
20. SEM/ TEM

Note: In case a hand on experiment is not possible, models can be used.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER II

Agriculture Biotechnology **SC23SECBIO206**

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. Demonstrate the ability to communicate effectively both orally and in writing.
2. Demonstrate knowledge of the legal and ethical environment impacting business organizations and exhibit an understanding and appreciation of the ethical implications of decisions.
3. Demonstrate an understanding of and appreciation for the importance of the impact of globalization and diversity in modern organizations.
4. Demonstrate an ability to engage in critical thinking by analyzing situations and constructing and selecting viable solutions to solve problems.
5. Demonstrate an ability to work effectively with others.
6. Demonstrate knowledge of current information, theories and models, and techniques and practices in all of the major business disciplines.

Sr. No.			Credit	Hrs.
1	UNIT-1	Introduction, Cryo and organogenic differentiation, Types of culture: Seed , Embryo, Callus, Organs, Cell and Protoplast culture. Micropopagation Axillary bud proliferation, Meristem and shoot tip culture, cud culture, organogenesis, embryogenesis, advantages and disadvantages of micropropagation.	1	15
2	UNIT-2	Protoplast Isolation and fusion Methods of protoplast isolation, Protoplast development, Somatic hybridization, identifiation and selection of hybrid cells, Cybrids, Potential of somatic hybridization limitations. Somaclonal variation Nomenclautre, methods, applications basis and disadvantages. Plant Growth Promoting bacteria. Nitrogen fixation, Nitrogenase, Hydrogenase, Nodulation, Biocontrol of pathogens, Growth promotion by free-living bacteria.	1	15

References:

1. Bhojwani, S.S. and Razdan 2004 Plant Tissue Culture and Practice.

Further Reading:

1. Slater, A., Scott, N.W. & Fowler, M.R. 2008 Plant Biotechnology: The Genetic Manipulation of Plants, Oxford University Press

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-II

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Major Discipline Theory Course-2**
COURSE CODE:	**SC23MJDSCMAT201**
PAPER NAME	**Advance Mathematics**
Total Theory Credit:	**04**
Exam Pattern:	**50 Marks (CCE) + 50 Marks (SEE) = 100 Marks**
With Effective From:	**June 2023**

Program Outcomes:	
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 Outcomes:	
1.	**Understand the properties of matrices, row and column dependence, rank and inverse of a matrix. By applying matrix operations solve the systems of linear equations.**
2.	**Analyze the concepts of integral calculus and its applications in various fields.**
3.	**Understand the concepts of applications of integration.**
4.	**Develop the skill of solving linear and homogeneous differential equations by using various methods.**

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
	1	**Matrices: Introduction of matrices, Hermitian and Skew-Hermitian Matrices, Linear dependence and Independence of row and column Matrices, Row rank, Column rank and Rank of matrix, Row- reduced Echelon form of a Matrix and matrix inversion and their all-related examples, Solution of the system linear equations.**	1	15
	2	**Integration: (Revision: Definition of integration, repeat all formulae of integration) Derive Redaction formula for $\int \sin^n x \, dx$ where $n \in N$ and using this formula find the formula of $\int_0^{\frac{\pi}{2}} \sin^n x \, dx$ where $n \in N$, $\int \sin^n x \, dx$ where $n \in N$ and using this formula find the formula of $\int_0^{\frac{\pi}{2}} \cos^n x \, dx$ where $n \in N$ and $\int \sin^m x \cos^n x \, dx$, where $m, n \in N$ and using this find the formula of $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x \, dx$ where $m, n \in N$ and their related examples, Some examples of Summation of the series using integration.**	1	15
	3	**Applications of Integration: Derive the formula for arc length using definite integral and its applications, derive the formulas for surface area and volume using definite integral and its applications.**	1	15
	4	**Differential Equation: (Revision: Order and degree of differential equation, Constant and arbitrary constant in Solution of differential equation, General Solution, Method of finding differential Equation, Method of Solution of Differential Equation Separable variable, Differential Equation Homogenous differential Equation) Linear differential Equation: $\frac{dy}{dx} + Py = Q$ where P and Q are functions of x, Linear Differential equation with Constant coefficients, Bernoulli's differential Equation with applications, Clairaut equation with applications.**	1	15

References:

1.	Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732
2.	B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd, ISBN:978-8126558646
3.	N.M. Kapoor, A Text Book of Differential Equations, 10th Edition, Pitambar Publishing Co. Ltd., New Delhi, ISBN: 978-8120902905

Further Reading:

1.	Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732
2.	Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd. , New Delhi ISBN: 978-0070602302
3.	Wolfgang Walter, Ordinary Differential Equations,

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Major Discipline Practical Course-2** **Practical on Advance Mathematics (Group A)**
COURSE CODE:	**SC23PMJDSCMAT201 (A)**
Practical Credit:	**02 (04 hours per15 students batch in a week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
With Effective From:	**June 2023**

Program Outcomes:	
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 analyse 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 Outcomes:	
1.	**Understand the properties of matrices, row and column dependence, rank and inverse of a matrix. By applying matrix operations solve the systems of linear equations.**
2.	**Analyze the concepts of integral calculus and its applications in various fields.**
3.	**Understand the concepts of applications of integration.**

Sr. No.	Practical Details
1.	**Hermitian and Skew-Hermitian Matrices** **Task: Explore the definition of a Hermitian and Skew-Hermitian Matrices and their properties and provide examples illustrating the concepts.**
2.	**Linear dependence and independence of row and column of matrices.** **Task: Explore the Linear dependence and independence of row and column of matrices and provide examples illustrating the concepts.**
3. & 4.	**Rank of a Matrix** **Task: Analyze the definition of row and column Rank of a Matrices and Rank of a Matrices by means of examples.**
5. & 6.	**Row Reduction Echelon Form** **Task: by means of Row Reduction Echelon Form find the rank and inverse of matrices and other related examples.**
7.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\sin x$**
8.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\cos x$**
9.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\sin x \cdot \cos x$**
10.	**Evaluate integration of higher power of trigonometric function using substitution method.** **Task: Examples of integration of higher power of trigonometric function using substitution method.**
Note: Minimum EIGHT practical to be performed	
References:	
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2.	**B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd, ISBN:978-8126558646**
Further Reading:	
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2.	**Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd. , New Delhi** **ISBN: 978-0070602302**

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Major Discipline Practical Course-2 (Group-B)**
COURSE CODE:	**SC23PMJDSCMAT201 (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.	PRACTICALDETAILS
Unit-1	**Microsoft Office Excelcharts Used in Mathematical Research**
1	**Create Effective Charts to Present Data Visually** • Inserting Columns, Pie charts, etc. • Create an effective chart with Chart Tool • Design, Format, and Layout options • Adding chart title • Changing layouts • Chart styles • Editing chart data range • Editing data series • Changing chart **(Questions to be asked in Practical: Creating different types of charts in Excel worksheet for the given data to visualize data easily which is to be used in a research paper and formatting them)**
2	**Solving Equations** • Using the Quadratic Formula • Using SOLVER • Solving Equations Using Graphs **(Questions to be asked in Practical: Equations to be given for solving using Excel worksheet which is to be used in a research paper)**
Unit-2	**Microsoft Office Excel Tools Used in Mathematical Research**
3 &4	**Functions (Two Practical)** • Calculating Numerical Expressions • Using Function Notation • Creating Function • Graphing Function • Piecewise Functions • Finding Intersection Points • Finding Maximum and Minimum **(Questions to be asked in Practical: Finding Maximum, Minimum values, Intersection points of given equations which is to be used in a research paper)**
Unit-3	**Microsoft Office Excel Tools Used in Mathematical Research**
5 & 6	**Exponential and Logarithmic Functions (Two Practical)** • Evaluating Powers of e • Evaluating Expressions Involving Logarithms **(Questions to be asked in Practical: Finding values of exponential functions, logarithmic functions, and equations containing them which is to be used in a research paper)**
7	**Mathematics of Finance (Two Practical)** • Compound Interest • Effective Rate • Present Value for Compound Interest • Future Value of the Ordinary Annuity • Future Value of the Annuity Due
Unit-4	**Microsoft Office PowerPoint Tools Used in Mathematical Research**

8	**Hyperlinks and Action Buttons in PowerPoint (Two Practical)** • Inserting Hyperlinks and Action Buttons • Edit Hyperlinks and Action Button • Word Art and Shapes
9	**Working with Movies and Sounds** • Inserting Movie from a Computer File • Inserting an Audio file • Audio Video playback and format options • Video options, Adjust options • Reshaping and bordering Video
10	**Using SmartArt and Tables** • Working with Tables, Table Formatting • Table Styles • Alignment option • Merge and split option • Converting text to smart art **(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 North west, 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:	**II**
COURSE NAME:	**Minor Discipline Theory Course-2**
COURSE CODE:	**SC23MIDSCMAT202**
PAPER NAME	**Matrices and Reduction Formulas**
Theory Credit:	**02**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
With Effective From:	**June 2023**

Program Outcomes:	
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 Outcomes:	
1.	**Understand the properties of matrices, row and column dependence, rank and inverse of a matrix. By applying matrix operations solve the systems of linear equations.**
2.	**Analyze the concepts of integral calculus and its applications in various fields.**

UNIT	DETAILS	CREDIT	Total Hrs.
1	**Matrices: Introduction of matrices, Hermitian and Skew-Hermitian Matrices, Linear dependence and Independence of row and column Matrices, Row rank, Column rank and Rank of matrix, Row- reduced Echelon form of a Matrix and matrix inversion and their all-related examples, Solution of the system linear equations.**	1	15
2	**Integration: (Revision: Definition of integration, repeat all formulae of integration) Derive Redaction formula for $\int \sin^n x \, dx$ where $n \in N$ and using this formula find the formula of $\int_0^{\frac{\pi}{2}} \sin^n x \, dx$ where $n \in N$, $\int \sin^n x \, dx$ where $n \in N$ and using this formula find the formula of $\int_0^{\frac{\pi}{2}} \cos^n x \, dx$ where $n \in N$ and $\int \sin^m x \cos^n x \, dx$, where $m, n \in N$ and using this find the formula of $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x \, dx$ where $m, n \in N$ and their related examples, Summation of the series.**	1	15
References:			
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**		
2.	**B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd, New Delhi ISBN:978-8126558646**		
Further Reading:			
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**		
2.	**Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd. , New Delhi ISBN: 978-0070602302**		

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Minor Discipline Practical Course-2** **Practical on Matrices and Reduction Formulas**
COURSE CODE:	**SC23PMIDSCMAT202**
Practical Credit:	**02 (04 hours per15 students batch in a week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
With Effective From:	**June 2023**

Program Outcomes:	
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 Outcomes:	
1.	**Understand the properties of matrices, row and column dependence, rank and inverse of a matrix. By applying matrix operations solve the systems of linear equations.**
2.	**Analyze the concepts of integral calculus and its applications in various fields.**
3.	**Understand the concepts of applications of integration.**
4.	**Develop the skill of solving linear and homogeneous differential equations by using various methods.**

Sr. No.	Practical Details
1.	**Hermitian and Skew-Hermitian Matrices** **Task: Explore the definition of a Hermitian and Skew-Hermitian Matrices and their properties and provide examples illustrating the concepts.**
2.	**Linear dependence and independence of row and column of matrices.** **Task: Explore the Linear dependence and independence of row and column of matrices and provide examples illustrating the concepts.**
3. & 4.	**Rank of a Matrix** **Task: Analyze the definition of row and column Rank of a Matrices and Rank of a Matrices by means of examples.**
5. & 6.	**Row Reduction Echelon Form** **Task: by means of Row Reduction Echelon Form find the rank and inverse of matrices and other related examples.**
7.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\sin x$**
8.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\cos x$**
9.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\sin x \cdot \cos x$**
10.	**Evaluate integration of higher power of trigonometric function using substitution method.** **Task: Examples of integration of higher power of trigonometric function using substitution method.**
Note: Minimum EIGHT practical to be performed.	
References:	
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2.	**B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd, ISBN:978-8126558646**
Further Reading:	
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2.	**Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd. , New Delhi ISBN: 978-0070602302**

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Multi-Discipline Theory Course-2**
COURSE CODE:	**SC23MDCMAT203**
PAPER NAME	**Mathematics – II**
Total Theory Credit:	**02**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
With Effective From:	**June 2023**

Program Outcomes:	
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 analyse 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 Outcomes:	
1.	**Understand the properties of matrices, row and column dependence, rank and inverse of a matrix. By applying matrix operations solve the systems of linear equations.**
2.	**Analyze the concepts of integral calculus and its applications in various fields.**

UNIT	DETAILS	CREDIT	Total Hrs.
1	**Matrices: Introduction of matrices, Hermitian and Skew-Hermitian Matrices, Linear dependence and Independence of row and column Matrices, Row rank, Column rank and Rank of matrix, Row- reduced Echelon form of a Matrix and matrix inversion and their all-related examples, Solution of the system linear equations.**	1	15
2	**Integration: (Revision: Definition of integration, repeat all formulae of integration) Derive the Redaction formulas of for $\int \sin^n x\ dx$ where $n \in N$ and using this formula find the formula of $\int_0^{\frac{\pi}{2}} \sin^n x\, dx$ where $n \in N$, $\int \sin^n x\ dx$ where $n \in N$ and using this formula find the formula of $\int_0^{\frac{\pi}{2}} \cos^n x\, dx$ where $n \in N$ and $\int \sin^m x \cos^n x\, dx$, where $m, n \in N$ and using this find the formula of $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x\, dx$ where $m, n \in N$ and their related examples, Summation of the series.**	1	15
References:			
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**		
2.	**B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd, ISBN:978-8126558646**		
Further Reading:			
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**		
2.	**Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd., New Delhi ISBN: 978-0070602302**		

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Multi-Discipline Practical Course-2** **Practical on Mathematics – II**
COURSE CODE:	**SC23PMDCMAT203**
Practical Credit:	**02 (04 hours per15 students batch in a week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
With Effective From:	**June 2023**

Program Outcomes:	
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 Outcomes:	
1.	**Understand the properties of matrices, row and column dependence, rank and inverse of a matrix. By applying matrix operations solve the systems of linear equations.**
2.	**Analyze the concepts of integral calculus and its applications in various fields.**
3.	**Understand the concepts of applications of integration.**
4.	**Develop the skill of solving linear and homogeneous differential equations by using various methods.**

Sr. No.	Practical Details
1.	**Hermitian and Skew-Hermitian Matrices** **Task: Explore the definition of a Hermitian and Skew-Hermitian Matrices and their properties and provide examples illustrating the concepts.**
2.	**Linear dependence and independence of row and column of matrices.** **Task: Explore the Linear dependence and independence of row and column of matrices and provide examples illustrating the concepts.**
3. & 4.	**Rank of a Matrix** **Task: Analyze the definition of row and column Rank of a Matrices and Rank of a Matrices by means of examples.**
5. & 6.	**Row Reduction Echelon Form** **Task: by means of Row Reduction Echelon Form find the rank and inverse of matrices and other related examples.**
7.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\sin x$**
8.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\cos x$**
9.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\sin x \cdot \cos x$**
10.	**Evaluate integration of higher power of trigonometric function using substitution method.** **Task: Examples of integration of higher power of trigonometric function using substitution method.**
Note: Minimum EIGHT practical to be performed.	
References:	
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2.	**B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd, ISBN:978-8126558646**
Further Reading:	
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2.	**Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd. , New Delhi ISBN: 978-0070602302**

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Skill Enhancement Course-2**
COURSE CODE:	**SC23SECMAT206**
PAPER NAME	**Mathematics for Competitive Exams-2**
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	**Simplification: VBODMAS Rule, Basic Formulae** **Approximation: Basic Rules to Solve the Problems by Approximation** **Word Problems Based on Numbers: Types of Word Problems Based on Numbers** **Average: Average, Properties of Average, Important Formulae Related to Average of Numbers, Short Cut Techniques**	1	15
2	2	**Percentage: Percentage, Formulae to Calculate Percentage, Short Cut Techniques** **Profit and Loss: Basic Formulae Related to Profit and Loss, Short Cut Techniques** **Discount: Marked Price, Basic Formulae Related to Discount, Successive Discount, 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.			

Methods of assessing the Major Theory Course Ooutcomes for Sem 1 & Sem 2

- **Components* of CCE (Continuous and Comprehensive Evaluation): 50 marks**

Sr. No.	Component	Duration (if any)	Marks
1	Daily/Weekly/Monthly Unit Test/ Exam	$1\frac{1}{2}$hours	25
2	Assignment/ Quiz Test		10
3	Development of Soft Skills		05
4	Class activity		05
5	Attendance		05
Grand Total			50
Development of Soft Skills		• Seminar • Group Discussion	
Class activity		• Problem Solving • Work base tanning • Reading Analyzing	

- **SEE (Semester End Evaluation): 50 marks**

Que. No.	Unit No.	Question	Marks
1	Unit 1	Long Questions (Attempt any two out of three)	10
2	Unit 2	Long Questions (Attempt any two out of three)	10
3	Unit 3	Long Questions (Attempt any two out of three)	10
4	Unit 4	Long Questions (Attempt any two out of three)	10
5	Unit 1 to 4	Short Questions (Attempt any five out of seven)	10

Methods of assessing the Minor/Multidiscipline/Skill Enhancement Theory Course Outcomes for Sem 1 and Sem 2

- **Components* of CCE (Continuous and Comprehensive Evaluation): 25 marks**

Sr. No.	Component	Duration (if any)	Marks
1	Daily/Weekly/Monthly Unit Test/ Exam	$1\frac{1}{2}$hours	15
2	Assignment/ Quiz Test, Development of Soft Skills and Class activity		05
3	Attendance		05
Grand Total			25
Development of Soft Skills		• Seminar • Group Discussion	
Class activity		• Problem Solving • Work base tanning • Reading Analysing	

- **SEE (Semester End Evaluation): 25 marks**

Que. No.	Unit No.	Question	Marks
1	Unit 1	Long Questions (Attempt any two out of three)	10
2	Unit 2	Long Questions (Attempt any two out of three)	10
3	Unit 1 & 2	Short Questions (Attempt any five out of seven)	05

Practical Paper Structure for Internal Examination: SEM:1 & 2
Major (GROUP-A)/ Major(GROUP-B)/Minor/Multidiscipline
Continuous and Comprehensive Evaluation
Total Marks: 25 Time for Practical: 2.5 Hrs.
Instructions: Strictly follow the instructions given by the examiner(s)
1. Attempt any One out of two (5 Marks)
2. Attempt any One out of two (5 Marks)
3. Attempt any One out of two (5 Marks)
4. Attempt any One out of two (5 Marks)
5.Journal/Viva (5 Marks)
Semester End Evaluation (SEM.-1 & 2)
Total Marks: 25 Time for Practical: 2.5 Hrs.
Instructions: Strictly follow the instructions given by the examiner(s)
1. Attempt any One out of two (5 Marks)
2. Attempt any One out of two (5 Marks)
3. Attempt any One out of two (5 Marks)
4. Attempt any One out of two (5 Marks)
5.Journal/Viva (5 Marks)