હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC B (2.21) State University

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

ફોનઃ(૦૨૭૬૬) ૨૩૭૦૦૦ ફેકસ : (૦૨૭૬૬) ૨૩૧૯૧૭

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પરિપત્ર નં.- ૮૭ /૨૦૨૪ *રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦*

વિષયઃ વિજ્ઞાન વિદ્યાશાખા હેઠળના સ્નાતક કક્ષાના સેમેસ્ટર-૦૩ અને ૦૪ના શૈ.વર્ષઃ ૨૦૨૪-૨૫થી ક્રમશઃ અમલમાં આવતા અભ્યાસક્રમ / પરિક્ષા સ્કીમ અંગે.

આ યુનિવર્સિટીની વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, વિજ્ઞાન વિદ્યાશાખાની તારીખઃ 30/03/૨૦૨૪ના રોજ મળેલ સભાના નિર્દિષ્ટ ઠરાવોથી રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦ અંતર્ગત UGCની Guideline મુજબ વિજ્ઞાન વિદ્યાશાખા હેઠળના નીચેના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો મંજુર કરવા કરેલ ભલામણ માન. કુલપતિશ્રીએ એકેડેમિક કાઉન્સિલવતી સ્વીકારી શૈક્ષણિક વર્ષઃ ૨૦૨૪-૨૫થી ક્રમશઃ અમલમાં આવે તે રીતે મંજુર કરેલ છે, જેનો અમલ કરવા સારૂ સબંધિતોને આ સાથે મોકલવામાં આવે છે.

ક્રમ	અભ્યાસક્રમ	ઠરાવ ક્રમાંક	સેમેસ્ટર
૧	ભૌતિકશાસ્ત્ર	૩	સેમેસ્ટર ૩ અને ૪
૨	રસાયણશાસ્ત્ર	૪	સેમેસ્ટર ૩ અને ૪
૩	વનસ્પતિશાસ્ત્ર	૫	સેમેસ્ટર ૩ અને ૪
૪	ઝુલોજી	૬	સેમેસ્ટર ૩ અને ૪
૫	માઇક્રોબાયોલોજી	૭	સેમેસ્ટર ૩ અને ૪
૬	બાયોટેકનોલોજી	૮	સેમેસ્ટર ૩ અને ૪
૭	ગણિતશાસ્ત્ર	૯	સેમેસ્ટર ૩ અને ૪

સદર બાબતની જાણ આપના સ્તરે થી અધ્યાપકશ્રીઓ તથા વિદ્યાર્થીઓને કરવા વિનંતી છે.

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

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

બિડાણઃઉપર મુજબ

કા. કુલસચિવ

નં-એકે/અ×સ/૪૮/૨૦૨૪

તારીખ:૧૬/૫/૨૦૨૪

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.(વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઇલ અર્થે)

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)

Hemchandracharya North Gujarat University
PATAN-384 265

CBCS :: Semester :: Grading Pattern

CurriculumandCreditFrameworkForSEMIIIandIV
AsperUGCGuideline
(AccordingtoNATIONALEDUCATIONPOLICY(NEP)–2020)

Submittedon21th MARCH 2024

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)basedontheperformanceofstudentsinthe examinations,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.Augmentedinthisframeworkaregraduateattributesincludingcriticalthinking,basicpsychology,scientificreasoning,moralethicalreasoningandsoon.

Learningoutcomesforthetwoprogrammestheseframeworkshavebeendeveloped,learningoutcomes for individual courses, pedagogical methods and assessment methods. Looking at allthese new concepts and progress,the detailed syllabus ofB.Sc.(Honours)–PHYSICShasbeendesignedanddecidedtobeimplementedfromtheacademicsessionfromJune2023-24.

PROGRAMMESPECIFICOUTCOMESTOBEATTAINEDATTHEENDOFTHEPROGRAMME

AccordingtoGuidelineofNEP2020,theBoardofStudiesinPhysicsrecognizesthatcurriculum,course 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.
- Toprovideanintellectuallystimulatingenvironmenttodevelopskillsandenthusiasmsofstudentstoth ebestoftheirpotential.
- Togiveneedbasededucationinphysicsofthehighestqualityattheundergraduatelevel.
- Tooffercoursestothechoiceofthestudents.
- To enablestudentstoperformexperimentsandinterprettheresultsofobservation, includinganassessmentofexperimentaluncertainties.
- Tomakestudentseligibleforgovernmentjob.

ObjectivesofProgramme:

BytheendoftheSecondyear(4th semester),thestudentsshouldhaveattainedacommonlevelinbasicofphysicstocomplementthecorefortheirfuturecoursesanddevelopedtheirexperimentalanddataanalysisskillsthroughexperimentsatlaboratories.

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/Institutemayalsoofferdisciplinerelated Electivecoursesofinterdisciplinarynature(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.
8. **Indian knowledge System (IKS):** TheProposednewcoursesinchemistryforundergraduateclassesarereassignedinaccordance tosemester/CBCS/Gradingsystemwithneweducationpolicy.Thenewcourse isbasedonmodelcurriculumoftheuniversitygrantscommission.

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/vocational 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 aesthetic focused 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 III and IV shall be offered from theAcademicyear,June2024.
- Physicssubjectlike Major, Multidisciplinary, Skill enhancement (In Sem 3) and Major, Minor and Skill enhancement (In Sem 4) in the Universities/Affiliated Collegesshall offerundergraduate programmeinFacultyofSciencefromtheAcademicyear2024-25.
- 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) or Indian knowledge System (IKS)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)eachwith4creditineachsemesterandtheirpractical'seachwith4credit which is grouped in A and B.
- One IDC/MDC course shall have to be offered. The credit weight-age for MDC shall be of 2 creditineachsemesterandtheirpractical'seachwith2credit.
- In addition to the Major/Minor/Multidisciplinarycourse,astudent willhave to choose IDC/MDC,AEC,

SECaswellasVAC/IKS fromapoolofcourses.

- AEC, SEC and IKS / (Sem 3)VAC(Sem 4) courses shall have to be offered. The credit weight-age for AEC, SEC,IKS(Sem 3) / VAC(Sem4) coursesshallbeof2credit.
- EachcourseshallhaveauniqueCoursecode.TheDisciplineSpecificCoreCourse,Inter/Multi-Disciplinary Course, Ability Enhancement Course, ValueAddedCourse, Indian knowledge System (IKS)andSkillEnhancementCourseshallbeabbreviatedrespectivelyas**DSC(Major/Minor),IDC/MDC,AEC, VAC/IKSandSEC.**

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 or** Indian knowledge System **IKS**
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 theory coursewith**4credit**shallbeof**60Hours**(15weeksx4credits)duration,
- Thetheory coursewith**2credit**shall beof**30Hours**(15weeksx2credits)duration.
- **Practicalwith2Credit**shallbeof**60Hours**(15weeksx4hours)duration.
- **Practicalwith4 Credit**shallbeof 120**Hours**(15weeksx8hours)duration.

ATTENDANCE:

Theattendancerulesasperthenormsof Hemchandracharya NorthGujarat University,Patan.

MEDIUMOFINSTRUCTION:

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

TEACHINGLEARNINGPROCESS:

Teachingandlearninginthisprogrammeinvolve**classroomlecturesaswelltutorials**. Itallows-

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

LANGUAGEOFQUESTIONNPAPER:

Questionpapershouldbedrawnin**Gujarati**languageanditsEnglishversionshouldbegiven.

EVALUATIONMETHOD :

Academic performance in various courses *i.e.* MJ**DSC, MIDSC, IDC/MDC,AEC, VAC/IKS**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.
- Astudentshallbeevaluatedthrough**Comprehensive Continuous Examination**(**CCE**)-(***InternalEvaluation***)aswellasthe**SemesterEndE xamination**(SEE ***ExternalEvaluation***).
- Theweight-ageofCCEshallbe50%,whereastheweight-ageoftheSemesterEndExamination (SEE)shallbe50%.
- In**Comprehensive Continuous Examination**(**CCE**)/(**InternalEvaluation**)assessmentisspreadthroughthedurationofthecourseandistobedonebytheTeacherteachingthecourse.BOSofthesubjectswilldecidevarious criteriaandtheirweight-ageforCCA.Theassessmentistobedonebyvariousmeansincluding:
    - Written Tests,MCQsbasedTests/Quiz
    - Presentations/Seminars
    - Groupdiscussions/Groupactivities
    - Assignmentsetc.,Projectwork/Fieldwork

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

- Thedistributionof**InternalEvaluation CEE**isgivenaspercriteriagivenbelow.

Components	MAJOR 4 Credit Theory	MI/MDC/AEC/ IKS/SEC/VAC 2 Credit Theory
WrittenTest/WeeklyTest (2 Test Best out of 3)	20Marks	10Marks
Quiz (2 Test Best out of 3)	10 Marks	---
Active Learning During whole Term (seminar)	10 Marks	05 Marks
Home Assignments	05Marks	05Marks
Attendance-Regularityin Learning, WrittenTestandActivity	05Marks	05Marks
Total of CEE	50 Marks	25 Marks

- **SCHEMEOFASSESMENTin Uni.ExaminationforEachPRACTICAL.**

No.	Nameofthehead	Marks for Major Group A	Group B	Marks MI/MDC
1.	Understandingandapproachtotheexperiment,circuitlayout,use of apparatus	05 Marks	05 Marks	05 Marks
2.	Tabulationwithcorrectunitsandaccuracy ofreading,whichisread andnotedbythestudentandverifiedbyexaminer.	05 Marks	05 Marks	05 Marks
3.	OralquestionsRegardingtheexperiment(Viva)	07 Marks	07 Marks	07 Marks
4.	Calculationsbycorrectformulaandgraphwithscale.	05 Marks	05 Marks	05 Marks
5.	Accuracyoftheresultasjudgedbycomparingthestudentsresults withthosesuppliedbyexpertassistantwhohassettheexperiment.	01 Marks	01 Marks	01 Marks
6.	Marksfor Journal. (Must be produced)	02 Marks	02 Marks	02 Marks
Total		25 Marks	25 Marks	25 Marks

- ❖ There will be two group of Practicals in Major subject and total credit of them is 4. Each group of Practical will be 2 credit.(Weigh-tage: credit = 25 Marks, 2 credit = 50 Marks, 4 credit= 100 Marks)

- ❖ In Major subject total Marks of both Group will be 100. 50 Marks is of CCE and 50 Marks is of SEE. Students have must attend both group of practical in practical examination.

Batch Size of Practical:

According to Uniform model statues for the Gujarat Public Universities Act -2023, EDUCATIONDEPARTMENT – GOVERNMENT OF GUJARAT guideline, <u>The batch size shall be not less than ten and not more than twenty.</u>

- The **SemesterEnd Examination**(SEE ***ExternalEvaluation***)shallhavean assessmentbaseduponfollowingperspectivewithrespecttoallthecourses:
  - ➢ EvaluationwithrespecttoKnowledge,
  - ➢ EvaluationwithrespecttoUnderstanding,
  - ➢ EvaluationwithrespecttoSkill,
  - ➢ EvaluationwithrespecttoApplicationand
  - ➢ HigherOrderThinkingSkills.
- WithrespecttoalltheabovecomponentsthereshallbefollowingtypesofQuestionsfromeachunitoft hecourse.
  - ❖ MCQs/Fillintheblanks/Matchthepairs,etc
  - ❖ Shortanswerquestions
  - ❖ Mediumanswerquestions
  - ❖ Longanswerquestions, Examples/Problems,Shortnotesetc.

Exam pattern of Theory and Practical Examination in SEM 3, 4 for MAJOR, MINOR, MULTI/INTER DISCIPLINARY subject

For Major Course		
Course	***Theory***	***Practical***
Credit	4 + 4 = 8 Credit (Two Theory Papers)	4 Credit (Group A -2 credit and Group B-2 credit)
Teaching Hours / Week	4 + 4 = 8 Hours	8 Hours (Group A -4 Hours and Group B-4 Hours)
Examination Marks CCE - Internal SEE - External	100 + 100 Marks (For CCE 50+50) (For SEE 50+50)	**100 Marks** • 50 Marks for **Group A Experiment** (25 Marks -CCE & 25 marks - SEE) • 50 Marks for **Group B Experiment** (25 Marks -CCE & 25 marks - SEE)
Examination Hours	2.5 Hours (CEE & SEE)	5 Hours (2.5 Hours for each Group)
For MINOR, MDC, AEC, IKS		
Course	***Theory*** **MINOR, MDC, AEC,SEC, VAC /IKS**	***Practical*** **MINOR, MDC**
Credit	2 Credit	2 Credit
Teaching Hours / Week	2 Hours	4 Hours
Examination Marks CCE - Internal SEE - External	50 Marks (For CCE 25 Marks) (For SEE 25 Marks)	**50 Marks** 25 Marks -CCE & 25 Marks - SEE
Examination Hours	2.5 Hours (CEE & SEE)	2.5 Hours SEE and CCE

- **CERTIFIED JOURNAL:** TheEndofSemesterExaminationwillbeconductedbytheUniversity.A***certifiedjournal***oftherespectivepra cticalcourse**MUSTBEPRODUCED**atthe timeofpracticalexaminationbythestudent.
- Itwillbecompulsory foracandidate to obtain ***passingpercentage***in bothInternal aswellasExternalEvaluation.Thepassingmarksforeachcourseshallbe**36%**asdecidedbyconcernBoardof Studies HNGUinPhysics.
- Promotion,Re-AdmissionandTimeforCompletionofCourse, Procedure forAwardingGrades,ProvisionforAppeal,etc.asdecidedbytheHemchandracharyaNorthGujaratUniversit y,Patan.

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,Pa tan.

Thereshallbecoverageofmaximum30%syllabusthroughonlinemodeofteaching.Asper directivesofUGC.

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:

NCrF Credit Level	Semester	Major (Core) (68/88)	Minor (Elective) (32)	Multi/Inter-disciplinary (12)	AEC (10)	SEC/ Internship (12)	VAC/ IKS (8)	RP/ OJT	Total Credit/ Sem. (144/176)	Qualification / Certificate
OPTION I BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)										
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	
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 course for next NCrF credit level										
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 course for next NCrF credit level										
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 4th Year	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 – 3 and 4 are as below.

Sr. No.	Course Code	StudyComponents	InstructionHrs/	Examination			Credit	Exam Duration(Hour
				Internal (CCE)	External (SEE)	Total		
SEMESTER–III PROGRAMCODE:SCIUG101								
TheoryCourse(DSC)								
1	SC23MJDSCPHY301	Major-1:DisciplineSpecificCoreCourse (MJDSC – 1)	04	50	50	100	4	02:30
2	SC23MJDSCPHY301A	Major-2:DisciplineSpecificCoreCourse (MJDSC-2)	04	50	50	100	4	02:30
3	SC23MDSCPHY303	Inter/MultiDisciplinary Courses (MDC)	02	25	25	50	2	02:00
PracticalCourse(PDSC)								
4	SC23PMJDSCPHY301	MajorDisciplineSpecificCoreCourseP MJDSC (Group A)	04	25	25	50	2	2:30
		MajorDisciplineSpecificCoreCourseP MJDSC (Group B)	04	25	25	50	2	2:30
5	SC23PMDCPHY303	Inter/Multidisciplinary Course PMDC	04	25	25	50	2	2:00
(AEC)(Languages)								
6	SC23AEC304	**AbilityEnhancementCourses** (AEC)	02	25	25	50	2	1:30
Indian Knowledge System Course(IKS)								
7	SC23IKSPHY305	Indian Knowledge System (IKS)	02	25	25	50	2	1:30
SkillEnhancementCourse (SEC)								
8	SC23SECPHY306&306A	SkillEnhancementCourse(SEC)	02	25	25	50	2	1:30
Total			28	275	275	550	22	

SEMESTER–IVPROGRAMME CODE : SCIUG101

Sr. No.	CourseCode	StudyComponents	Instruction Hrs/week	Examination			Credit	ExamDuration(Hours)
				Internal (CCE)	Uni Exam (SEE)	Total		
TheoryCourse(DSC)								
1	SC23MJDSCPHY401	Major-1:DisciplineSpecificCoreCourse (MJDSC – 1)	04	50	50	100	4	02:30
2	SC23MJDSCPHY401A	Major-2:DisciplineSpecificCoreCourse (MJDSC-2)	04	50	50	100	4	02:30
3	SC23MIDSCPHY402	MinorDisciplinary Course (MIDC)	02	25	25	50	2	02:00
PracticalCourse(PDSC)								
4	SC23PMJDSCPHY401	MajorDisciplineSpecificCoreCourseP MJDSC (Group A)	04	25	25	50	2	2:30
		MajorDisciplineSpecificCoreCourseP MJDSC (Group B)	04	25	25	50	2	2:30
5	SC23PMIDSCPHY402	Minor Disciplinary Course PMIDC	04	25	25	50	2	2:00
AbilityEnhancementCourses(AEC)								
6	SC23AEC404	(AEC)(Languages)	02	25	25	50	2	1:30
ValueAdded Course(VAC)								
7	SC23VACPHY405	ValueAddedCourses(VAC)	02	25	25	50	2	1:30
SkillEnhancementCourse								

8	SC23SECPHY406&406A	**SkillEnhancementCourse(SEC)**	02	25	25	50	2	1:30
Total			28	275	275	550	22	

Note: A student will allow to switch over minor to major course before entering in Sem III. For that He/She must earn credits equal to credits of major subject (which he/she wants to take)during First and Second semesters.

Semester	**Second Year B Sc Sem III& IV Credit in Theory –Practical Distribution**						
	DisciplineSpecificCoreCourses		Inter/Multi Disciplinary Course (4)	AbilityEnhancementCourse (Languages) (2)	VAC /IKS Course (2)	SkillEnhancement Course (2)	TotalCredit
	Major (8)	Minor / (4)					
	Theory+ Practical Credit	Theory+ Practical Credit	Theory+ Practical Credit	Credit	Credit	Credit	
III	8 T + 4 P = 12 [In Practical 2 of Group A and 2 of Group B]	NA	2 T + 2 P = 4	2 T	2 T IKS	2 T	22
IV	8 T + 4 P = 12 [In Practical 2 of Group A and 2 of Group B]	2 T + 2 P = 4	NA	2 T	2 T VAC	2 T	22

T=Theory P=Practical

Semester III

Sr No	Course Type	Course Name	Course Code	Credit	Lect Hours
1	MAJOR - 1	Thermodynamics, Modern Physics&Solid State Phyics	SC23MJDSCPHY301	4	4
2	MAJOR - 2	Electromagnetics, Optics and Electronics	SC23MJDSCPHY301A	4	4
3	MDC	Thermodynamics & Optics	SC23MDSCPHY303	2	2
4	IKS	Yoga-Pranayaam And Wellness	SC23IKSPHY305	2	2
5	IKS	Traditions of Indian Parivar	SC23IKSPHY305A	2	2
6	SEC - 1	Energy Technology	SC23SECPHY306	2	2
7	SEC - 2	Vacuum Pumps, Pressure Gauges and Instruments	SC23SECPHY306A	2	2
8	Major Practical	Laboratory Experiment (Group A & Group B)	SC23PMJDSCPHY301	4	8
9	Multi Practical	Laboratory Experiment	SC23PMDSCPHY303	2	4
Semester IV					
1	MAJOR - 1	Classical Mechanics, Nuclear Physics & Plasma	SC23MJDSCPHY401	4	4
2	MAJOR - 2	Mathematical Physics, Quantum Physics, Electronics	SC23MJDSCPHY401A	4	4
3	MINOR	Nuclear Physics & Plasma Physics	SC23MIDSCPHY402	2	2
4	VAC	Shreemad Bhagavad Geeta & Stress Management in life	SC23VACPHY405	2	2
5	SEC - 1	Astro Physics/ Space Physics	SC23SECPHY406	2	2
6	SEC - 2	Transducer & Sound	SC23SECPHY406A	2	2
7	Major Practical	Laboratory Experiment (Group A & Group B)	SC23PMJDSCPHY401	4	8
8	Minor Practical	Laboratory Experiment	SC23PMDSCPHY402	2	4

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–III

TYPEOFCOURSE:MAJORDISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 COURSECODE:SC23MJDSCPHY301

COURSENAME:THERMODYNAMICS, MODERN PHYSICS & SOLID STATE PHYSICS

(EffectivefromJune2024UnderNEP–2020)

TotalCredits:04 TeachingHoursperWeek:04TeachingHoursperSemester: 60	THEORY MAJOR I	ExternalMarks-50 InternalMarks-50

CourseObjective:

- To understand the principles of Heat and Thermodynamics, Mathematical Theorems, Liquification of Gases
- Learns about Franck -Hertz Experiment, Bohr's Theory, Sommerfield Model
- To develope foundation in Atomic Spectra, Understand Spectroscopic terms Zeeman Effect, Paschan Back effect etc.
- To Learn Crystal Lattice and Crystal structure, the Seven crystal Systems.

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

- Understand the principles of Heat and Thermodynamics, Mathematical Theorems, Liquification of Gases
- Learns about Franck -Hertz Experiment, Bohr's Theory, Sommerfield Model
- Learns the concepts Atomic Spectra, Understood Spectroscopic terms Zeeman Effect, Paschan Back effect
- Get sufficient knowledge of Crystal Lattice and Crystal structure, The Seven crystal Systems.

Syllabus

Unit No.	Content	Credit	Lect.Hrs60
Unit-1	**Thermodynamics:** **Heat and Thermodynamics**: Characteristic functions, Enthalpy(11.1), The Helmholtz and Gibb's function(11.2), Two Mathematical Theorems(11.3), Maxwell's equation(11.4), The T-dS equations(11.5), InternalEnergy equation(11.6), Heat capacity equation, The Thermal Exapansivity (11.9), Compressibility(11.10), Joule-Kelvin effect (Porous plug Experiment) (12.1) Liquification of Gases by Joule-Kelvin Effect (12.2) (*Related Examples, Problems, MCQ & Short Questions)* **Basic Reference:** *Heat and Thermodynamics by Mark W. Zeemansky (5th Edition)*	1	15
Unit 2	**Modern Physics :** **Atomic Spectra:** Franck -Hertz Experiment(2.16), Critical Potentials (2.17), Shortcoming of Bohr's Theory(2.19) , Sommerfield extension of Bohr theory (2.20), Limitations of Sommerfield Model(2.21) (*Related Examples, Problems, MCQ & Short Questions.)* **Matter Waves and Schrodinger Equations :** Formulation of Quantum Mechanics(1.19), Photon: The Quantization of field(1.20),: A Free Particle in One Dimension(2.1), Generalization to Three Dimension(2.2), The Operator correspondence and the Schrodinger equation for a particle subject to forces(2.3). (*Related Examples, Problems, MCQ & Short Questions.)*	1	15

	Basic Reference: 1. *Atomic and Molecular Physics by Raj Kumar (Campus Books)* *2. A Text Book of Quantum Mechanics by Mathews and K.Venkatesan, Tata Mc-Graw Hill Publication*		
Unit -3	**ATOMIC PHYSICS:** **Atomic Spectra**: Orbital and Magnetic Dipole Moment (4.1), Larmor Precession (4.2), Space quantization(4.3), electron spin (4.4), Vector model of atom (4.5), Spectroscopic terms and their notations(4.6), Stern Gerlach Experiment(4.7), Pauli's Exclusion Principle(4.8). Zeeman Effect-Normal Zeeman Effect and anomalous Zeeman Effect(12.1), Explanation of Normal Zeeman Effect(12.2), Explanation of Anomalous Zeeman Effect(12.3), Paschan Back effect (12.4). Stark Effect of Hydrogen (13.1) (*Related Examples, Problems, MCQ & Short Questions.)* **Basic Reference**: Atomic & Molecular sprctra by Rajkumar Kedarnath Prakashan Meerut.	1	15
Unit-4	**SOLID STATE PHYSICS** **Crystal Structure:** Crystalline and Amorphous Solid(1.1) , Crystal Lattice and Crystal structure(1.2), Translational Symmetry, Space, Unit Cell and Primitive Cell(1.3), Symmetry Elements in Crystals(1.4-1.4.1 to 1.4.6), The Seven crystal Systems(1.5), Coordination Number(1.5.1), Some important crystal structure(1.6) , Simple Cubic Structure(1.6.1), Body Centered Cubic (BCC) Structure(1.6.2), Face Centered Cubic (FCC) Structure(1.6.3), Hexagonal closed packed structure (1.6.4), Sodium chloride structure (1.6.5), Cesium chloride structure (1.6.6), Diamond structure (1.6.7), Wigner-Seitz Cells (1.7), Miller Indices (1.8), The inter planar spacing of crystal planes (1.11). (*Related Examples, Problems, MCQ & Short Questions)* **Basic Reference:** Solid State Physics By Ajay Kumar Saxena (Macmillan India Limited)	1	15

: Further Reading – Other References:

(1) HeatandThermodynamicsbyZeemansky
(2) UniversityPhysicsbySears,Zeemankkyandyoung(6th Edition Narosa Publishing)
(3) HeatandThermodynamicsbyRichardH.Dittmon&MarkW.Zemansky (TMH)
(4) HeatandThermodynamicsbyA.B.GuptaandH.P.Roy
(5) Thermodyna -mics and Statistical Physics by Singhal–Agarwal-Prakash Pragati Prakashan, Meerut.
(6) Spectroscopy Vol-1 by Walker & Straw
(7) Atomic Physics by J.B. Rajam (5th Edition – 1960) S. Chand & Co.
(8) Physics of Atoms and Molecules by B.H.Brandsden & C.J.Joachagh, Pearson Education.
(9) Modern Physics by Kenneth Krane, Jon wiley &sons
(10) Elements of Spectroscopy S L Gupta, V Kumar & R C Sharma (24th Edition) Pragati Prakashan,
(11) Molecular Structure and Spectroscopy G Aruldhas, Prentice Hall of India Private Limited
(12) Elements of Solid State Physics (2003) by J. P. Shrivastav, PHI
(13) Introduction to solid state Physics By C.Kittle (John Willey)
(14)Fundamen- tal of solid state Physics By Saxena, Gupta, Saxena (Pragati Prakashan)
(15) Solid State Physics By Ajay Kumar Saxena (Macmillan India Limited)
(16) Solid State Physics by S O Pillai

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–III

TYPEOFCOURSE:MAJORDISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 COURSECODE:SC23MJDSCPHY301A

COURSENAME:ELECTROMAGNETICS, OPTICS AND ELECTRONICS

(EffectivefromJune2024UnderNEP–2020)

TotalCredits:04 TeachingHoursperWeek:04TeachingHoursperSemester: 60	THEORY MAJOR II	ExternalMarks- 50 InternalMarks-50

CourseObjective:

- To Learns the basics concepts and the law of Electrostatics and Magnetostatics.
- To develop foundation in optics and Learn the concepts of diffraction, Single slit, Double Slit Fraunhoffer diffraction
- To learn the the knowledge of Resolving Power of Optical Instruments and the basic concepts of Polarization and Retarders.
- To develop sufficient knowledge about Farmat's principle.
- To understands and recalls the basic concepts of Basic Transistors
- To provide sufficient knowledge of Transistors Current Component, static (Input and Output) characteristics

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

- Understands basics concepts of electrostatics and Magnetostatics.
- Learns the foundation of optics as well as the concepts of diffraction. Also Understands the concepts of Single slit, Double Slit Fraunhoffer diffraction
- Learns basic concepts of Polarization and Retarders.
- Get sufficient knowledge of Basic Transistors
- Learns the knowledge of various type of Transistors Current Component, static (Input and Output) characteristics

Syllabus

Unit No.	Content	Credit	Lect.Hrs60
Unit-1	**ELECTROSTATICS AND MAGNETOSTATICS :** **Electrostatics in Dielectric**: Introduction to polar and non polar dielectrics, Gaseous Non Polar Dielectrics (2.11), Gaseous Polar Dielectrics (2.12), Non Polar Liquids (2.13), Solid Dielectrics Electrets(2.14), Methods of Electrostatics Images (3.11 i to v) (*RelatedExamples&Problems*) **Magnetostatics :** The Magnetic Potential (4.9-a & b) Magnetic Vector Potential due to small Current Loop(4.12), An Alternative method for finding the Vector Potential A and the field B due to Current Loop(4.13), Magnetization(4.15), Magnetic Field Vector (4.16),Magnetic susceptibility and Permeability (4.17), Boundary Conditions(4.18), Uniformly Magnetized Sphere in External Magnetic Field (4.19), A comparison of Static Electric and Magnetic Field (4.20) (*RelatedExamples&Problems*) **BasicReference:**. Electromagnetics by B.B. Laud, New Age Publisher	1	15

Unit-2	**OPTICS :** **Diffraction:** Fraunhoffer Diffraction Introduction (18.1)Fraunhoffer Diffraction at a Single slit (18.2), Intensity distribution in diffraction pattern due to a single slit (18.2.1) Fraunhoffer diffraction at a double slit (18.4), Fraunhoffer diffraction at double slit (Calculus method)(18.4.1), Distinct between single slit and double slit diffraction pattern (18.4.2), Fraunhoffer diffraction at N slit(18.6 & 18.6.1), Plane Diffraction Gratting (18.7), Theory of plane transmission gratting (18.7.1), Dispersive power of Grating (18.7.7) *(RelatedExamples&Problem, MCQ, SQ)* **Resolving Power:** Resolving Power of Optical Instrument(19.5), Resolving Power of a telescope(19.7), Relation between magnifying power and resolving power of a telescope(19.7.1)., Resolving power of a plan transmission grating (19.12)*(RelatedExamples&Problem, MCQ, SQ)* **BasicReference:***ThermodynamicsandStatisticalPhysicsbyDr.J.P.AgarwalandSatyaPrakash(PragatiPrakashan)*	1	15
Unit-3	**OPTICS:** **Fermat's Principle :** Fermat's principle (2.1), Fermat's principle of least time(2.2), law of reflection and law of refraction(2.3) **Polarization:** Introduction(20.1), Polarization by double refraction(20.5.5), Double refraction(20.8.3), Huygens' explanation of double refraction(20.9 & 20.9.1), Types of Polarized light(20.15),, Retarders or Wave plate (Quarter wave plate) (20.17.1), (Half wave plate)(20.17.2), Production of Elliptically polarized light(20.18), Detection of Elliptically polarized light(20.18.1). *(RelatedExamples&Problem, MCQ, SQ)* **Basic Reference:***A text book of OPTICS by Dr. N.Subrahmanyam, Brijlal, Dr.M. N. Avadhanulu - S Chand*	1	15
Unit-4	**ELECTRONICS:** **Basic Transistors:** (Review of Construction of Transistor) Transistor Current Component(4.18), Detailed Transistor Leakage Currents (4.18-1) (Collector to Base and Collector to Emitter Leakage Current), C-B configuration static (Input and Output)characteristics)(4.09-1), Load Line(4.21), Operating Point(4.22) *(Related Examples, Problems, MCQ & Short Questions)* **Transistor Biasing and Stabilization:** Bias Stabilization (Operating Point stabilization) (8.7, 8.7.1 & 8.7.2), Stability factor (8.8), Stabilization by Collector Base Resistance (8.9) Stabilization by potential divider and Emitter resistor (8.10) *(Related Examples, Problems, MCQ & Short Questions)* **Basic Reference:** 1. Hand book of Electronics by Gupta & Kumar 30th Revised Edition, 2002 Pragati Prakashan	1	15

	: Further Reading – Other References : 1. Electricity and Magnetism by Mahajan and Rangwala, THM 2. Electricity and Magnetism Berkeley Phy Vol.-II by Edward M Purcell, McGraw-Hill Publi 3. Electricity and Magnetism by D. C. Tayal, Himalaya Publishing House 4. A Text book of light by D.N.Vasudev – Atmaram & sons,New Delhi . 5. Fundamentals of Optics by F A Jenkine and H E White Tata McGraw Hill Book Co. Ltd. 6. Optics by Ajoy Ghatak Tata McGraw Hill Book Co. Ltd 7. Principles of Optics by B.K. Mathur 8. A Text book of light by D.N.Vasudev – Atmaram & sons,New Delhi . 9. Fundamentals of Optics by F A Jenkine and H E White Tata McGraw Hill Book Co. Ltd. 10. Optics by Ajoy Ghatak Tata McGraw Hill Book Co. Ltd 11. Principles of Optics by B.K. Mathur 12. Electronic Devices and Circuits by A. Mottershead prentice- Hall of India 13. Integrated Electronics by Milliman & Halkias 14. Basic Electronics and Linear Circuits by N. N. Bharagava, D.C.Kulshreshtha, S.C. Gupta. 15. Electronics and Radio Engineering by M L Gupta (9th Edition-2002) Dhanraj &Sons

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B.Sc. PHYSICS-SEMESTER – III
TYPE OF COURSE: MULTI DISCIPLINE SPECIFIC COURSE

PROGRAM CODE: SCIUG101 COURSE CODE: SC23MDSCPHY303

COURSE NAME: THERMODYNAMICS& OPTICS

(Effective from June 2024 under NEP 2020)

Total Credit : 02 Teaching Hours per Week : 02 Teaching Hours Per Semester : 30	THEORY MDC	External Marks : 25 Internal Marks : 25

CourseObjective:

- To understand the principles of Heat and Thermodynamics, Mathematical Theorems, Liquification of Gases.
- TodevelpoeknowledgeaboutMaxwell's equation, Heat capacity, Thermal Exapansivity and Compressibility
- To get sufficient knowledge of Polarization and learns basic concepts of Retarders.
- To develop sufficient knowledge about Farmat's principle and laws for it.

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

- Understand the principles of Heat and Thermodynamics, Mathematical Theorems, Liquification of Gases.
- DevelpoedknowledgeaboutMaxwell's equation, Heat capacity, Thermal Exapansivity and Compressibility
- Get sufficient knowledge of Polarization and learns basic concepts of Retarders.
- Develope sufficient knowledge about Farmat's principle and laws for it.

Syllabus

Unit-1	**Thermodynamics:** **Heat and Thermodynamics**: Characteristic functions, Enthalpy(11.1), The Helmholtz and Gibb's function(11.2), Two Mathematical Theorems(11.3), Maxwell's equation(11.4), The T-dS equations(11.5), Internal Energy equation(11.6), Heat capacity equation, The Thermal Exapansivity (11.9), Compressibility(11.10), Joule-Kelvin effect (Porous plug Experiment) (12.1) Liquification of Gases by Joule-Kelvin Effect (12.2) (*Related Examples, Problems, MCQ & Short Questions)* **Basic Reference:** *Heat and Thermodynamics by Mark W. Zeemansky (5th Edition)*	1	15
Unit-2	**OPTICS:** **Fermat's Principle :** Fermat's principle (2.1), Fermat's principle of least time(2.2), law of reflection and law of refraction(2.3) **Polarization:** Introduction(20.1), Polarization by double refraction(20.5.5), Double refraction(20.8.3), Huygens' explanation of double refraction(20.9 & 20.9.1), Types of Polarized light(20.15),, Retarders or Wave plate (Quarter wave plate) (20.17.1), (Half wave plate)(20.17.2), Production of Elliptically polarized light(20.18), Detection of Elliptically polarized light(20.18.1). *(RelatedExamples&Problem, MCQ, SQ)* **Basic Reference:***A text book of OPTICS by Dr. N.Subrahmanyam, Brijlal, Dr. M. N. Avadhanulu - S Chand*	1	15

: Further Reading – Other References :

(1) HeatandThermodynamicsbyZeemansky

(2) UniversityPhysicsbySears,Zeemankkyandyoung(6th Edition Narosa Publishing)

(3) HeatandThermodynamicsbyRichardH.Dittmon&MarkW.Zemansky (TMH)

(4) HeatandThermodynamicsbyA.B.GuptaandH.P.Roy

(5) Thermodynamics and Statistical Physics by Singhal -Agarwal-Prakash, Pragati Prakashan,Meerut.

(6) Optics by Ajoy Ghatak Tata McGraw Hill Book Co. Ltd

(7) Principles of Optics by B.K. Mathur

(8) A Text book of light by D.N.Vasudev – Atmaram & sons,New Delhi .

(9) Fundamentals of Optics by F A Jenkine and H E White Tata McGraw Hill Book Co. Ltd.

(10) Optics by Ajoy Ghatak Tata McGraw Hill Book Co. Ltd

(11) Principles of Optics by B.K. Mathur

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–III

TYPEOF COURSE:SKILL ENHANCEMENTCOURSEPROGRAMMECODE:SCIUG101

COURSECODE:SC23SECPHY306

COURSENAME:ENERGY TECHNOLOGY

(EffectivefromJune2024UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02 TeachingHoursperSemester: 30	THEORY SEC I	ExternalMarks–25 InternalMarks-25

Course Objective:

- To understand several forms of Conventional (Non-renewable) and Renewable energy sourcesas well as energy technology.
- To develop knowledge about the close relationship among energy, energy conversion processes and environment and To learn demand of energy and how to do its management.
- To learn about the efficiency of geothermal power plants and merits and limitations of wind energy.

Course outcome:

At the end of the course students will able to

- Get knowledge of Coal energy, Natural gas energy, Nuclear energy, Solar energy, Geothermal energy, Hydro energy, Wind energy and Develop the knowledge of energy technology.
- Understand close relationship among energy, energy conversion processes and environment.
- Develop knowledge of demand of energy and its management. Also understand about efficiency improvement in power geothermal power plants and applications of wind energy.

:: Syllabus ::

UnitNo.	Content	Credit	Hrs30
Unit-1	**Introduction:** What is energy? Energy Science and Technology, Energy, man and environment, Some well known forms of energy, Energy Resources and forms of energy, Energy demand, Energy Routes for Conventional energy resources, National energy strategies, and energy plan, Energy management, Costcomparision of energy resources and conversion, Energy Conservation opportunities. **Environmental aspects of energy:** Introduction, Pollution from use of energy, Conbustation Products of Fossil Fuels, Particulate Matter, Electrostatic Precipitator(ESP), Fabric Filter and Baghhouse.	1	15
Unit-2	**Geothermal Energy:** Introduction, Applications, Utilization of Geothermal Energy, Geothermal Energy Resources, Hydro Geothermal Resources, Hot Dry Rock Geothermal Resources. Merits and demerits of PetroGeothermalenergy Power Plant, Geothermal Electrical Power Plants, Classification and types of Geothermal Power plants, **Wind Energy:** Introduction, Applications of Wind Energy and Historical Background, Merits and limitations of Wind energy Conversion, Nature and Origin of Wind, Wind Energy Quantom, Variables in Wind Energy Conversion systems, Wind power density, Power in wind Stream, Wind turbine Efficiency. Types of wind Turbine-Generator Units, Characteristics of wind turbine generator, Mono-blade HAWT, Twin-blade HAWT	1	15

Reference: (1) Energy Technology by S.Rao and Dr. B.B. Parulekar, Khanna Pub.-1995 1st edition
(2) Solar Energy conversion, An introductory course By A. E. Dikon and J. D. Loslie
(3) Principles of Energy Conversion

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–III

TYPEOF COURSE:SKILL ENHANCEMENTCOURSE

PROGRAMMECODE:SCIUG101 COURSECODE:SC23SECPHY306A

COURSENAME:VACUUM PUMPS, PRESSURE GAUGES AND INSTRUMENTS

(EffectivefromJune2024UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02 TeachingHoursperSemester: 30	THEORY SEC II	ExternalMarks–25 InternalMarks-25

Course Objective:

- To understand principles of vacuum technology, concept of pressureand vacuum levels.
- To familiarize about vacuum pumps and pressure gauges available, their working principles.
- To know the operation of vacuum pumps, pressure gauges and aware the errors in measurements.
- To understand Optical instruments and its applications and the basic principle of electrical measurement

Course outcome:

At the end of the course students will able to

- Understand principles of vacuum technology, concept of pressureand vacuum levels.
- Familiarize about vacuum pumps and pressure gauges available, their working principles.
- Get knowledge about operation of vacuum pumps, pressure gauges
- Understands the mechanism of Optical as well as electrical instruments and their applications

:: Syllabus ::

Unit No.	Content	Credit	Hrs 30
Unit-1	**Vacuum Pumps, Pressure Guages:** Exhaust Pumps and their characteristics(15.1), Rotary Oil Pumps(15.2), Molecular Pump(15.3), Diffusion Pump(15.4), Other methods of Producing Low Pressures(15.5), Pressure Gauges - McLeod Guage, Pirani Guage, Thermocouple Guage, Ionization Gauge,(15.7). **Errors in measurement:** Errors of observations, Types of errors, Normal law of errors, Average, standard and probable errors, Percentage error.	1	15
Unit-2	**Optical Instruments:** Travelling Microscope, Cathetometer, and Optical bench.Objective and Eyepiece, Kellner's Eyepiece, Huygens Eyepiece, Ramsden Eyepiece, Comparision of Ramsden Eyepiece and Huygens Eyepiece, Gauss Eyepiece, Telescopes, Refracting Astronomical Telescope, Reflecting Telescope, Newton's Telescope, Other reflecting Telescopes. **Electrical Instruments:** Moving coil Galvanometer,Ballistic Galvanometer, Calibration of Ballistic Galvanometer using different methods, Multimeters, Digital multimeter, Earphone and Headphone.	1	15

Reference: Basic Reference

1. An Advanced Course in Practical Physics by D.Chattopadhyay, P.C. Rakshit, B.SAHA,NewCentral Book Ltd.
2. A text book of OPTICS by Dr. N, Subrahmanyam, Brijlal, Dr, M,N, Avadhanulu S.Chand
3. Mechanics by D.S.Mathur S.Chand.(For Vacuum pumps)

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

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

PROGRAMMECODE: SCIUG101

(EffectivefromJune2024UnderNEP–2020)

LABORATORYEXPERIMENTS: MAJOR COURSE 2 Credit for Group A

COURSECODE: SC23PMJDSCPHY301 Group A

TYPE OFCOURSE	CREDIT	Marks	COURSECODE
MajorDisciplineCoreCoursePractical (MJDSCP)	2 (Group A)	25 CCE + 25 SEE =50	SC23PMJDSCPHY301
TeachingHours TeachingHoursperWeek:08 Hours for 4 Credit practical (120 Hours per Semester) TeachingHoursperWeek:04 Hours for 2 Credit practical (60 Hours per Semester)			

LABORATORYEXPERIMENT COURSE: Group A

1. To Find out Viscosity co- efficient of liquid using co-axial viscometer.
2. To determine Young Modulus 'Y' for metal rod using Kund 's tube.
3. To find out the value of e/k using power transistor (PNP →CK 100 or NPN→SL-100).
4. To Determine Self Inductance of inductor by Anderson Bridge.
5. To determination of 'l_0','r' and 'a' for resonance pendulum.
6. To Determine Unknown Wave Length of Light 'λ' using Hartzmann Formula.
7. To Find out The Refractive Index of Ordinary and Extra Ordinary Rays using Dual Refraction From Calcite Prism.
8. To Find out The Wave Length of Light using Newton's Rings.
9. Stirling's formula (Numerical interpolation).
10. To determine unknown resistance using Post Office Box.

CourseObjectives:

- Togainpracticalknowledgebyapplyingtheexperimentalmethodtocorrelatewiththe Physicstheory.
- Toprovidehandsonexperiencewithequipmentsuchas,spectrometer,Pendulum, Viscometer, Newtons ring apparatus, power transistor and Anderson bridge.
- Tolearntheusageofelectricalandopticalsystemsofvariousmeasurements.
- Toprovidetraininghow toanalyzetheexperimentaldataandgraphicalanalysis.

CourseOutcome:LearningOutcomes:

Bytheendofthecourse,thestudentswillbeableto,

- Gainspracticalknowledgeofexperimentalmethods and Get sufficient knowledge about equipmentslike,spectrometer,Pendulum, Viscometer, Newtons ring apparatus, power transistor and Anderson bridge.
- Determineunknown wavelength, refractive index, electricalandopticalproperties.
- Get sufficient knowledgebyperformingexperimentsbasedontheprinciplesoftheory course.
- Analyzeand understands theexperimentaldataandgraphicalanalysis.
- Developthe communicationskillsby discussing basicprinciplesofscientific conceptsinthegroup.

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

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

PROGRAMMECODE: SCIUG101

(EffectivefromJune2024UnderNEP–2020)

COURSE NAME: MAJOR DISCIPLINE PRACTICAL COURSE 2 Credit for Group B

COURSECODE: SC23PMJDSCPHY301 Group B

TYPE OFCOURSE	CREDIT	Marks	COURSECODE
MajorDisciplineCoreCoursePractical (MJDSCP)	2 (Group B)	25 CCE + 25 SEE =50	SC23PMJDSCPHY301
TeachingHours TeachingHoursperWeek:08 Hours for 4 Credit practical (120 Hours per Semester) TeachingHoursperWeek:04 Hours for 2 Credit practical (60 Hours per Semester)			

LABORATORY EXPERIMENT COURSE: Group A

1. To determine the Absolute Value of Capacity using B.G or B.G
2. Obtain the Characteristics of UJT and Determination of R_{BB}, V_d& η
3. To Verify De Morgen's Theorems using IC-7400.
4. Absorption Co-Efficient of Liquid using Photocell.
5. Obtain the Characteristics of PNP Common Base Transistor.
6. A Study of Characteristics of JFET & Determination of μ, r_d, gm
7. Construction of AND, OR, NOT Gates Using NAND & NOR Universal Gates.
8. Numerical Analysis (Minimum Class Method)
9. To determine μ, r_d, g_m parameter of the JFET
10. A Study of Load line and determination of Q point for BJT

CourseObjectives:

- Togainpracticalknowledgebyapplyingtheexperimentalmethodtocorrelatewiththe Physicstheory.
- Toaware about circuit analysis of various electronic apparatus.
- Toget knowledgebyperformingexperiments and determine various parameter related with it.
- Toprovidetraininghow toanalyzetheexperimentaldataandgraphicalanalysis.
- Todevelopcommunicationskillsanddiscussthebasicprinciplesofscientific conceptsinthegroup.

CourseOutcome:LearningOutcomes:

Bytheendofthecourse,thestudentswillbeableto understands,

- ThebasicprinciplesofPhysicsrelatedtocoursesinthepracticalway.
- Operationaldetailsand Experimentalmethods of various electronic circuits.
- Aware about JFET, Various Gate, UJT, Photocell and Ballestic Galvanometer.
- DetermineQ-point of BJT, μ, r_d, g_m parameter of the JFET, Absorption Co-Efficient of Photocelletc.
- Get sufficient knowledgebyperformingexperimentsbasedontheoretical aspect.
- Learns howtoanalyzetheexperimentaldataandgraphicalanalysis.
- Developthe communicationskillsby discussing basicprinciplesofscientific conceptsinthegroup.

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

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

PROGRAMMECODE: SCIUG101

(EffectivefromJune2024UnderNEP–2020)

COURSE NAME: MDC(MULTIDISCIPLINARY COURSE PRACTICAL)

COURSECODE: SC23PMDSCPHY303 CREDIT: 2

TYPE OFCOURSE	CREDIT	Marks	COURSECODE
MultiDisciplineCoreCourse(MDSCP)	2	25 CCE + 25 SEE =50	SC23PMDSCPHY303
TeachingHours TeachingHoursperWeek:04 Hours for 2 Credit practical (60 Hours per Semester)			

::LABORATORYEXPERIMENTS::

1. To Find out Viscosity co- efficient of liquid using co-axial viscometer.
2. To find out the value of e/k using power transistor (PNP →CK 100 or NPN→SL -100).
3. To Determine Self Inductance of inductor by Anderson Bridge.
4. To Find out The Wave Length of Light using Newton's Rings.
5. Stirling's formula (Numerical Interpolation).
6. Obtain the Characteristics of UJT and Determination of R_{BB}, V_d& η.
7. Absorption Co-Efficient of Liquid using Photocell.
8. Obtain the Characteristics of PNP Common Base Transistor.
9. Construction of AND, OR, NOT Gates Using NAND & NOR Universal Gates.
10. Numerical Analysis (Minimum Class Method)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. SEMESTER – III

TYPE OF COURSE:INDIAN KNOWLEDGE SYSTEM COURSE

PROGRAM CODE: SCIUG101 COURSE CODE: SC23IKSPHY305

COURSE NAME:YOGA-PRANAYAM and WELLNESS

(Effective from June 2024 under NEP 2020)

Total Credit : 02 Teaching Hours per Week : 02 Teaching Hours Per Semester : 30	THEORY IKS	External Marks : 25 Internal Marks : 25

:Syllabus:

Unit 1 Basics of Yoga

What is Yoga? Meaning of Yoga, History, development and basic concept of Yoga. brief information about Yog-Acharya Patanjali. Why Yoga-Abhyas is necessary? Need of Yoga for better health? Common Guideline for Yoga-Abhyas. Precaution for Yoga-Abhyas.Worldwide publicity of Bharatiya Yoga., brief information about yogacharya patanjali. Ashtang yog (Yam-Niyam-Asan-Pranayam-paryaahaar-dharana-dhyan-samadhi) External yoga and type of yam-niyam, Main Yam –Niyam,Breathing Process in Yoga. General instruction of Aasan and Pranayam. Physical and Mental benefit of Yog Pranayam.History of World Yog day (21 June) and its celebration

Shudhdhikriyao: (a) Jalneti, sutraneti, (b) Dhaudhi – Jaldhauti, Vastrdhauti (c) Udiyan Bandh, (d) Tratak (e) Kapalbhati

Unit 2Yogasan and Pranayam: Suryanamskar**,** Mantra of suryanamskar, Various Position of Suryanamskar, Benefit of Suryanamaskar, Relaxation (Shithilikaran) of Body (Neck, shoulder, Backbody, Nee Relaxation)

Standing Yogasan:- Position and Process (Tadasan, Vruxasan, Pad-Hastasan, Ardhachakrasan, Trikonasan), Benefits and Precaution of Standing position Aasan.

Sitting Aasan:- Position and process (Vajrasan, suptavajrasan, Shashankasan, Pashchimotanasan, ushtrasan, padmasan, vakrasan),Benefits and Precaution of Sitting position Aasan.

Aasan on base of Stamouch: (A) Makarasan, Bhujangasan, Shalabhasan, Dhanurasan-Position, Process, (Precaution and Benefits of them.)

Aasan on base of Backbody:(B) Setubandhasan, Uttanapadasan, Ardhahalasan, Pavanmuktasan, shavasan,(Position, Process, Precaution and Benefits of them)

Pranayam: Position and Process of pranayam, (a)Bhastrika, (b)Anulom-Vilom(Nadishodhan), (c)Shitali, (d)Bhramari

References:

1. Yoga,Pranayam, Mudra,Kriya Margadarshak pustika, pub. Vivekanand Kendra, Bodakdev, Amadavad web: www.vkendra.org , email : karnavati@vkendra.org
2. International Yoga Day abhyaskram Protokol, 4th edition, Aayush Mantralay, Government of India, web: www.yogamdniy.nic.in, www.ayush.gov.in
3. Yog Darshika, by Swami Rajarshi Muni (Life mission, karelibag, Vadodara)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. SEMESTER – III

TYPE OF COURSE: INDIAN KNOWLEDGE SYSTEM COURSE

PROGRAM CODE: SCIUG101 COURSE CODE: SC23IKSPHY305A

COURSE NAME: TRADITIONS OF INDIAN PARIVAR

(Effective from June 2024 under NEP 2020)

Total Credit : 02 Teaching Hours per Week : 02 Teaching Hours Per Semester : 30	THEORY IKS	External Marks : 25 Internal Marks : 25

Course Objective:

- To provide concept of parivar and duties of family members.
- To draw attention of students to gruhasthashram and Sacrament of marriage.
- To discuss the importance Indian tradition in Hindu parivar.
- To give sufficient knowledge to students about mass meal and mass prayer with family.

Course Outcome:

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

- Cconcept of parivar and duties of family members.
- About Gruhasthashram and Sacrament of marriage.
- The importance Indian tradition in Hindu parivar.
- About mass meal and mass prayer with family.

:Syllabus:

UNIT 1 PARIVAR APPROACH

- Understanding of Parivar, Ideal Parivar
- Home is Temple (Mandir)
- Construction of Child Character
- Duties of Family members, Duty of offsprings (santan) towards Parents
- Female : A centre of Parivar
- Philosophical Abode(adhisthan) of Family
- House meeting – A collocation bridge
- Dhanyo gruhasthashram (Blessed Familymonastery)
- Family Celebration of Festivals in our Culture
- Our Faith centres (Temples), Our Traditions
- Sacrament of marriage (Vivah sanskar - Saptapadi,)
- Sixteen Sacrament
- Role of YOG in parivar
- Patriotism in parivar
- Education of Children, Parents as a GURU for parivar
- Kitchen- a Doctor of parivar, Importance of Samuhbhojan (Mass meal)
- Mass prayer in family

પરિવારનીસમજ, આદર્શ પરિવાર, ઘર એજ વિદ્યાલય, બાળચારિત્ર્ય નિર્માણ, પારિવારિક સભ્યોના કર્તવ્યો, માતા પિતા પ્રત્યે-સંતાનોનું કર્તવ્ય, સ્ત્રી-પરિવારનું કેંદ્રબિંદુ, પરિવારનું તાત્વિક અધિષ્ઠાન, ઘરસભાસંવાદસેતુ:, ધન્યોગૃહસ્થાશ્રમ, તહેવારોની પારિવારિક ઉજવણી, આસ્થાકેંદ્રો-મંદિરો, પરંપરાઓ, વિવાહસંસકાર- સપ્તપદી,, સોળ સંસકાર, પરિવારમાં યોગની ભૂમિકા, પરિવાર અને દેશભક્તિ, સંતાનોનું શિક્ષણ, માતાપિતા તરીકેની કેળવણી, રસોડુંપારિવારિક સમુહ ભોજનના લાભ .પરિવારનો વૈધ:, પરિવારમાં સમુહ પ્રાર્થનાનું મહ્ત્વ

UNIT-2 RIDDLES IN FAMILY AND SOLUTIONS

- Concept of Joint parivar and Discreate parivar, Merrits and Demerrits of them
- A parivar with Dedication of Daughter in law
- Hospitality of guest in family
- Obstales against Parivar arrangement and solutions
- Personal Presents problems against Marriage Life
- Importance of healthy food in family – Dangerness of Junk food
- Spiritulity in Family arrangement
- Social problems in Marriage Life and solutions
- Disturbance in life of TV – Mobile magic and solutions

સંયુક્ત પરિવાર અને વિભક્ત પરિવારની વિભાવના તથા લાભગેરલાભ-, પુત્રવધુના સમર્પણભાવયુક્ત પરીવાર, પરીવારમાં આતિથ્યસત્કાર ભાવના, પરિવાર વ્યવસ્થા સામેના સંકટો, દાંમ્પત્ય જીવન સામે સાંપ્રત સમસ્યાઓ, તંદુરસ્ત પરિવારમાં પૌષ્ટિક ખોરાક અને જંકફુડનો ખતરો, પરિવાર ભાવનાવ્યવસ્થા માટે ઉપાયો-, દામ્પત્યજીવનમાં સામાજીક સાંસ્કૃતિક સમસ્યાઓ – ઉપાયો, ટી .ઉપાય – પરિવાર માટે એક સમસ્યા :મોબાઈલની માયાજાળ-.વી.

BASIC REFERENCE :

GRUHSHASHTRA : Main Reference book of Family Arrangement
(Punaruthan Prakashan Seva Trasht- Gyanam, anandpaark, kaankariya, Karnavati)

ગૃહશાસ્ત્ર: પરિવારવ્યવસ્થા અંગેનો મુખ્ય સંદર્ભગ્રંથ

(પ્રકાશકજ્ઞનમ -પુનરુત્થાન પ્રકાશન સેવા ટ્રસ્ટ :, -9બી, આનંદપાર્ક, કાંકરીયા અમદાવાદ (

અન્ય સંદર્ભ (Other Reference) :

૧પરિવાર ગોષ્ઠિ ., લેસાહિત્ય સાધના ટ્રસ્ટ) સુશ્રી ઇંદુમતીબેન કાટદરે ., કર્ણાવતી (

૨પરિવાર પ્રબોધન ., સુરુચિ પ્રકાશન, ન્યુ દિલ્હી

.૩ઘરે એ જ વિદ્યાલયસુશ્રી ઇંદુમતીબેન કાટદરે પ્રકાશક .લે -, ભારતીય વિચારમંચ

૪ઘરસભા સહાયિકા ., પ્રકાશક, BAPS, શાહીબાગ, અમદાવાદ .

પહિંદી સંસ્કરણ – સુરુચિ પ્રકાશન (મંગલ ભવન અમંગલહારી) પરિવાર પ્રબોધન ., ન્યુ દિલ્હી .

PROGRAM CODE : SCIUG102
Syllabus and Scheme of Examination
for

Sem. III and Sem. IV 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, 2024

Submitted on March, 2024

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
(c) Journal/ Practical Report(Certified)	10 (5+5)
(d) Viva voce	10 (5+5)

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. For each semester in IInd year, there will be 550 marks per semester, for both semester III and IV. At end of IInd year for completion of **Diploma course** at the time of exit, the total marks will be given out of 2300 (1100+1100+100). The cumulative grade will be given as per university rules.
15. **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

16. For internal remuneration, four hours of Practical's should be considered equivalent to two hours of theory.

17. For conducting practicals, batch size should be with Minimum 10 students and should not exceed more than 20 as per circular by education department under Gujarat public act 2023 on January 20, 2024.

18. For conducting external practical examinations

(Major Discipline Course)	Marks (out of 50)
(a) Internal practical exam Group A	15
(b) Internal practical exam Group B	15
(c) Journal/ Practical Report(Certified)	10 (5+5)
(d) Viva voce	10 (5+5)

(Minor/ Multi/ Interdisciplinary Course)	Marks (out of 25)
(a) Internal practical exam	15
(b) Journal/ Practical Report(Certified)	05
(c) Viva voce	05

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

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**

Semester	Type Of Course Opted	Course Name	Course Code	Credits	Examination			Total Marks
					Internal	External	Examination Hours	
III	Major Discipline Specific course MJDSC-I	Basic of Chemistry- I	SC23MJDSCCHE301	4	50	50	2.30	100
	Major Discipline Specific course MJDSC-II	Basic chemistry -1I	SC23MIDSCCHE301A	4	50	50	2.30	100
	Major Discipline Specific course MJDSC-III Practicals	PMJDC Practical -I & II Lab Group A & Group B	SC23PMJDSCCHE301	4	50	50	2.30	100
	Multi/Inter disciplinary Course MDC/IDC	Simplified chemistry-I	SC23MDCCHE303	2	25	25	2.00	50
	Multi/Inter disciplinary Course MDC/IDC Practicals	PMDC/PIDC Practical- Lab	SC23PMDCCHE303	2	25	25	2.00	50
	Ability Enhancement Courses AEC	To be Selected (From languages)	SC23AECCHE304	2	25	25	2.00	50
	Indian Knowledge System IKS	To be Selected (Basic concept of IKS)	SC23IKSCHE305	2	25	25	2.00	50
	Skill Enhancement Course SEC	To be selected SEC-I Environmental Pollution or SEC-2 Chemical Metallurgy	SC23SECCHE306/ SC23SECCHE306A	2	25	25	2.00	50
	Total Credits of Semester - III			22	275	275		550

IV	**Major Discipline Specific course MJDSC -1**	**Basic Chemistry- III**	**SC23MJDSCCHE401**	**4**	**50**	**50**	**2.30**	**100**
	Major Discipline Specific course MJDSC-II	**Basic Chemistry- IV**	**SC23MJDSCCHE401A**	**4**	**50**	**50**	**2.30**	**100**
	Major Discipline Specific course MJDSC -1II Practicals	**PMJDC Practical -I & II Lab Group A & Group B**	**SC23PMJDSCCHE401**	**4**	**50**	**50**	**2.30**	**100**
	Minor Discipline Specific course MIDSC	**To be Selected Simplified chemistry -I**	**SC23MIDSCCHE402**	**2**	**25**	**25**	**2.00**	**50**
	Minor Discipline Specific course MIDSC Practicals	**Practical's for simplified chemistry I**	**SC23PMIDSCCHE402**	**2**	**25**	**25**	**2.00**	**50**
	Ability Enhancement Courses AEC	**To be Selected (From languages)**	**SC23AECCHE404**	**2**	**25**	**25**	**2.00**	**50**
	Value Added course VAC	**To be Selected (VAC Bhartiya Science & Technology)**	**SC23VACCHE405**	**2**	**25**	**25**	**2.00**	**50**
	Skill Enhancement Course SEC	**To be Selected SEC-1 Green chemistry or SEC-2 Ceramics**	**SC23SECCHE406/ SC23SECCHE406A**	**2**	**25**	**25**	**2.00**	**50**
		Total Credits of Semester - IV		**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

D. Common Formula for External Practical Examination

Sr. no.	Details	Marks Major Course		Marks (MI /MDC)
		Group A	Group B	
1	Experiment (do any one)	15	15	15
2	Viva	05	05	05
3	Certified Journal	05	05	05
4	Total	25	25	25
5	time	2.30 Hr	2.30 Hr	2.00 Hr

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name : B. Sc. Chemistry Semester : III
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MJDSCCHE301

Type of course : Major Discipline Specific course
Name of course : Basic chemistry I
Total Marks : 100

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To understand the core concepts of coordination compounds using CFT.
2. To understand carbohydrates and their chemistry.
3. To study and understand electronic spectroscopy.
4. To know basicc principals of thermodynamics and relevant numericals.

Course Outcome:

1.Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in coordination compounds, carbohydrates and thermodynamics.

2. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.

3.Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.

4. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

Unit	Topic	Credit	Hr
1	**CFT of Coordination compounds** CFT theory, splinting of d-orbitals Oh and Td complex. Factor influencing the magnitude of Δ (Crystal field splitting energies). Calculation of Crystal field stabilization energies for Oh and Td complexes. Applications of CFT: For determination of color of complexes. Use of CFSE Value to determine the stability of Complex, Low spin and high spin complexes. Limitation of CFT	1	15
2	**Carbohydrates.** Introduction, Classification and nomenclature of Mono Saccharides. Reactions of Glucose and Fructose. (Methylation, Acetylation, Oxidation with Br_2 water and Conc. HNO_3, Reaction with HCN, NH_2OH, $C_6H_5NHNH_2$, Osazone formation and Epimerization.) Lengthening of carbon chain of aldoses, Shortening of carbon chain of aldoses. Configuration of Aldo Hexoses [D (+) Glucose], Hemi acetal and acetal forms, Cyclic structure of D (+) glucose, Mechanism of mutarotation, cyclic structure of D (-) fructose (only introduction about structure), Determination of ring size of Aldo hexose. Inter conversions of Glucose from Fructose, Fructose from Glucose, Glucose from Manose, Manose from Glucose, Glucose from Arabinose, Arabinose from Glucose	1	15
3	**Ultra violet Spectroscopy** Introduction, Type of electronic transitions. Origin of UV Spectra, Effect of conjugation, Concept of Chrmophores and Auxochromes. Bathochromic, Hypsochromic, Hyper chromic, and Hypochromic shifts.	1	15

	Woodward – Fisher rules. Problems of conjugated enes, enones and aromatic ketones, aldehydes, acids and esters using empirical rules. (Data table has to be provided to students)		
4.	**Thermodynamics** Clapeyron equation and its Applications for various phase equilibrium ,Integrated form of Clapeyron - Clauses equation, and its Applications for various phase equilibrium. Traouton's Law, Craft equation. Elevation of Boiling point, Depression in Freezing point Partial molar Properties, Gibbs Duhem equation of Free energy, Entropy, Enthalpy, Concept of chemical potential, Duhem Margules equation. Variation of chemical potential with temperature and pressure. Roult's law of ideal solution, Vapour pressure of Ideal solutions & Thermodynamics of Ideal solutions. Numericals	1	15

Books Recommended:

➢ **Inorganic Chemistry**

1. Inorganic chemistry, Catherine E. house croft, 5 th edition, Pearson , 2018.

2. Concise Inorganic Chemistry J.D.Lee, 4th edition, ELBS publication.

➢ **Organic Chemistry**

1. Organic Chemistry by Morrison and Boyd. 4th ed. Pearson Education- 2003

2. Organic Chemistry by pine, Hendriction, Cram and Hammond 4th ed. By P.S.Kalsi.

3. Advance Organic Chemistry by Jerry March.

4. Advance Organic Chemistry by ArunBahal and B.S.Bahal.

5. Organic Chemistry Vol. I & II by S.M.Mukherji, S.P.Sing, R.P.Kapoor.

6. Reaction mechanism and Reagents in Organic Chemistry by GurdeepR.Chatwal 4th ed. Himalaya public House.

7. Text book of Organic Chemistry by ArunBahal, B.S.Bhal, S.Chand.

8. Organic Spectroscopy by P.S.Kalsi.

9. Organic Chemistry by I.R.Finar.

➢ **Physical Chemistry**

1. Advance Physical Chemistry by Gurdeep Raj

2. Physical Chemistry (Question and Answers) by R.N.Madan, G.D.Tully, S.Chand.

3. Principal of Physical Chemistry by Puri, Sharma, Pathania.

4. Chemical Thermodynamics by R.P.Rastogy and R.R.Misra.

5. Essentials of Physical Chemistry by B.S.Bahal, ArunBahal, G.D.Tully.

6. Physical Chemistry by P.W.Atkins, 5th ed., Oxferd, 1994, 7th ed.,2002

7. Physical Chemistry by R.A.Alberty and R.J.Silbey, John Wiley, 1995.

8. Physical Chemistry by G.H.Barrow, 5th ed., Mac Graw Hill, 1998, 6th ed.

9. Physical Chemistry by W.J.Moore, 4th ed., Orient Longmans, 1969.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name : B. Sc. Chemistry Semester : III
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MJDSCCHE301A

Type of course : Major Discipline Specific course
Name of course : Basic 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 the core concepts of Magnetochemistry.
2. To understand basic quantum chemistry i.e. paricle and wave natureof particle, Dual nature of particle.
3. Understanting concept of aromatic substitution reactions
4. To study about the nature and physical properties of liquid.

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Course Outcome:

1.Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories bsed on wave mechanics, magnetic properties, Organic aromatic reactions and liquid behaviour.

2. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.

3.Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.

4. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

5. To know about the physical characteristics of liquids for various estimations.

Unit	Topic	Credit	Hr

1	**Magnetic Properties of Co-ordination compounds.** Elementary theory of Magneto chemistry, Guoy's method for determination of Magnetic susceptibility, Calculation of Magnetic Moments, Magnetic properties of Free ions, Application of Magneto chemistry in structure determination, Determination of the oxidation state of transition metal centre, Determination of the stereochemistry of various transition metal	1	15
2	**Wave Mechanics** Black Body Radiation & Quantum Theory, Photo electric effect, Wave particle duality of radiation, Compton Effect. Basic postulates of quantum Mechanics, Operator: Definition, Algebra of operators, Addition, Multiplication, Commutative properties, Linear operator, Commutative operators, Laplacian operator, Hamiltonian Operators for atoms, Molecules and Molecule ions. Free particle System, Particle in one-dimension box.	1	15
3	**Electrophilic Aromatic substitution** Introduction, Effect of substituent groups, Determination of orientation. Classification of substituent groups, Orientation in disubstituted benzenes. Use of Orientation in synthesis, Mechanism of Nitration, Sulphonation, Friedel – crafts alkylation and Halogenation. Electrophilic aromatic substitution (Two steps). Theory of Reactivity & Orientation, Electron release via resonance.	1	15
4.	**Physical properties of Liquid.** Vapour pressure, Surface tension, Application of surface tension and Measurement using StalagmometerPerachore and its applications. Defination of Viscosity, Application of viscosity and Measurement by Ostwald viscometer Refractive index, Specific refraction,Molar refraction Application of Refractive index and Measurement using abbe's Refractometer.	1	15

	Optical activity, Applications of optical activity and Measurement using Polari meter. Dipole moment and its applications and measurement. Numerical.		

Books Recommended:

➢ **Inorganic Chemistry**

1Quantum Chemistry by R.K.Prasad, Revised IIIrd Edition, Page- 3,5,7,34-37,41,65-68.

2. Concise Inorganic Chemistry J.D.Lee, 4th edition, ELBS publication.

3. Magnetochemistry by Shymal and Dutta, Revised IIIrd Edition, New age publications.

➢ **Organic Chemistry**

1. Organic Chemistry by Morrison and Boyd. 4th ed. Pearson Education- 2003

2. Organic Chemistry by pine, Hendriction, Cram and Hammond 4th ed. By P.S.Kalsi.

3. Advance Organic Chemistry by Jerry March.

4. Advance Organic Chemistry by ArunBahal and B.S.Bahal.

5. Organic Chemistry Vol. I & II by S.M.Mukherji, S.P.Sing, R.P.Kapoor.

6. Reaction mechanism and Reagents in Organic Chemistry by GurdeepR.Chatwal 4th ed. Himalaya public House.

7. Text book of Organic Chemistry by ArunBahal, B.S.Bhal, S.Chand.

8. Organic Spectroscopy by P.S.Kalsi.

9. Organic Chemistry by I.R.Finar.

➢ **Physical Chemistry**

1. Advance Physical Chemistry by Gurdeep Raj

2. Physical Chemistry (Question and Answers) by R.N.Madan, G.D.Tully, S.Chand.

3. Principal of Physical Chemistry by Puri, Sharma, Pathania.

4. Chemical Thermodynamics by R.P.Rastogy and R.R.Misra.

5. Essentials of Physical Chemistry by B.S.Bahal, ArunBahal,G.D.Tully.

6. Physical Chemistry by P.W.Atkins, 5th ed., Oxferd, 1994, 7th ed.,2002

7. Physical Chemistry by R.A.Alberty and R.J.Silbey, John Wiley, 1995.

8. Physical Chemistry by G.H.Barrow, 5th ed., Mac Graw Hill, 1998, 6th ed.

9. Physical Chemistry by W.J.Moore, 4th ed., Orient Longmans, 1969.Further Reading:

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. ChemPMJDSCistry** **Semester : III**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMJDSCCHE301

Type of Course : Practicals Major Discipline Specific Course PMJDSC
Name of Course : Practical's for Basic chemistry I
Total Marks : 100

Effective from June 2023 Under NEP 2020

GROUP A

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

GROUP B

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

Course Objectives:

1. To identify the In organic components in mixtures
2. To find out of normmality of components in mixture using instruments like conductometers.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in operations of instruments needed in industry.
2. To find of the concentrationof acids in binary mixtures.
2. To understand basic methods to identify the cations and anions in the prepared samples.

Sr.No.	List of Practicals	Credit	Hr
GROUP A	Inorganic Chemistry 1. Inorganic Qualitative analysis. (any 8 Mixtures) Mixture containing four radicals. Anion should be (CO_3^{-2},NO_2^- ;SO_3^{-2};S^{-2};Br^-;Cl^-;I^-;NO_3^-;SO_4^{-2};CrO_4^{-2}; $Cr_2O_7^{-2}$) (except PO_4^{-3}, Bo_3^{-3},ASO_3^{-3},ASO_4^{-3},O^{-2})	2	60

	2. To separate Pb, Ag, and Hg ions present in a mixture by paper chromatography. 3. To separate Zn,Co, Ni ions by paper chromatography.		
GROUP B	Physical Chemistry (Do any 10) 1. Conductrometric titration of HCl/CH_3COOH Vs $NaOH$ 2. Conductrometric titration of HCI Vs NH_4OH 3. pH-metric titration of HCI Vs NaOH after Calibration of pH meter. 4. Determine the Dissociation constant of the acid using mixtures of CH3COONa and CH3COOH using pH meter. 5. Determine the specific refraction and molar refraction of the given liquid A, B and mixture C (A+B) and calculate the percentage composition of A and B in the given mixture C using Abbe's Refractometer. 6. Determine the molar refraction $CH_3COOC_2H_5$, CH_3COOCH_5 and CH_3COOCH_7, and show the constancy of reaction equivalent of -CH_2 - Group using Abbe's Refractometer. 7. To determine the viscosity of a different mixture of liquid A and B and determine the percentage composition of unknown mixture by graphical method. 8. To determine the surface tension and compare cleaning-efficiency of two samples of a detergent or soap with stalagmometer. 9. To study kinetic reaction of decomposition of H_2O2 catalysis by iodine ion (Clock reaction) 10. Find the solubility and heat of solution of the given organic acid at two different temperatures 11. To separate Cu, Pb, Cd ions by paper chromatography	2	60

Books Recommended:

1. Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By Pandey O.P. & et Al. publisher S. Chand's, Paper back 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 : III**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MDCCHE303

Type of course : Multi disciplinary course MDSC
Name of course : Simplified chemistry I **Total Mark : 50**

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To understand the core concepts of Boron compounds.
2. To understand Heterocyclic chemistry and their application.

Course Outcome:

1.Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those of boron compounds and hetrocyclic Chemistries.

2.Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.

3. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

Unit	Topic	Credit	Hr
1	Boron Hydride Introduction for Metal Hydride Classification of hydrides. Preparation, properties structure and use of Diborone. Bridge bonding in B_2H_6 (M.O. and sp3 approach). Structure of higher Borones: B_4H_{10}, B_5H_9, B_5H_{11}, B_6H_{10}, $B_{10}H_{14}$.	1	15

2	Heterocyclic Compounds. Introduction, Nomenclature, Structure and aromatic characteristic of Pyrrole, Furan and Thiophene and Pyridine Reactivity and orientation of electrophilic substitution reactions (ESR) in five membered heterocycles (Pyrrole, Furan and Thiophene) and six membered heterocycles (Pyridine). Synthesis and electrophilic substitution of Pyrrole, Furan and Thiophene Structure of Pyridine, Electrophilic and Nucleophilic substitution reactions of pyridine. Basicity of pyridine, piperidine and pyrrole	1	15

Books Recommended:

Inorganic Chemistry

1. Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. Coilin Educational. 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. 5th edn. Oxford University Press.
4. Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.
5. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS,1991.
6. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

Organic Chemistry

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

Further Reading:

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4thedn, Himalaya Publication House.
2. Text book of Organic Chemistry, ArunBahal, S.Chand.
3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.

4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.
5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.
6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.
7. Physical Chemistry by P.W.Atkins. 5^{th} edn.Oxferd 1994 7thedn-2002.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

PROGRAM CODE : SCIUG102

COURSE CODE : SC23PMDCCHE303

Type of Course : Practicals Multidisciplinary (Elective) Course PMDSC

Name of Course : Practical's for Simplified chemistry I

Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To identify the components in Inorganic mixtures.
2. Preparation of different solutions and samples.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in preparation of solutions for carrying out reactions in inorganic samples.
2. To understand basic methods to identify the compnents in mixtures.

Sr.No.	List of Practicals	Credit	Hr
1	**Inorganic Chemistry** **1. Inorganic Qualitative analysis. (any 8 Mixture)** Mixture containing four radicals.Anion should be be (CO_3^{-2},NO_2^-;SO_3^{-2};S^{-2};Br^-;Cl^-;I^-;NO_3^-;SO_4^{-2};CrO_4^{-2}; $Cr_2O_7^{-2}$) (except PO_4^{-3} , Bo_3^{-3},ASO_3^{-3},ASO_4^{-3},O^{-2} **2.** To separate Pb, Ag, and Hg ions present in a mixture by paper chromatography. **3.** To separate Zn,Co, Ni ions by paper chromatography.	1	30

Books Recommended:

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

2. Basic Principles of Practical Chemistry,
by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012
3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.
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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

PROGRAM CODE : SCIUG102
COURSE CODE : SC23IKSCHE305

Type of course : Indian Knowledge System course IKS
Name of course : Basic concept of IKS **Total Mark : 50**

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To understand importance IKS
2. To have knowledge of IKS.
3. To know about principle and appication of IKS.

Course Outcome:

1. Students will gain a comprehensive knowledge of IKS.
2. To raise awareness among students about Indian culture .
3. Students will learn how to control and prevent pollution.

Unit	Topic	Credit	Hr
1	**Indian Knowledge System** Introduction to IKS, Importance of IKS, What is Santa Dhrma and its core literature source, Vedas and Vedagas, Purans and its Itihas, classification of Santan dharma literature,Fourteen major divisions, Dharma Shastras and Smritis, oral and writte scripts of IKS.	1	15
2	**Religion and Dharma** Distinction of religion and Dharma, spirutial and materialistic dimensions, Presentation of IKS in form of sutras,concept of yagna,	1	15

	Indian philosphical system – Upnishdas, IKS and modern science, Apllications of IKS of humanity.		

Books Recommended:

1. Mahadavan, Bhatt, Nagendra Pavana, Indian knowledge system : concepts and applications, (PHI Learning privatelimited, New Delhi, 2022.

2. Bhag Chand Chuhan, Indian knowledge system, Garuda Prakashan ltd, 2023..

3. Vasant Shinde, Bhartiya Knowledge systems, ; Bhishma Prakashan, 2022.

4. Virander kumar Singh, Pranchin Bhartiya, Akshayavata Prakashan, 2016.

Further Reading:

Suggestive Digital Platforms Web Links:

1. http://www.phindia.com
2. https://www.garudabooks.com
3. https://www.exotiindiaart.com/
4. https://www.anaadi.org

3HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE306

Type of course : Skill Enhancement course SEC
Name of course : Environmental Pollution **Total Mark : 50**

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To understand importance environment and its protection
2. To have knowledge of principles of environment protection.
3. To know about types of pollutants.

Course Outcome:

1. Students will gain a comprehensive knowledge about natural and artificil pollutants.
2. To understand the importance of environment forour survival.
3. Students will learn how to reduce and stop environment pollution with helpof various agencies.

Unit	Topic	Credit	Hr
1	**Air Pollution And Water Pollution** Introduction & Classification of pollutant What is air pollution and Types of pollution Source of air pollution and action to reduce air pollution Acid Rain, Green house effect, Emissions of major industrial air pollutant and air quality index Water pollution; Source of Water Pollution Sewage and Wastewater, Agricultural, How to prevent pollutions of Indian rivers, lakes and seas.	1	15

	Types of water pollution- Physical &Chemicals, Biological and Physiological What is Climate Change - Impacts of global warming		
2	**Soil, Noise, Thermal And Radio Pollution** Introduction of soil pollution Sources of soil pollution and action to reduce soil pollution., Effect of Modern Agro-Technology on Soil and Benefit of organic farming. What is Noise Pollution and action to reduce Noise pollution.What is Thermal PollutionWhat is Radio Active Pollution and How to prevent Radio Active PollutionPrevention and control of Pollution	1	15

Books Recommended:

1. Environmental chemistry by Shankar IAS Academy, 10 edition, vikas book house, Pune
2. Environment Issues In India, Mahesh Rangarajan, By Pearson Education India 2006.
3. Environmental Science 8 Th Edition By Botkin And Keller, Wiley, 2012 House,2008.
4. Perspective in enviromental studies, Anubhav Kaushik, CP kaushik, 7th edition, New age International pvt ltd. 2021.

Further Reading:

1. Green chemistry: theory and Practice, Paul t. Anatas, John charles Warner, Oxford university Press,1998.
2. A text book ofgreenchemistry, sankar p dey and Nayin sepoy, Tech word, 2012.

Suggestive Digital Platforms Web Links:

1. http://earthwatch.org/vlabs
2. https://www.treehugger.com.
3. https://www.earthday.org.
4. https://www.fivebooks.com

3HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : III**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE306A

Type of course : Skill Enhancement course SEC
Name of course : Chemical Metallurgy **Total Mark : 50**

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To understand importance metals and their utility
2. To have knowledge of extraction of metals.
3. To know about types of electro metallurgical processes.

Course Outcome:

1. Students will gain a comprehensive knowledge about metullargical methods.
2. To understand the importance of earth as source of metals.
3. Students will learn how to extract metals from natural resources and electrometallurgical tools..

Unit	Topic	Credit	Hr
1	**General principles of Extraction of Metals** Parts of Earth, composition of lithosphere, different layers of earth, production of elements in sea water, metals, non-metals and metalloids, occurrence of elements in nature, minerals and ores, types of ores, Different steps of Metallurgy,Crushing and grinding of the ore(pulverisation of the ore), Removal of impurities from the ore, Electromagnec separation Method, Hydraulic washing method, leaching process, Hand picking method, Froth flotation process, Calcination, Roasting, Pyrometallurgical process, Gold schmidts',Alamino thermic	1	15

	process, Thermite welding process, Carbon reduction process, Reduction of metallic sulphides, Reduction of Metallic slphates, Reduction of metallic halides, Smelting, flux, slag, Electrolytic reduction,		
2	**Electro metallurgy and Furnaces** Electro metallurgy, refining of impure metals, Liquation process, Fractional distillation process, Zone refining process, Oxidative process, Cupellation process, Bessemer's process, puddling process, softening process, Parke's process, Bett's electrolytic process, Poling process, Mond's process, Van-Arkelde Boer's process, Amalgamation process, Electrolytic process, Hydrometallurgical process, Types of furnaces, Reverberatory furnace, Blast furnace, Pudding furnace, Bessemer's converter, Open-hearth furnace, Siemen's Martins furnace, Electric furnace.	1	15

Books Recommended:

1. Industrial Chemistry vol 1 & 2by B. K. Sharma, Krishna prakashan, 2022.
2. Comphrensive industrial chemistry by Prakshan more,Pragati prakshan, 2022.
3. Industrial chemistry by B K sharma, Goel publication house,2008.

Further Reading:

1. Extractive metullargy, Avinash b. lele, Yakshil B. Choksi, second edition, International Press 2022.
2. Refractory metals extractive metallurgy, Roger Rumby, Wiley press, 1998.

Suggestive Digital Platforms Web Links:

1. http://chemcollective.org/vlabs
2. https://www.krishna.com.
3. https://wp.labster.com/chemistry-virtual-labs/
4. https://www.youtube.com/watch?v=O_nyEj_hZzg

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

PATAN - 384 265

NAAC "A" (3.02) State University

FACULTY OF SCIENCE

B.Sc. (Honours) BOTANY

(With Research/without Research)

SCIUG103

Semesters: III and IV

(with multiple entry & exit option)

DIPLOMA SYLLABUS

Curriculum as per UGC Guideline

Framed according to National Education Policy (NEP) - 2020

With effect from June – 2024 (and thereafter)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

PATAN - 384 265

NAAC "A" (3.02) State University

B.Sc. (Honours) Botany Programme

(With Research/without Research)

SCIUG103

NEP-2020

With effect from June – 2024 (and thereafter)

FACULTY OF SCIENCE

Subject: BOTANY

B. Sc. Semesters: III and IV

Total Pages: 01 to 65

Submitted on

Date: 14th March 2024(Thursday)

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./KCG/NEP/2024-25/1368 Dt. 29/09/2023.

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B.Sc. Semester III Courses :: BOTANY ::

SEMESTER: THIRD	TYPES OF THE COURSES	PAPER NO.	PROGRAMME CODE	TITLE OF THE COURSE	CREDITS (T=TEACHING P=PRACTICAL)
	MAJOR THEORY	III	SCIUG103	MYCOLOGY AND PHYTOPATHOLOGY (SC23MJDSCBOT301)	4T
		IV		ARCHEGONIATE (SC23MJDSCBOT301A)	4T
	MAJOR PRACTICAL (GROUP A & B)	III		MYCOLOGY AND PHYTOPATHOLOGY (SC23PMJDSCBOT301)	2P
		IV		ARCHEGONIATE (SC23PMJDSCBOT301A)	2P
	MULTI/INTER DISCIPLINARY THEORY	III		MEDICINAL BOTANY (SC23MDCBOT303)	2T
	MULTI/INTER DISCIPLINARY PRACTICAL	III		MEDICINAL BOTANY (SC23PMDCBOT303)	2P
	ABILITY ENHANCEMENT THEORY	III		FROM POOL OF COURSE (Language) (SC23AECBOT304)	2T
	INDIAN KNOWLEDGE SYSTEM THEORY	II		INDIGENOUS MEDICINAL SYSTEM (SC23IKSBOT305)	2T
	SKILL ENHANCEMENT THEORY	III		MUSHROOM CULTIVATION (SC23SECBOT306)	2T

B.Sc. Semester IV Courses :: BOTANY ::

SEMESTER: FOURTH	TYPES OF THE COURSES	PAPER NO.	PROGRAMME CODE	TITLE (COURSE CODE)	CREDITS (T=TEACHING P=PRACTICA)
	MAJOR THEORY	V	SCIUG103	ANATOMY OF ANGIOSPERMS (SC23MJDSCBOT401)	4T
		VI		ECONOMIC BOTANY (SC23MJDSCBOT401A)	4T
	MAJOR PRACTICAL (GROUP A & B)	V		ANATOMY OF ANGIOSPERMS (SC23PMJDSCBOT401)	2P
		VI		ECONOMIC BOTANY (SC23PMJDSCBOT401A)	2P
	MINOR THEORY	III		APPLIED BOTANY (SC23MiDCBOT402)	2T
	MINOR PRACTICAL	III		APPLIED BOTANY (SC23PMiDCBOT402)	2P
	ABILITY ENHANCEMENT THEORY	IV		FROM POOL OF COURSE (Language) (SC23AECBOT404)	2T
	VALUE ADDED COURSE THEORY	II		FROM POOL OF COURSE (SC23VACBOT405)	2T FROM POOL OF COURSE
	SKILL ENHANCEMENT THEORY	IV		PLANT BREEDING (SC23SECBOT406)	2T

CONTENTS

SEMESTER: III
SUMMARY OF THE PROGRAMME

SYLLABUS DURATION	**SEMESTER PATTERN *I.E.*, SIX MONTHS (single major)**
THEORY	
No. of Discipline Specific Major Core Courses (MJDSC)	***02/Semester***
Credits per Discipline Specific Major Core Course (MJDSC)	*04*
Total credits for Discipline Core Major Course (MJDSC)	***08/Semester***
Theory lectures per Discipline Major Core Course (MJDSC)	*04/week*
No. of 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 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 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 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)(GROUP A+GROUP B)*	***01 (in each semester)***
Credits per Practical course	***04(GROUP A:2+GROUP B:2)***
Total Credits of Practical course	*04/Semester*
Total Practical lectures	*08/week/ batch*
No. of Practical course (in Uni. Exam.)	***01****/Semester*
No. of Practical courses *per Discipline Specific 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	*As per 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-III and IV

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 sem. III & IV has been designed and decided to be implemented from the academic session from June 2024-25.

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.

PROGRAMME LEARNING OUTCOMES:

Learning Outcome Curriculum Framework (LOCF) aims to equip students with knowledge, skills, values, attitudes, leadership readiness/qualities and lifelong learning. The fundamental premise of LOCF is to specify what graduates completing a particular programme of study are expected to know, understand and be able to do at the end of their programme of study. Besides this, students will attain various 21st century skills like critical thinking, problem solving, analytic reasoning, cognitive skills, self-directed learning etc.. A note on LOCF for undergraduate education is available on the UGC website www.ugc.ac.in. It can serve as guiding documents for all Universities undertaking the task of curriculum revision and adoption of outcome based approach.

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.

PO 7: Analytical ability: The students will be able to demonstrate the knowledge in understanding research and addressing practical problems. Application of various scientific methods to address different questions by formulating the hypothesis, data collection and critically analyze the data to decipher the degree to which their scientific work supports their hypothesis.

SALIENT FEATURES:

- B.Sc. (Honours) Botany in UG programme - **Semester III and IV** shall be offered from the Academic year, June **2024**.
- Botany subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2024-25.
- 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 two **Major (MJDSC) Compulsory** course (Theory) with **4 credits/major** and their practical with **4 credits**.
- One **Minor (MiDSC) Compulsory (sem. IV)** course and **Multi-Disciplinary Course (MDC) (sem. III)** (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 2** credit, **SEC 2** credit**, IKS (sem. III)** and **VAC (sem. IV) 2** credit course shall be offered.
- 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 4credits) 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

ATTENDANCE:

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

To be able to appear for the SEE, a student must comply with the following conditions:

1. Should have at least 75% of attendance in all the courses put together.
2. Should have at least 70% of attendance in each course/subject.
3. Should not have any disciplinary proceedings pending against him/her.
4. Should have no pending due.

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. Open Book Reading 7. 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/Dissertatio	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% (50)	**SEE- 50% (50)**
Exam Pattern	**Marks**
Class Test (Best 2 out of 3)	15
Quiz (Best 3 out of 4)	15
Active Learning	05
Home Assignment	05
Class Assignment	05
Attendance	05
Continuous and Comprehensive Evaluation(CCE)	**50**
Semester-End Evaluation (SEE)	**50**

Model for Practical Courses	
CCE- 50% (50)	**SEE- 50% (50)**
Exam Pattern	**Marks**
Lab work assessment (Best 4 out of 5)	20
Viva voce/Lab quiz (Best 4 out of 5)	20
Attendance	10
Continuous and Comprehensive Evaluation(CCE)	**50**
Semester-End Evaluation(SEE)	**50**

Model for Project/Self Model for Project/Self-study course-study/ Model for work experience course	
CCE- 50% (50)	**SEE- 50% (50)**
Exam Pattern	**Marks**
Project Evaluation (Best 3 out of 5)	30
Participation in discussion	10
Attendance	10
Continuous and Comprehensive Evaluation(CCE)	**50**
Semester-End Evaluation(SEE)	**50**

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 **36%** 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, Patan(Gujarat)***.

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.

DIPLPMA COURSE								
Part/Class	Subject code	Study Components	Instruction Hrs/Week	Examination Marks			Credits	Exam Duration (Hours)
				CCE	SEE	Total		
B.Sc. Semester -III		**Semester-III**						
		Discipline Specific Core Course(DSC)						
	SC23MJDSCBOT301	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	02:30
	SC23MJDSCBOT301A	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	
	SC23MDCBOT303	Multi/Inter Disciplinary Courses (MDC/IDC)	2	25	25	50	2	02:00
		Practical Course(PDSC)						
	SC23PMJDSCBOT301& SC23PMJDSCBOT301A	Major Discipline Specific Core Courses (PMJDSC)(GROUP A & B)	8 (4+4)	50	50	100	4 (2+2)	05:00
	SC23PMDCBOT303	Multi/Inter Disciplinary Courses (PMDC/PIDC)	4	25	25	50	2	02:30
		Ability Enhancement Course (AEC)						
	SC23AECBOT304	Ability Enhancement Courses (AEC) (Language)	2	25	25	50	2	02:00
		Value Added Course (VAC)/ Indian Knowledge System (IKS)						
	SC23IKSBOT305	Indian Knowledge System (IKS)	2	25	25	50	2	02:00
		Skill Enhancement Course (SEC)						
	SC23SECBOT306	Skill Enhancement Course (SEC)	2	25	25	50	2	02:00
			28	**275**	**275**	**550**	**22**	
B.Sc. Semester -IV		**Semester-IV**						
		Discipline Specific Core Course(DSC)						
	SC23MJDSCBOT401	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	02:30
	SC23MJDSCBOT401A	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	
	SC23MiDCBOT402	Minor Discipline Specific Core Courses (MiDSC)	2	25	25	50	2	02:00
		Practical Course(PDSC)						
	SC23PMJDSCBOT401& SC23PMJDSCBOT401A	Major Discipline Specific Core Courses (PMJDSC)(GROUP A & B)	8 (4+4)	50	50	100	4 (2+2)	05:00
	SC23PMiDCBOT402	Minor Discipline Specific Core Courses (PMiDSC)	4	25	25	50	2	02:30
		Ability Enhancement Course (AEC)						
	SC23AECBOT404	Ability Enhancement Courses (AEC) (Language)	2	25	25	50	2	02:00
		Value Added Course (VAC)/ Indian Knowledge System (IKS)						
	SC23VACBOT405	Value Added Courses (VAC)	2	25	25	50	2	02:00
		Skill Enhancement Course (SEC)						
	SC23SECBOT406	Skill Enhancement Course (SEC)	2	25	25	50	2	02:00
			28	**275**	**275**	**550**	**22**	

SEMESTER: III

MAJOR DISCIPLINE SPECIFIC CORE COURSES:

PROGRAMME CODE: SCIUG103

SEM-III: SC23MJDSCBOT301: MYCOLOGY AND PHYTOPATHOLOGY

Programme specific Learning Outcomes:

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

- Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.
- Demonstrate skills in laboratory, field and glasshouse work related to mycology and plant pathology.
- Develop an understanding of microbes, fungi and lichens and appreciate their adaptive strategies.
- Identify the common plant diseases according to geographical locations and device control measures.

SEM-III: SC23MJDSCBOT301A: ARCHEGONIATE

Programme specific Learning Outcomes:

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

- Demonstrate an understanding of archegoniatae, Bryophytes, Pteridophytes and Gymnosperms.
- Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.
- Understanding of plant evolution and their transition to land habitat.
- Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Bryophytes, Pteridophytes, and Gymnosperms.

MULTI / INTER DISCIPLINARY COURSE:

PROGRAMME CODE: SCIUG103

SEM-III: SC23MDCBOT303: MEDICINAL BOTANY

Programme specific Learning Outcomes:

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

- Recognize the basic medicinal plants.
- Apply techniques of conservation and propagation of medicinal plants.
- Setup process of harvesting, drying and storage of medicinal herbs.
- Propose new strategies to enhance growth of medicinal herbs considering the practical issues pertinent to India.

INDIAN KNOWLEDGE SYSTEM:

PROGRAMME CODE: SCIUG103

SEM-III: SC23IKSBOT305: INDIGENOUS MEDICINAL SYSTEM

Programme specific Learning Outcomes:

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

- Recognize the basic medicinal plants in the Indian Continent.
- Apply traditional techniques of conservation and propagation of medicinal plants.
- Setup traditional process of harvesting, drying and storage of medicinal herbs.
- Propose new strategies to enhance growth of medicinal herbs considering the practical issues pertinent to the India.

SKILL ENHANCEMENT COURSE:

PROGRAMME CODE: SCIUG103

SEM-III: SC23SECBOT306: MUSHROOM CULTIVATION

Programme specific Learning Outcomes:

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

- Recall various types and categories of mushrooms.
- Demonstrate various types of mushroom cultivating technologies.
- Examine various types of food technologies associated with mushroom industry.
- Value the economic factors associated with mushroom cultivation
- Device new methods and strategies to contribute to mushroom production.

MAJOR DISCIPLINE SPECIFIC CORE COURSE (MJDSC) *Programme Code: SCIUG103*							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***Credits***	***Lectures***	***THEORY***	
						CCE	***SEE***
Diploma Course	***B.Sc. III***	***SC23MJDSCBOT 301***	**MYCOLOGY AND PHYTO PATHOLOGY**	**4**	**T=60hrs**	***50%***	***50%***
Course outcomes:	On completion of the course, the students will be able to: • Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease. • Demonstrate skills in laboratory, field and glasshouse work related to mycology and plant pathology. • Develop an understanding of microbes, fungi and lichens and appreciate their adaptive strategies. • Identify the common plant diseases according to geographical locations and device control measures. **Pedagogy:** Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.						
THEORY UNIT	***TOPIC***					***NO. OF LECTURES* (60hrs)**	
Unit 1	**Fungi-1** • General characteristics, Thallus organization; Cell wall composition; Nutrition; Classification (**Ainsworth**). • **Allied Fungi**: General characteristics; Classification; Occurrence; Types of plasmodia; Types of fruiting bodies. • **Applied Mycology**: Application of fungi in food industry (Fermentation, Organic acids, Enzymes and Mycoproteins); Medicines (Pharmaceutical preparations); Agriculture (Bio fertilizers).					**15**	

Unit 2	**Fungi-2** • **Mycorrhiza**: Ectomycorrhiza, Endomycorrhiza and their significance. • **Zygomycetes:** Characteristic features, Reproduction. Life cycle and classification with reference to ***Rhizopus*.** • **Ascomycetes**: General characteristics (asexual and sexual fruiting bodies), Life cycle and classification with reference to ***Claviceps*.**	**15**
Unit 3	**Fungi and Phytopathology** • **Basidiomycetes**: General characteristics, Life cycle and Classification with reference to ***Agaricus***. • **Lichens**: General characteristics; Classification; Study of thallus (morphological and anatomical), Reproduction; Economic importance. • Terms and concepts; General symptoms of phytopathology.	**15**
Unit 4	**Phytopathology** • Geographical distribution of diseases. Host-Pathogen relationships. • Pathogen, Symptoms, Dissemination, Disease cycle and control measures of following plant diseases: ➢ Bacterial diseases – **Citrus canker.** ➢ Fungal diseases – **White rust of crucifers.** **Black rust of wheat.**	**15**

Suggested Readings:

1. Agrios, G.N. (1997) Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore. 4th edition.
3. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.
4. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.

<table>
<tr><td colspan="7">MAJOR DISCIPLINE SPECIFIC CORE COURSE (MJDSC)
Programme Code: SCIUG103</td></tr>
<tr><td rowspan="2">COURSE</td><td rowspan="2">SEMESTER</td><td rowspan="2">COURSE CODE</td><td rowspan="2">COURSE TITLE</td><td rowspan="2">Credits</td><td rowspan="2">Lectures</td><td colspan="2">THEORY</td></tr>
<tr><td>CCE</td><td>SEE</td></tr>
<tr><td>Diploma Course</td><td>B.Sc. III</td><td>SC23MJDSCBOT301A</td><td>ARCHEGONIATE</td><td>4</td><td>T=60hrs</td><td>50%</td><td>50%</td></tr>
<tr><td>Course outcomes:</td><td colspan="6">Programme specific Learning Outcomes:
On completion of this course, the students will be able to:
• Demonstrate an understanding of archegoniatae, Bryophytes, Pteridophytes and Gymnosperms.
• Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.
• Understanding of plant evolution and their transition to land habitat.
• Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Bryophytes, Pteridophytes, and Gymnosperms.

Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</td></tr>
<tr><td>THEORY UNIT</td><td colspan="5">TOPIC</td><td>NO. OF LECTURES (60hrs)</td></tr>
<tr><td>Unit 1</td><td colspan="5">Bryophytes -I
• General characteristics of Bryophytes, Vegetative reproduction of bryophytes.
• Classification (Rothmaler); Alternation of generations.
• Affinities of Bryophytes with Pteridophytes.</td><td>15</td></tr>
</table>

Unit 2	**Bryophytes -II** • Classification only (up to family), morphology, anatomy and reproduction of ***Marchantia***. • Classification only (up to family), morphology, anatomy and reproduction of ***Funaria***. • Economic importance of bryophytes.	
Unit 3	**Pteridophytes** • General characteristics and economic importance of Pteridophytes; Classification (**Smith**). • Classification only (up to family), morphology, anatomy and reproduction of ***Equisetum*** (Developmental details not to be included). • Classification only (up to family), morphology, anatomy and reproduction of ***Nephrolepis*** (Developmental details not to be included).	**15**
Unit 4	**Gymnosperms** • General characteristics and economic importance of Gymnosperms. classification of Gymnosperms (**Sporne**, **1965**). • Affinities with Pteridophytes and Angiosperms. • Morphology, anatomy (leaflets and coralloid root) and reproduction of ***Cycas*** (Developmental details not to be included).	**15**

Suggested Readings

Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.

Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.

Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot. Allahabad.

Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.

Vanderpoorten, A. & Goffinet, B. (2009) Introduction to Bryophytes. Cambridge University Press.

MAJOR DISCIPLINE SPECIFIC CORE COURSE -PRACTICAL (PMJDSC) ***Programme Code: SCIUG103***						
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***		
				Credits	***CCE***	***SEE***
Diploma Course	***B.Sc. III***	***SC23PMJD SCBOT 301***	**MYCOLOGY AND PHYTOPATHOLOGY, ARCHEGONIATE**	**4 (120 hrs)**	***50%***	***50%***
Course outcomes:	After the completion of the course the students will be able: 1. Understand the instruments, techniques, lab etiquettes and good lab practices for working in a lower groups. 2. Develop skills for identifying Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and using them for Industrial, Agriculture and Environment purposes. 3. Practical skills in the field and laboratory experiments in Mycology, Archegoniate & Pathology. 4. Learn to identify lower group. 5. Can initiate his own Plant & Seed Diagnostic Clinic and 6. Can start own enterprise on lower group products. **Pedagogy:** Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.					

PRACTICALS	***NO. OF LECTURES*** **(120 hrs)**
GROUP A	
1. ***Rhizopus****: study of asexual stage from temporary mounts and sexual structures through permanent slides/photographs/charts.* 2. ***Claviceps****: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs/charts.* 3. ***Agaricus****: Specimen of fruiting body; sectioning of gills. Permanent slides/photographs/charts.* 4. ***Lichens****: Study of thallus (crustose, foliose and fruticose) and reproductive structure (apothecium) through Permanent slides/ photographs/ charts/ specimen.* 5. ***Mycorrhizae****: Ectomycorrhiza and Endomycorrhiza (Photographs).* 6. ***Phytopathology****: Study of Plant diseases: Citrus Canker,* ***White rust of crucifers*** *and* ***Black rust of wheat****.*	**60**

GROUP B	
1. ***Marchantia***- Morphology of thallus with Gemma cup (whole mount), vertical section of thallus through Gemma cup (temporary slide), permanent slides of vertical section of Antheridiophore, Archegoniophore and Sporophyte. 2. ***Funaria***- Whole mount of plant, longitudinal section of capsule (temporary slide), permanent slides of antheridial and archegonial heads. 3. ***Equisetum***- Morphology, longitudinal section of strobilus (temporary slide and permanent slide). 4. ***Nephrolepis***- Morphology, transverse section of sori (temporary slide and permanent slide), prothallus (permanent slide). 5. ***Cycas***- Morphology, vertical section of leaflet (temporary slide), whole mount of spores and specimen of coralloid roots, microsporophyll and megasporophyll.	**60**

Suggested Readings:

1. Agrios, G.N. (1997) Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore. 4th edition.
3. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.
4. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.
6. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
7. Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
8. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.
9. Vanderpoorten, A. & Goffinet, B. (2009) Introduction to Bryophytes. Cambridge University Press.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2024-25 UNDER NEP-2020)

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

Programme Code: SCIUG103

MYCOLOGY AND PHYTOPATHOLOGY, ARCHEGONIATE

SC23PMJDSCBOT 301

(GROUP A & GROUP B)

Date: **Place:**

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

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

(GROUP A)

1. Identify and classify giving reasons up to family of given specimen **A**. **06**

2. Make a temporary slide of the reproductive organ/Phytopathology from the given specimen **B**. **06**

   Draw the labelled diagram of it and show your slide to the examiner.

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

   I) Specimen – **C:** Electron micrographs/Models/charts/permanent slide **(Lichens/Mycorrhizae)**. (5 minutes)

   II) Specimen – **D**: Electron micrographs/Models/charts/permanent slide **(Rhizopus/Claviceps/Agaricus)**. (5 minutes)

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

   b. Journal **04**

(GROUP B)

1. Identify and classify giving reasons up to family of given specimen **E**. **06**

2. Make a temporary slide of the reproductive organ from the given specimen **F**.

   Draw the labelled diagram of it and show your slide to the examiner. **06**

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

   I) Specimen – **G:** Permanent slide. (5 minutes)

   II) Specimen – **H**: Permanent slide. (5 minutes)

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

   b. Journal **04**

DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2024-245UNDER NEP-2020)

<table>
<tr><td colspan="8">MULTI/INTER DISCIPLINARY COURSE (MDC)
Programme Code: SCIUG103</td></tr>
<tr><td rowspan="2">COURSE</td><td rowspan="2">SEMESTER</td><td rowspan="2">COURSE CODE</td><td rowspan="2">COURSE TITLE</td><td rowspan="2">Credits</td><td rowspan="2">Lectures</td><td colspan="2">THEORY</td></tr>
<tr><td>CCE</td><td>SEE</td></tr>
<tr><td>Diploma Course</td><td>B.Sc. III</td><td>SC23MDCBOT303</td><td>MEDICINAL BOTANY</td><td>2T</td><td>T=30hrs</td><td>50%</td><td>50%</td></tr>
<tr><td>Course outcomes:</td><td colspan="7">On completion of the course, the students will be able to:
Recognize the basic medicinal plants.
This course gives a broader exposure to these very important economic plants in addition to their origin, general information, conservation and ethnobotany.
The students who have opted for this course will be knowledgeable on several medicinally important plants.
This will help them to pursue their career as economic botanist, conservation biologist, medicinal plants biologist, etc. will be able to deal with ethnobotanist, agricultural and horticultural scientist and social scientists.
Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</td></tr>
<tr><td>THEORY UNIT</td><td colspan="6">TOPIC</td><td>NO. OF LECTURES (30hrs)</td></tr>
<tr><td>Unit 1</td><td colspan="6">Popular medicinal plants and plant drugs:
A brief account of the chief chemical constituents and uses of the following plant drugs used in indigenous and allopathic systems of medicine:
Root: Asparagus racemosus
Leaf: Vitex negundo
Stem: Tinospora cordifolia
Bark: Cinnamon zeylanicum</td><td>15</td></tr>
</table>

Unit 2	**Popular medicinal plants and plant drugs:** ➢ A brief account of the chief chemical constituents and uses of the following plant drugs used in indigenous and allopathic systems of medicine: ➢ **Flower: *Syzygium aromaticum*** ➢ **Fruit*: Moringa pterygosperma*** ➢ **Seed: *Datura metel***	**15**

Suggested Readings:

1. Kochhar S.L. (2012) Economic Botany in the Tropics. MacMillan India Ltd., New Delhi.
2. Wickens G.E. (2001) Economic Botany: Principles & Practices. Kluwer Academic Publishers,The Netherlands.
3. Chrispeels M.J. and Sadava D.E. (1994) Plants, Genes and Agriculture. Jones & Bartlett Publishers.
4. Sambamurty A.V.S.S. and Subramanyam N.S. (1989) A Textbook of Economic Botany. Wiley Eastern Ltd., New Delhi.
5. Trivedi P.C. (2006) Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
6. Purohit and Vyas (2008) Medicinal Plant Cultivation: A Scientific Approach. Agrobios, India.
7. Fuller K.W. and Gallon J.A. (1985) Plant Products and New Technology. Clarendon Press, Oxford, New York.
8. Hill A.F. (1952) Economic Botany: A Textbook of useful plants and plant products. McGraw Hill Publishing Company Ltd., New Delhi.
9. Sen S. (2009) Economic Botany. NCBA Publishers, New Delhi.

DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2024-25 UNDER NEP-2020)

<table>
<tr><td colspan="6">MULTI/INTER DISCIPLINARY COURSE-PRACTICAL (PMDSC)
PROGRAMME CODE: SCIUG103</td></tr>
<tr><td rowspan="2">COURSE</td><td rowspan="2">SEMESTER</td><td rowspan="2">COURSE CODE</td><td rowspan="2">COURSE TITLE</td><td colspan="2">PRACTICAL</td></tr>
<tr><td>Credits</td><td>CCE</td><td>SEE</td></tr>
<tr><td>Diploma Course</td><td>B.Sc. III</td><td>SC23PMDC BOT303</td><td>MEDICINAL BOTANY</td><td>2 (60hrs)</td><td>50%</td><td>50%</td></tr>
<tr><td>Course outcomes:</td><td colspan="5">After the completion of the course the students will be able to:
1. Recognize the basic medicinal plants.
2. This course gives a broader exposure to these very important economic plants in addition to their origin, general information, conservation and ethnobotany.
3. The students who have opted for this course will be knowledgeable on several medicinally important plants.
4. This will help them to pursue their career as economic botanist, conservation biologist, medicinal plants biologist, etc. will be able to deal with ethnobotanist, agricultural and horticultural scientist and social scientists.
Apply theoretical knowledge in utilization, and report generation of economical and medicinal plants. Create awareness on conservation of medicinal plants and use of natural plant products as alternatives to synthetic products.
Pedagogy: Lectures, Tutorials, Assignments, Demonstrations, live specimens, Herbarium specimens, Videos, Team based learning, Field visit and report writing.</td></tr>
<tr><td colspan="5">PRACTICALS</td><td>NO. OF LECTURES (60 hrs)</td></tr>
<tr><td></td><td colspan="4">1. Identification (botanical name and family), description and utilization of plants and/or plant parts studied in theory under each group.

2. Chemical tests for sesame and groundnut oil and study of oil glands in T.S. of Eucalyptus leaf.

3. Study of properties and measurement of diameter of plant fibres: cotton, jute and coir.</td><td>60</td></tr>
</table>

	4. Study of plants used as sources of drugs as in theory. 5. Preparation of Holi colours using natural ingredients. 6. Identification and medicinal value of locally available plants (field visit).	

Suggested Readings:

1. Kochhar S.L. (2012) Economic Botany in the Tropics. MacMillan India Ltd., New Delhi.
2. Wickens G.E. (2001) Economic Botany: Principles & Practices. Kluwer Academic Publishers,The Netherlands.
3. Chrispeels M.J. and Sadava D.E. (1994) Plants, Genes and Agriculture. Jones & Bartlett Publishers.
4. Sambamurty A.V.S.S. and Subramanyam N.S. (1989) A Textbook of Economic Botany. Wiley Eastern Ltd., New Delhi.
5. Trivedi P.C. (2006) Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
6. Purohit and Vyas (2008) Medicinal Plant Cultivation: A Scientific Approach. Agrobios, India.
7. Fuller K.W. and Gallon J.A. (1985) Plant Products and New Technology. Clarendon Press, Oxford, New York.
8. Hill A.F. (1952) Economic Botany: A Textbook of useful plants and plant products. McGraw Hill Publishing Company Ltd., New Delhi.
9. Sen S. (2009) Economic Botany. NCBA Publishers, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2024-25 UNDER NEP-2020)

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

(MULTI/INTER DISCIPLINARY COURSE)

Programme Code: SCIUG103

MEDICINAL BOTANY

SC23PMDCBOT303

Date: **Place:**

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

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

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

   b. Journal 03

DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2024-245UNDER NEP-2020)

INDIAN KNOWLEDGE SYSTEM (IKS) ***Programme Code: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***CREDITS***	***LECTURES***	***THEORY***	
						CCE	***SEE***
Diploma Course	***B.Sc. III***	***SC23IKSBOT305***	**INDIGENOUS MEDICINAL SYSTEM**	**2T**	**T=30hrs**	***50%***	***50%***
Course outcomes:	On completion of the course, the students will be able to: • To study how indigenous population used nature and natural products as medicine. **Pedagogy:** Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.						
THEORY UNIT	***TOPIC***						***NO. OF LECTURES*** **(30hrs)**
Unit 1	• **Medicinal plants** in Atharvaveda, religious healing in Veda. • **Traditional Treatment System:** Treatment of different diseases.						**15**
Unit 2	• **Herbal medicines:** History and Scope. • **Herbal preparations:** preparations, formulations and benefits of herbal utilization.						**15**

Suggested Readings:

1) Medicinal Plants: Ethnobotanical Approach, Trivedi P C, 2006. Agrobios, India.

2) The Yoga of Herbs: An Ayurvedic Guide to Herbal Medicine, Vasant Lad, David Frawley.

3) Medicine and athava veda: Dr. C. K. Ramachandran, Mathrubhumi books.

4) Hand Book of Ayurvedic medicinal plants Herbal (Kapoor).

DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2024-245UNDER NEP-2020)

<table>
<tr><td colspan="8">SKILL ENHANCEMENT COURSE (SEC)
Programme Code: SCIUG103</td></tr>
<tr><td rowspan="2">COURSE</td><td rowspan="2">SEMESTER</td><td rowspan="2">COURSE CODE</td><td rowspan="2">COURSE TITLE</td><td rowspan="2">CREDITS</td><td rowspan="2">LECTURES</td><td colspan="2">THEORY</td></tr>
<tr><td>CCE</td><td>SEE</td></tr>
<tr><td>Diploma Course</td><td>B.Sc. III</td><td>SC23SECBOT306</td><td>MUSHROOM CULTIVATION</td><td>2T</td><td>T=30hrs</td><td>50%</td><td>50%</td></tr>
<tr><td>Course outcomes:</td><td colspan="7">On completion of the course, the students will be able to:
• Recall various types and categories of mushrooms.
• Demonstrate various types of mushroom cultivating technologies.
• Examine various types of food technologies associated with mushroom industry.
• Value the economic factors associated with mushroom cultivation
• Device new methods and strategies to contribute to mushroom production.

Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</td></tr>
<tr><td>THEORY UNIT</td><td colspan="6">TOPIC</td><td>NO. OF LECTURES (30hrs)</td></tr>
<tr><td>Unit 1</td><td colspan="6">Mushrooms:
• History, Scope, Vegetative characters, Nutritional values of mushrooms.

Types of Mushrooms:
• Edible Mushrooms: Button mushroom (Agaricus bisporus), Oyster mushroom (Pleurotus sajor-caju) and paddy straw mushroom (Volvariella volvcea).
• Poisonous Mushrooms: Amanita phalloides.</td><td>15</td></tr>
</table>

Unit 2	***Mushroom cultivation:*** • Mushroom bed preparation- Preparation of mother culture, media preparation, inoculation, incubation and spawn production. • Spawning, spawn running, harvesting and Cultivation of oyster mushroom using paddystraw/agricultural wastes.	**15**

Suggested Readings:

1. Marimuthu, T. et al. (1991). Oster Mushroom. Department of Plant Pathology. Tamil NaduAgricultural University, Coimbatore.
2. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Pandey R.K, S. K Ghosh, 1996. A Hand Book on Mushroom Cultivation. Emkey Publications.
4. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
5. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.
6. Tripathi, D.P. (2005) Mushroom Cultivation, Oxford & IBH Publishing Co. PVT.LTD, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Zoology

Syllabus/ scheme

Semester – 3 to 4

With effect from

June-2024

Date: 11/03/2024 Total page: 38

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN	
B. Sc. (Zoology) Syllabus 2024 (according to NEP-2020)	
Document code	**Syllabus ZL- 2024**
Name of faculty	**Science**
Faculty code	**SCI**
Programme name	**B. Sc. ZOOLOGY**
Programme code	**SCIUG104**
Effective from	**June-2024**

The proposed new structure for B. Sc. course is based on NEP-2020 which is in force June-2024.

Course Pattern

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

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

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

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

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

Evaluation

Continuation and Comprehensive Evaluation (CCE)

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

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

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

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

Semester End Evaluation (SEE)

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

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

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

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

PROGRAM OBJECTIVE

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

PROGRAMME OUTCOMES

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

B.Sc. Semester III (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 ZOO301	Diversity of chordates- I	4	50	50	100	4	2.5
Major Discipline Specific core course	SC23MJDSC ZOO301A	Ecology, Environmental Pollution and Climate Change	4	50	50	100	4	2.5
Multi Disciplinary Course	SC23MDC ZOO303	Introduction to Ecology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC ZOO301	Diversity of chordates- I Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
	SC23 PMJDSC ZOO301A	Ecology, Environmental Pollution and Climate Change Practical Part B	4	25	25			More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC ZOO303	Introduction to Ecology practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC ZOO304	English	2	25	25	50	2	2
Indian Knowledge System II Course	SC23IKS ZOO305	IKS course basket	2	25	25	50	2	2
Skill Enhancement Course	SC23SEC ZOO306	Introduction to Poultry Science	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

B.Sc. Semester IV (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 ZOO401	Diversity of chordates- II	4	50	50	100	4	2.5
Major Discipline Specific core course	SC23MJDSC ZOO401A	Economic Zoology	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC ZOO402	Industrial Zoology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23PMJDSC ZOO401	Diversity of chordates- II Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
	SC23MJDSC ZOO401A	Economic Zoology Practical Part B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC ZOO402	Industrial Zoology practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC ZOO404	English	2	25	25	50	2	2
Value added courses	SC23VAC ZOO405	Value added course basket	2	25	25	50	2	2
Skill Enhancement Course	SC23SEC ZOO406	Fish Aquarium Management	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

Semester III

B.Sc. Semester III (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 ZOO301	Diversity of chordates- I	4	50	50	100	4	2.5
Major Discipline Specific core course	SC23MJDSC ZOO301A	Ecology, Environmental Pollution and Climate Change	4	50	50	100	4	2.5
Multi Disciplinary Course	SC23MDC ZOO303	Introduction to Ecology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC ZOO301	Diversity of chordates- I Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
	SC23 PMJDSC ZOO301A	Ecology, Environmental Pollution and Climate Change Practical Part B	4	25	25			More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC ZOO303	Introduction to Ecology practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC ZOO304	English	2	25	25	50	2	2
Indian Knowledge System II Course	SC23IKS ZOO305	IKS course basket	2	25	25	50	2	2
Skill Enhancement Course	SC23SEC ZOO306	Introduction to Poultry Science	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER III
PROGRAM CODE: SCIUG104
MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCZOO301

DIVERSITY OF CHORDATES- I

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

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

Program Outcome:

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

Course Outcome:

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

1. The classification and general characters of phylum chordata
2. The functional anatomy of typical representatives of different classes.
3. Ecological and behavioral adaptations of chordates

Sr. No			Credit	Hr
1	Unit-1	● General characters and outline classification of chordates, origin and evolution of chordates ● Classification and general characters of subphylum Urochordata and Cephalochordata (up to order). ● Type study: Herdmania (Urochordata) habit and habitat, external features, locomotion and movement ● Systems of Herdmania: digestive system, respiration, blood vascular, nervous and urinogenital system	1	15

2	**Unit-2**	● Type study: Amphioxus (Cephalochordata) habit and habitat, external features, locomotion and movement ● Systems of Amphioxus: digestive system, respiration, blood vascular, nervous and urinogenital system ● General characteristics and classification of subphylum vertebrata (upto order). ● Diversity and evolution of vertebrate	**1**	**15**
3	**Unit-3**	● General characters and classification of fishes (up to orders). ● Differences between Chondrichthyes and Osteichthyes, types of scales and caudal fins ● Migration and parental care in fishes ● Type study: *Scloliodon*- dog fish (habit and habitat, external features, digestive system, respiration, blood vascular, nervous and urinogenital system)	**1**	**15**
4	**Unit-4**	● General characteristics and classification of class amphibia ● Metamorphosis in frog ● Parental care in amphibia ● Type study: *Hoplobatrachus tigrinus*- bull frog (habit and habitat, external features, digestive system, respiration, blood vascular, nervous and Urinogenital system)	**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 III
PROGRAM CODE: SCIUG104
MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCZOO301A

ECOLOGY, ENVIRONMENTAL POLLUTION AND CLIMATE CHANGE

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

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

Program Outcome:

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

Course Outcome:

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

1. History, branches and structure of ecology.
2. Fresh water, marine and terrestrial ecosystems
3. Different types of pollution and various pollution control methods.
4. Factors responsible for climate change and mitigation efforts to deal climate change.

Sr. No			Credit	Hr
1	**Unit-1**	● Introduction to ecology, historical background, branches of ecology, structure of atmosphere, lithosphere and hydrosphere ● Water: Properties of water, water as a living medium for aquatic animals. ● Soil: Definition and Composition of soil, types of soil, soil erosion, soil conservation. ● Biogeochemical cycles: types of biogeochemical cycles, water cycle, oxygen cycle, carbon cycle, nitrogen cycle, sulphur and phosphorous cycle	**1**	**15**

2	**Unit-2**	● Aquatic ecosystems: sub division of aquatic ecosystems, freshwater ecosystems, lentic and lotic ecosystems. ● Zonation of marine environment, stratification of marine environment, biotic communities of marine environment. ● Classification of terrestrial ecosystem: different types of biomes. ● Zoogeographical realms.	**1**	**15**
3	**Unit-3**	● Air pollution: sources, effect and control ● Noise pollution: sources, effect and control ● Water pollution: sources, effect and control ● Soil pollution: sources, effect and control, Solid waste and e-waste management	**1**	**15**
4	**Unit-4**	● Greenhouse effect and Global warming. ● Acid rain and Ozone layer destruction. ● Effect of climate change on public health. ● Mitigation efforts to deal with climate change.	**1**	**15**

Reference:

1. Odum, E.P. 1996 Fundamentals of Ecology. Nataraj Publishers, Dehra Dun.
2. Smith, R.L.1986. Elements of Ecology. Harpet and Row Publishers, New York.

Further Reading:

3. Verma P. S. and Agrawal V. K. (2010) Cell biology, Genetics, Molecular biology, Evolution and Ecology. S. Chand publications.
4. Singh J. S., Singh S. P. and Gupta S. R. (2014) Ecology, Environmental Science and Conservation. S. Chand publications.
5. Sharma P. D. (2003) Ecology and Environment. Rastogi Publications.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,
PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER III
PROGRAM CODE: SCIUG104
PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE CODE:
SC23PMJDSCZOO301 & SC23PMJDSCZOO301A
DIVERSITY OF CHORDATES- I PRACTICAL PART A
ECOLOGY, ENVIRONMENTAL POLLUTION AND CLIMATE CHANGE PRACTICAL PART B
EFFECTIVE FROM JUNE 2024-25 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**	

SC23PMJDSCZOO301: DIVERSITY OF CHORDATES- I PRACTICAL PART A

List of Practicals

1. Study of classification of subphylum urochordata and cephalochordate (up to order) using laboratory specimens, models, slides, charts.
2. Study of classification of fishes (up to order) using laboratory specimens, models, slides, charts.
3. Study of classification of Amphibian up to orders using laboratory specimens, models, slides, charts.
4. Study of Digestive system of *Scloliodon* using models, slides and charts.
5. Study of Arterial system of *Scloliodon* using models, slides and charts.
6. Study of Venous system of *Scloliodon* using models, slides and charts.
7. Study of Nervous system of *Scloliodon* using models, slides and charts.
8. Study of Urinogenital system of *Scloliodon* using models, slides and charts.
9. Study of Digestive system of Bull frog using models, slides and charts.
10. Study of Arterial system of Bull frog using models, slides and charts.
11. Study of Venous system of Bull frog using models, slides and charts.
12. Study of Nervous system of Bull frog using models, slides and charts.
13. Study of urinogenital system of Bull frog using models, slides and charts.
14. Study of Migration in fishes.
15. Study of Parental care in fishes.
16. Study of Metamorphosis in frog.
17. Study of Parental care in amphibian.
18. Study of ampullae of lorenzini, scale and internal ear of dog fish using models, slides and charts (Mounting).
19. Study of buccal cavity, eye and ear of bull frog using models, slides and charts (Mounting).

SC23PMJDSCZOO301A ECOLOGY, ENVIRONMENTAL POLLUTION AND CLIMATE CHANGE PRACTICAL PART B

List of Practicals

1. To determine pH, EC, turbidity of given water sample.
2. To determine Total hardness and Calcium hardness of given water sample.
3. To determine Acidity of given water sample.
4. To determine Alkalinity of given water sample.
5. To determine Dissolve oxygen content of given water sample.
6. To determine Free CO_2 content of given water sample.
7. To determine water holding capacity and percolation rate of soil.
8. To determine pH, Chloride and Sulphate of given soil sample.
9. To determine Total Nitrogen and organic matter of given soil sample.
10. Study of different types of Biogeochemical cycles using charts.
11. Study of zonation, stratification and biotic communities of marine environment using models or charts.
12. Study of different types of biomes using models or charts.
13. Study of zoogeography using models or charts.
14. Study of structure of atmosphere through model or chart.
15. Study of structure of terrestrial ecosystem through model or chart.
16. Study of structure of freshwater ecosystem through model or chart.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
COURSE NAME B. SC. ZOOLOGY SEMESTER III
PROGRAM CODE: SCIUG104
MULTIDISCIPLINARY SPECIFIC COURSE CODE: SC23MDCZOO303

INTRODUCTION TO ECOLOGY

EFFECTIVE FROM JUNE 2024-25 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. History, branches and structure of ecology.
2. Fresh water, marine and terrestrial ecosystems

Sr. No			Credit	Hr
1	**Unit-1**	● Introduction to ecology, historical background, branches of ecology, structure of atmosphere, lithosphere and hydrosphere ● Water: Properties of water, water as a medium. ● Soil: Definition and Composition of soil, types of soil, soil erosion, soil conservation. ● Biogeochemical cycles: types of biogeochemical cycles, water cycle, oxygen cycle, carbon cycle, nitrogen cycle, sulphur and phosphorous cycle.	**1**	**15**
2	**Unit-2**	● Aquatic ecosystems: sub division of aquatic ecosystems, freshwater ecosystems, lentic and lotic ecosystems. ● Zonation of marine environment, stratification of marine environment, biotic communities of marine environment. ● Classification of terrestrial ecosystem: different types of biomes. ● Zoogeographical realms.	**1**	**15**

Reference:

1. Odum. E.P. 1996 Fundamentals of Ecology. Nataraj Publishers, Dehra Dun.
2. Smith, R.L.1986. Elements of Ecology. Harpet and Row Publishers, New York.

Further Reading:

3. Verma P. S. and Agrawal V. K. (2010) Cell biology, Genetics, Molecular biology, Evolution and Ecology. S. Chand publications.
4. Singh J. S., Singh S. P. and Gupta S. R. (2014) Ecology, Environmental Science and Conservation. S. Chand publications.
5. Sharma P. D. (2003) Ecology and Environment. Rastogi Publications.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
COURSE NAME B. SC. ZOOLOGY SEMESTER III
PROGRAM CODE: SCIUG104
PRACTICAL MULTIDISCIPLINARY SPECIFIC COURSE CODE: SC23PMDCZOO303

INTRODUCTION TO ECOLOGY

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

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

List of Practicals

1. To determine pH, EC, turbidity of given water sample.
2. To determine Total hardness and Calcium hardness of given water sample.
3. To determine Acidity of given water sample.
4. To determine Alkalinity of given water sample.
5. To determine Dissolve oxygen content of given water sample.
6. To determine Free CO_2 content of given water sample.
7. To determine water holding capacity and percolation rate of soil.
8. To determine pH, Chloride and Sulphate of given soil sample.
9. To determine Total Nitrogen and organic matter of given soil sample.
10. Study of different types of Biogeochemical cycles using charts.
11. Study of zonation, stratification and biotic communities of marine environment using models or charts.
12. Study of different types of biomes using models or charts.
13. Study of zoogeography using models or charts.
14. Study of structure of atmosphere through model or chart.
15. Study of structure of terrestrial ecosystem through model or chart.
16. Study of structure of freshwater ecosystem through model or chart.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
COURSE NAME B. SC. ZOOLOGY SEMESTER III
PROGRAM CODE: SCIUG104
SKILL ENHANCEMENT COURSE CODE: SC23SECZOO306

INTRODUCTION TO POULTRY SCIENCE

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

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

Program Outcome:

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

Course Outcome:

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

1. Basic poultry science, different breeds of poultry birds.
2. Various diseases of poultry and composition and processing of poultry products.

Sr. No			Credit	Hr
1	**Unit-1**	● Introduction and History of poultry science ● Different breeds of fowls ● Poultry house, Brooder, Feeder and water feeder. ● Reproductive system of hen, formation and structure of Egg.	**1**	**15**
2	**Unit-2**	● Disease of poultry ● Poultry Feed ● Hatching and Incubator ● Egg preservation & grading, poultry products: meat & fertilizer	**1**	**15**

Reference:

1. Economic Zoology : G. S. Shukla & V. B. Upadhyay, Rastogi Publication, Meerut.
2. Arumugam et al (2010) Economic Zoology, Saras Publications, New Delhi, India.

Further Reading:

3. Ghosh N. (2017) Poultry science and practice- A text book. CBC Publishers & Distributers.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER III
PROGRAM CODE: SCIUG104
PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE CODE:
SC23PMJDSCZOO301 & SC23PMJDSCZOO301A
DIVERSITY OF CHORDATES- I PRACTICAL PART A
ECOLOGY, ENVIRONMENTAL POLLUTION AND CLIMATE CHANGE PRACTICAL PART B
EFFECTIVE FROM JUNE 2024-25 UNDER NEP

PRACTICAL SKELETON

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

DIVERSITY OF CHORDATES- I PRACTICAL PART A

Q 1		Draw and label the diagram of given system of *Scoliodon* and describe location and functions of different organs in brief.	**06**
Q 2		Draw and label the diagram of given system of Bull frog and describe location and functions of different organs in brief.	**06**
Q 3		Do as directed: 1. Identify and classify the specimen up to order and describe its morphological characters. (urochordata, cephalochordata) 2. Identify and classify the specimen up to order and describe its morphological characters.(Fishes, Amphibian) 3 Identify and describe its morphological characters. (mounting: *Scoliodon*, Bull frog)	**06**
Q 4	**a**	Viva-voce	**03**
	b	Journal	**04**

ECOLOGY, ENVIRONMENTAL POLLUTION AND CLIMATE CHANGE PRACTICAL PART B

Q 1		Estimate the amount of Total hardness, Calcium Hardness, Free CO_2, pH, EC, Acidity, Alkalinity, Dissolve oxygen of given water sample.	**06**
Q 2		Estimate the amount of pH, Chloride, Sulphate, Total Nitrogen, water holding capacity, percolation rate from given soil sample.	**06**
Q3		Do as directed 1. Identify the specimen describe its details (Biomes, Biogeochemical cycles) 2. Identify the specimen describe its details (Atmosphere, Terrestrial or freshwater ecosystem)) 3. Identify the specimen describe its details (Zoogeographical realms)	**06**
Q 4	**a**	Viva-voce	**03**
	b	Journal	**04**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
COURSE NAME B. SC. ZOOLOGY SEMESTER III
PROGRAM CODE: SCIUG104
PRACTICAL MULTIDISCIPLINARY SPECIFIC COURSE CODE: SC23PMDCZOO303

INTRODUCTION TO ECOLOGY

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

PRACTICAL SKELETON

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

Q 1		Estimate the amount of Total hardness, Calcium Hardness, Free CO_2, pH, EC, Acidity, Alkalinity, Dissolve oxygen of given water sample. State your conclusion from environmental point of view. **OR** Estimate the amount of pH, Chloride, Sulphate, Total Nitrogen, water holding capacity, percolation rate from given soil sample.	**10**
Q 2		Do as directed 1. Identify the specimen describe its details (Biomes) 2. Identify the specimen describe its details (Biogeochemical cycles) 3. Identify the specimen describe its details (Atmosphere) 4. Identify the specimen describe its details (Terrestrial or freshwater ecosystem) 5. Identify the specimen describe its details (Zoogeographical realms)	**10**
Q 3	**a**	Viva-voce	**03**
	b	Journal	**02**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Microbiology

Syllabus/ scheme

Semester – 3 to 4

With effect from

June-2024

Date: 19/03/2024 Total page: 35

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN	
B. Sc. (Microbiology) Syllabus 2024 (according to NEP-2020)	
Document code	**Syllabus MIC- 2024**
Name of faculty	**Science**
Faculty code	**SCI**
Programme name	**B. Sc. MICROBIOLOGY**
Programme code	**SCIUG105**
Effective from	**June-2024**

The proposed new structure for B. Sc. course is based on NEP-2020 which is in force June-2024.

Course Pattern

1. This programme is divided into **Eight Semesters** (Four Years). The duration of an academic year consists of two semesters, each of 15 weeks for teaching. The academic session in each semester will provide 90 teaching days. Each semester has 22 credits and the programme is comprised of total 176 credits.

2. The theory courses with 4 credits shall have 60 hrs of direct classroom teaching workload (15 weeks × 4). The theory courses with 3 credits shall have 45 hrs of teaching workload (15 weeks × 3) and the theory courses with 2 credits shall have 30 hrs of teaching workload (15 weeks × 2).

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

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

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

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

Evaluation

Continuation and Comprehensive Evaluation (CCE)

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

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

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

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

Semester End Evaluation (SEE)

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

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

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

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

PROGRAM OBJECTIVE

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

PROGRAMME OUTCOMES

1. To understand the complex organization of microbial world, physiology, immunology, bioprospecting and importance of microbes in various biogeochemical cycles and for overall development.
2. For instance, if you major in Microbiology, you can also still take courses from across theother complementary.
3. Apply the wide range of subject based skills of various fields that provide a base for future career in disciplines such as Fermentation technology, Food microbiology, Environmental microbiology, Microbial biotechnology, Agriculture, Publishing, Teaching and Research.
4. Understand the applications of biological techniques to various fields of biology.
5. When you graduate with a Bachelor of Science (Microbiology) you can serve as academician in different institutes.
6. The syllabus has been designed in such a way that it will give good experience to thestudent to work under pressure.

B.Sc. Semester III (Microbiology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDS CMIC301	Microbial Biochemistry and Physiology	4	50	50	100	4	2.5
Major Discipline Specific core course	SC23MJDS CMIC301A	Microbial Diversity and Taxonomy	4	50	50	100	4	2.5
Multi Disciplinary Course	SC23MDC MIC303	Diversity of Microorganisms	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC MIC301 SC23 PMJDSC MIC301A	Microbial Biochemistry and Physiology Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Microbial Diversity and Taxonomy Practical Part B	4	25	25			More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC MIC303	Diversity of Microorganisms practical	4	25	25	50	2	More than 3
Ability Enhancement Course		AEC Basket	2	25	25	50	2	2
Skill Enhancement Course		SEC Basket	2	25	25	50	2	2
Indian Knowledge System II Course		IKS course Basket	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

B.Sc. Semester IV (Microbiology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDS CMIC401	Molecular Biology and Genetics	4	50	50	100	4	2.5
Major Discipline Specific core course	SC23MJDS CMIC401A	Industrial Microbiology	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDS CMIC402	Food and Dairy Microbiology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23PMJD SCMIC401	Molecular Biology and Genetics Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
	SC23MJDS CMIC401A	Industrial Microbiology Practical Part B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDS CMIC402	Food and Dairy Microbiology practical	4	25	25	50	2	More than 3
Ability Enhancement Course		AEC Basket	2	25	25	50	2	2
Skill Enhancement Course		SEC Basket	2	25	25	50	2	2
Value added courses		IKS course Basket	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

Semester III

B.Sc. Semester III (Microbiology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDS CMIC301	Microbial Biochemistry and Physiology	4	50	50	100	4	2.5
Major Discipline Specific core course	SC23MJDS CMIC301A	Microbial Diversity and Taxonomy	4	50	50	100	4	2.5
Multi Disciplinary Course	SC23MDC MIC303	Diversity of Microorganisms	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC MIC301 SC23 PMJDSC MIC301A	Microbial Biochemistry and Physiology Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Microbial Diversity and Taxonomy Practical Part B	4	25	25			More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC MIC303	Diversity of Microorganisms practical	4	25	25	50	2	More than 3
Ability Enhancement Course		AEC Basket	2	25	25	50	2	2
Skill Enhancement Course		SEC Basket	2	25	25	50	2	2
Indian Knowledge System II Course		IKS course Basket	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER III
PROGRAM CODE: SCIUG105
MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCMIC301

MICROBIAL BIOCHEMISTRY AND PHYSIOLOGY

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

Course objective

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

UNIT 1: Basic bioenergetics

- Chemical bonds and Stabilizing interactions: Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction
- Structure and properties of water
- pH and buffer: pH and buffer and Buffering against pH changes in biological systems.
- Energy flow: Basic introduction to laws of thermodynamics, Gibb's free energy and chemical potential, Enthalpy& Entropy and relation between them.

UNIT 2: Introduction to Metabolism

- An overview of metabolism, Anabolism, Catabolism, Primary and Secondary metabolism
- Energy rich compounds in cell metabolism, Basic concept of respiration, aerobic respiration, anaerobic respiration and fermentation.
- Carbohydrate metabolism: Glycolysis, TCA cycle, Electron transportsystem, components of respiratory system, Oxidative phosphorylation and photophosphorylation.
- Lipid metabolism: Biosynthesis of fatty acids and Phospholipids, Catabolism of fattyacids and β- Oxidation of fatty acids.

UNIT 3: Microbial growth and nutrient uptake

- Definitions of Growth.Microbial Growth, Mathematical Expression of microbial growthand Methods for the measurement of microbial growth(Direct microscopic count,

Electronicenumeration of cell numbers, plate count method, Membrane filter method, Turbidimetric methods, Biomass based methods).

- Batch culture, continuous culture, synchronous growth, diauxic growth
- Nutrient uptake and transport: Passive and facilitated diffusion, types of transport (primary, secondary, active), concept of uniport, symport and antiport, group translocation, iron uptake.

UNIT 4: Impact of environment on microbial growth

- Microbial growth in response to environment: temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermodurics, psychrotrophs); pH (acidophiles, alkaliphiles); solute and water activity (halophiles, xerophiles, osmophiles); Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe)
- Microbial growth in response to nutrient and energy: nutritional requirement of bacteria, autotrophshererotrophs, phototrophs, chemotrophs, obligate parasites with suitable examples.
- Introduction to aerobic and anaerobic chemolithotrophwith suitable example each. Hydrogen oxidation and methanogenesis (definition and basic reaction).
- Groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to photosynthesis in green bacteria, purple bacteria and cyanobacteria.

Outcomes:

- ✓ Students will know about fundamental aspects of basic biochemistry and metabolism
- ✓ Students will learn the basics of microbial growth, impact of environmental factors, and nutrient uptake approaches.

Reference books

1. Harper H. A. 1993 Review of Physiological Chemistry (Lange Publications).
2. Lehninger A. l., Nelson D. L. and Cox M.M. 1993. Principles of Biochemistry (CBC Publishers).
3. Rastogi S. C. 2003 Biochemistry (Tata Mc GrawHill Publishing Co. Ltd.).
4. MT, and Martinko JM (2014). Brock Biology of Microorganisms. 14th edition. Prentice Hall International Inc.
5. Moat AG and Foster JW. (2002). Microbial Physiology. 4th edition. John Wiley & Sons
6. Reddy SR and Reddy SM. (2005). Microbial Physiology. Scientific Publishers India
7. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5th edition, McMillan Press.
8. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER III
PROGRAM CODE: SCIUG105
MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCMIC301A

MICROBIAL DIVERSITY AND TAXONOMY

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

Learning objectives

- To acquaint students with basic concepts of microbial diversity and how the microbe concept emerged

UNIT-1 Introduction to microbial diversity

- Overview of Biodiversity: Evolution and Diversity of Microbes
- Microbial Taxonomy: Overview and Introduction Taxonomic ranks of microorganisms in classification systems
- Binomial nomenclature; Carl Woese's three domain classification; Whitteker's five kingdom classification.
- Phylogeny: Overview of Prokaryotic Phylogeny and Eukaryotic Phylogenetic Groups

UNIT-2 Introduction to characteristics of prokaryotic diversity

- Overview of Eubacteria and Archaea
- Gram-negative bacteria: general characteristics of helical vibroids, Aerobic / microaerophilic motile Curves in non-motile bacteria Microaerophilic / aerobic rods and cocci Bacteria with helices, curves, and rods are facultative anaerobes. Reducers of dissimilatory sulfur Anaerobic bacteria Bacteria that feed on light
- General characteristics of Gram-positive bacteria: Rods and cocci that generate endospores, Actinomycetes and Mycobacteria
- Microorganisms with Extremophile

UNIT-3 Eukaryotic diversity

A: Fungi: General features of Fungi: Define, Occurrence, Structure, and Reproduction (sexual & Asexual) Fungi classification and an overview of their main divisions Fungi's economic

significance

B: Algae: General features of Algae: Define Occurrence, Ultra-Structure, and Reproduction (Asexual & sexual). Algae's economic significance:

C: Protozoa: General Features of protozoa: Define Occurrence, Ultra-Structure, and Reproduction. Protozoa's Economic Importance.

UNIT-4 Viruses or Akaryotic diversity

- Overview and General Features of viruses: Definition, Organization, and classification.
- Cultivation of virus.
- Overview of Bacterial Viruses: Classification, Lytic Life Cycle (T4 Phage), and Lysogenic Life Cycle (Lambda Phage).
- Overview of Viruses in Animals: Classification, Replication, Cytocidal Impact, Viruses and Cancer, Prions.
- Overview of Plant Viruses: Taxonomy, Structure, and Replication of TMV, Viroids.

Learning outcomes:

- Student will be able to describe the fundamental concepts and terminology of taxonomic organization and parameters used in classifying bacteria, and the molecular analytic approaches used to classify diverse bacteria.
- Student will be able to discuss about the use of rRNA analysis as a means of developing phylogenetic relationships.
- Student will be able to describe the major groups of archaea, their stand-out physiological and structural features, as well as their ecological niches and economic significance.
- Student will be able to discuss the major groups of eubacteria, including archea with special features.

Reference Books:

1. Prescott, Healey and Klein., Microbiology-5 th International Edition, Tata-McGraw Hill publications, Delhi
2. Atlas. R.M., Principles of Microbiology- 2 nd Edition
3. Modi, H.A. Elementary Microbiology - Vol -I, Akta Prakashan, Nadiyad
4. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology,5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
5. Tortora, Funke & Case. Microbiology-An Introduction, 8 Edition, Pearson Education, Delhi.

6. Stainer, R.Y., Iingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5th Edition. MacMillan Press Ltd., London.
7. Salle, S.J. Fundamental Principals of Bacteriology, Tata McGraw Hill Publication Co. Ltd. New Delhi.
8. Frobisher M., Hinsdill, Crabtree and Goodherat, Fundamentals of Microbiology, 9 th Edition. W.B Saunders Co. USA .
9. Dubey, R.C.and Maheshwari, D.K., A Text Book of Microbiology, S. Chand Publications, New Delhi.
10. Powar and Daginawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER III
PROGRAM CODE: SCIUG105
PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE CODE:SC23PMJDSCMIC301 & SC23PMJDSCMIC301A
MICROBIAL BIOCHEMISTRY AND PHYSIOLOGY PRACTICAL PART A
MICROBIAL DIVERSITY AND TAXONOMY
PRACTICAL PART B

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

SC23PMJDSCMIC301: MICROBIAL BIOCHEMISTRY AND PHYSIOLOGY PRACTICAL PART A

List of Practical

1. Concept of pH and buffers, preparation of buffer solutions
2. Cole' method for estimation of reducing sugars
3. Estimation of total lipid content from given samples
4. Study of growth curve of *E.coli* by turbidometric and standard plate count methods.
5. Calculation of generation time and specific growth rate of bacteria from graph plotted with experimental data
6. Effect of pH on growth of bacteria
7. Effect of temperature on growth of bacteria
8. Effect of carbon sources on growth of bacteria
10. Effect of nitrogen sources on growth of bacteria
11. Effect of salt concentration on growth of bacteria

SC23PMJDSCMIC301A MICROBIAL DIVERSITY AND TAXONOMY PRACTICAL PART B

List of Practicals

1. Isolation of Gram negative & Gram positive bacteria from the given sample.
2. Identification of Gram negative bacteria from the given pure culture using biochemical media (*E.coli*, *Entrobacter aerogens*, Proteus, Salmonella).
3. Isolation and Identification of Gram positive bacteria from natural sources (*Bacillus megaterium*, *Bacillus subtilis*, *Staphylococcus aureus*, *Streptococcus*)
4. Cultivation and Identification of Fungi on the basis of Morphological Characteristics.
5. Cultivation of yeast from different natural samples and its morphological characterization using microscopic observation.
6. Study of premenant slide observation of Algae (Volvox, Spyrogyra, and Chlamydomonas).
7. Study of premenant slide observation of Protozoa (Amoeba, Paramecium, and Plasmodium).

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
COURSE NAME B. SC. MICROBIOLOGY SEMESTER III
PROGRAM CODE: SCIUG105
MULTIDISCIPLINARY SPECIFIC COURSE CODE: SC23MDCMIC303

DIVERSITY OF MICROORGANISM

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

Learning objectives

- To acquaint students with basic concepts of microbial diversity and how the microbe concept emerged

UNIT-1 Introduction to microbial diversity

- Overview of Biodiversity: Evolution and Diversity of Microbes
- Microbial Taxonomy: Overview and Introduction Taxonomic ranks of microorganisms in classification systems
- Binomial nomenclature; Carl Woese's three domain classification; Whitteker's five kingdom classification.
- Phylogeny: Overview of Prokaryotic Phylogeny and Eukaryotic Phylogenetic Groups

UNIT-2 Introduction to characteristics of prokaryotic diversity

- Overview of Eubacteria and Archaea
- General characteristics of Gram-negative bacteria with examples
- General characteristics of Gram-positive bacteria with examples
- Extremophiles
- **A: Fungi:** General features of Fungi: Define, Occurrence, Structure, Fungi classification and an overview of their main divisions Fungi's economic significance
- **B: Algae:** General features of Algae: Define Occurrence, Ultra-Structure, Algae's economic significance:
- **C: Protozoa:** General Features of protozoa: Define Occurrence, Ultra-Structure. Protozoa's Economic Importance.

Learning outcomes:

- Student will be able to describe the fundamental concepts and terminology of taxonomic organization and parameters used in classifying bacteria, and the molecular analytic approaches used to classify diverse bacteria.
- Student will be able to discuss about the use of rRNA analysis as a means of developing phylogenetic relationships.
- Student will be able to describe the major groups of archaea, their stand-out physiological and structural features, as well as their ecological niches and economic significance.
- Student will be able to discuss the major groups of eubacteria, including archea with special features.

List of reference books

- Prescott, Healey and Klein., Microbiology-5 th International Edition, Tata-McGraw Hill publications, Delhi
- Atlas. R.M., Principles of Microbiology- 2 nd Edition
- Modi, H.A. Elementary Microbiology - Vol -I, Akta Prakashan, Nadiyad
- Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5th Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
- Tortora, Funke & Case. Microbiology-An Introduction, 8th Edition, Pearson Education, Delhi.
- Stainer, R.Y., Iingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5th Edition. MacMillan Press Ltd., London.
- Salle, S.J. Fundamental Principals of Bacteriology, Tata McGraw Hill Publication Co. Ltd. New Delhi.
- Frobisher M., Hinsdill, Crabtree and Goodherat, Fundamentals of Microbiology, 9 th Edition. W.B Saunders Co. USA.
- Dubey, R.C.and Maheshwari, D.K., A Text Book of Microbiology, S. Chand Publications, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER III

PROGRAM CODE: SCIUG105

PRACTICAL MULTIDISCIPLINARY SPECIFIC COURSE CODE:SC23PMDCMIC303

DIVERSITY OF MICROORGANISM

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

List of Practicals

1. Isolation of Gram negative & Gram positive bacteria from the given sample.
2. Identification of Gram negative bacteria from the given pure culture using biochemical media (*E.coli*, *Entrobacter aerogens*, Proteus, Salmonella).
3. Isolation and Identification of Gram positive bacteria from natural sources (*Bacillus megaterium*, *Bacillus subtilis*, *staphylococcus aureus*, *Streptococcus*)
4. Cultivation and Identification of Fungi on the basis of Morphological Characteristics.
5. Cultivation of yeast from different natural samples and its morphological characterization using microscopic observation.
6. Study of premenant slide observation of Algae (Volvox, Spyrogyra, and Chlamydomonas).
7. Study of premenant slide observation of Protozoa (Amoeba, Paramecium, and Plasmodium).

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER IIIPROGRAM CODE: SCIUG105
PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE CODE:SC23PMJDSCMIC301 & SC23PMJDSCMIC301A
MICROBIAL BIOCHEMISTRY AND PHYSIOLOGY PRACTICAL PART A
MICROBIAL DIVERSITY AND TAXONMY PRACTICAL PART B

PRACTICAL SKELETON

Time: more than 2:30 Hours **Total Marks: 50**

DIVERSITY OF CHORDATES- I PRACTICAL PART A

Q 1	Perform the given experiment, Write principle, Methodology and show your results to the examiner	**10**
Q 2	Perform the given experiment, Write principle, Methodology and interpret your results	**05**
Q 3	Spotting	**04**
Q 4	Viva-voce	**04**
Q 5	Journal submission	**02**

MICROBIAL DIVERSITY AND TAXONMY PRACTICAL PART B

Q 1	Perform the given experiment, Write principle, Methodology and show your results to the examiner	**10**
Q 2	Perform the given experiment, Write principle, Methodology and interpret your results	**05**
Q 3	Spotting	**04**
Q 4	Viva-voce	**04**
Q 5	Journal submission	**02**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATANCOURSE NAME
B. SC. MICROBIOLOGY SEMESTER III
PROGRAM CODE: SCIUG105
PRACTICAL MULTIDISCIPLINARY SPECIFIC COURSE CODE:SC23PMDCMIC303

DIVERSITY OF MICROORGANISM

PRACTICAL SKELETON

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

Q 1	Perform the given experiment, Write principle, Methodology and show your results to the examiner	**10**
Q 2	Perform the given experiment, Write principle, Methodology and interpret your results	**05**
Q 3	Spotting	**04**
Q 4	Viva-voce	**04**
Q 5	Journal submission	**02**

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 24-25 under NEP

Syllabus B.Sc. (Biotechnology) Sem-III and IV

Sr. No.	Course code	Study components	Instructions Hrs./week	Examination			Credit	Exam Hours
				Continuous & Comprehensive Evaluation (CCE)	Semester End Evaluation (SEE)	Total		
Semester III								
Theory Course (DSC)								
1	SC23MJDSCBIO301	Concept of Metabolism	04	50	50	100	4	2:30
2	SC23MJDSCBIO301A	Food and Dairy Biotechnology	04	50	50	100	4	2:30
3	SC23MDCBIO303	Introduction to Metabolism	02	25	25	50	2	2:00
Practical Course (PDSC)								
4	SC23PMJDSCBIO301 (Group A) & SC23PMJDSCBIO301A (Group B)	Concept of Metabolism & Food and Dairy Biotechnology	4 (Group A + Group B)	50	25 Group A 25 Group B	25 Group A 25 Group B	4	5:00
5	SC23PMDCBIO303	Introduction to Metabolism	02	25	25	50	2	2:30
Ability Enhancement Course								
6	SC23AECBIO304	English	02	---	50	50	2	2:00
Indian Knowledge System (IKS)								
7	---	To be chosen from basket offered by university	02	---	50	50	2	2:00
Skill Enhancement Course (SEC)								
8	SC23SECBIO306	Molecular Diagnostics	02	---	50	100	2	2:00
			22	200	350	550	22	

Semester IV								
Theory Course (DSC)								
1	SC23MJDSCBIO401	Industrial Biotechnology	04	50	50	100	4	2:30
2	SC23MJDSCBIO401A	Molecular Biology	04	50	50	100	4	2:30
3	SC23MIDCBIO402	Fermentation Technology	02	25	25	50	2	2:00
Practical Course (PDSC)								
4	SC23PMJDSCBIO401 (Group A) & SC23PMJDSCBIO401A (Group B)	Industrial Biotechnology & Molecular Biology	4 (Group A + Group B)	50	25 Group A 25 Group B	25 Group A 25 Group B	4	5:00
5	SC23PMIDCBIO402	Fermentation Technology	02	25	25	50	2	2:30
Ability Enhancement Course								
6	SC23AECBIO404	English	02	---	50	50	2	2:00
Value Added Course								
7	---	To be chosen from basket offered by university	02	---	50	50	2	2:00
Skill Enhancement Course (SEC)								
8	SC23SECBIO406	Enzymology	02	---	50	100	2	2:00
			22	200	350	550	22	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER III

Concept of Metabolism **SC23MJDSCBIO301**

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

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

Program Outcome

1.

Course Outcome

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

No.			Credit	Hrs.
1	UNIT-1	Amino acids & Proteins: Structure & Function. Types of proteins and their classification Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides Lipids: Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids Nucleic acids: Structure and functions Biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z	1	15
2	UNIT-2	Introduction to biological thermodynamics Enzymes as a Biocatalyst Nomenclature & Classification of enzymes Enzyme kinetics Importance of Km & Vmax Enzyme inhibition Reversible & irreversible inhibition	1	15
3	UNIT-3	Glycolysis Discovery, pathway & Enzymes Fate of pyruvate under different condition TCA cycle Pathway & Enzymes Pentose phosphate pathway & Gluconeogensis Fatty acid biosynthesis & Fatty acid biodegradation (Beta oxidation) Urea cycle Pathway & Enzymes Transamination & reductive amination Overview of Nucleotide metabolism	1	15
4	UNIT-4	Components of Microbial Electron Transport System Oxidative phosphorylation in mitochondria Photochemical phase of photosynthesis Synthesis of ATP & NADHP & evolution of O_2 Biosynthetic phase of photosynthesis	1	15

References:

Lehninger Principle of Biochemistry: David L. Nelson & Michael M. Cox
Biochemistry: U.satyanarayan
Biochemistry: Lubert stryer

SC23PMJDSCBIO301 (Group A) Concept of Metabolism Practicals

1. Preparation of buffer & other reagents.
2. Estimation of reducing sugar by DNSA method.
3. Qualitative analysis of carbohydrate.
4. Estimation of protein by BIURET.
5. Estimation of protein by FOLIN LAWERY.
6. Effect of pH on salivary amylase activity.
7. Effect of temperature on salivary amylase activity.
8. Effect of substrate on salivary amylase activity.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
SCIUG106 BT (Biotechnology)
SEMESTER III
Food and Dairy Biotechnology SC23MJDSCBIO301A
EFFECTIVE FROM JUNE 2024-25 UNDER NEP

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

Program Outcome 2.
Course Outcome 5. Course will help students in understanding basics of biotechnology and its applied areas. 6. Students will understand use of biotechnology in Agriculture sector. 7. Course targets application of biotechnology in human health care. 8. Course aims to create basic understanding of use of biotechnology in resolution of various problems such as environmental pollution.

Sr. No.			**Credit**	**Hrs.**
1	UNIT-1	Use of microorganisms in preparation of various food products Fermented dairy products Different fermented food products Probiotics	1	15
2	UNIT-2	Spoilage of food : Vegetables, milk, meat, egg Principle & Method of Food preservation Physical method of preservation Chemical method of preservation	1	15
3	UNIT-3	Food borne disease Key bacterial disease Example of Fungal disease Important Viral disease	1	15
4	UNIT-4	Food sanitation & control HACCP Indices of food sanitary quality Sanitizers	1	15

References :

Tortora GJ : Microbiology : An Introduction .
Jay JM, Loessner MJ & Golden DA : Modern food Microbiology

MAJOR COURSE -

SC23PMJDSCBIO301A (Group B) Food and Dairy Biotechnology Practicals

1. Standard plate count of milk.
2. MBRT of milk sample
3. Isolation of food borne bacteria from food products.
4. Isolation of spoilage microorganism from spoiled fruits.
5. Isolation of spoilage microorganism from spoiled vegetables.
6. Isolation of spoilage microorganism from spoiled bread.
7. Preparation of Yogurt/Dahi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER III

Introduction to Metabolism **SC23MDCBIO303**

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

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

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

Sr. No.			**Credit**	**Hrs.**
1	UNIT-1	Basic concept of catabolism & Anabolism Glycolysis as an example of linear metabolic pathway. TCA cycle as an example of circular metabolic pathway. Fatty acid catabolism. Fatty acid biosynthesis & Fatty acid biodegradation (Beta oxidation) Urea cycle	1	15
2	UNIT-2	Pathway & Enzymes Transamination & reductive amination Overview of Nucleotide metabolism Enzyme as a regulatory molecule of metabolism. Classification of enzyme. Factor affecting enzyme activity. M-M kinetics Importance of Km & Vmax.	1	15

References:
Lehninger Principle of Biochemistry: David L. Nelson & Michael M. Cox
Biochemistry: U. Satyanarayan
Biochemistry: Lubert stryer

SC23PMDCBIO303 Introduction to Metabolism Practicals

1. Preparation of buffer & other reagents.
2. Estimation of reducing sugar by DNSA method.
3. Effect of pH on salivary amylase activity.
4. Effect of temperature on salivary amylase activity.
5. Effect of substrate on salivary amylase activity.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER III

Molecular Diagnostics **SC23SECBIO306**

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

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

Program Outcome 2.
Course Outcome 5. Course will help students in understanding basics of biotechnology and its applied areas. 6. Students will understand use of biotechnology in Agriculture sector. 7. Course targets application of biotechnology in human health care. 8. Course aims to create basic understanding of use of biotechnology in resolution of various problems such as environmental pollution.

Sr. No.			**Credit**	**Hrs.**
1	UNIT-1	Enzyme Immunoassays, Molecular methods in clinical microbiology, Susceptibility tests: Micro-dilution and macro-dilution broth procedures. Susceptibility tests:Diffusion test procedures. Susceptibility tests: Tests for bactericidal activity. Automated procedures for antimicrobial susceptibility tests.	1	15
2	UNIT-2	GLC, HPLC, Electron microscopy, flowcytometry and cell sorting. Transgenic animals.	1	15

References:

Ananthanarayan R and Paniker CKJ. (2005). Textbook of Microbiology. 7th edition (edited by Paniker CKJ). University Press Publication.
Brooks GF, Carroll KC, Butel JS and Morse SA. (2007). Jawetz, Melnick and Adelberg's Medical Microbiology. 24th edition. McGraw Hill Publication.
Goering R, Dockrell H, Zuckerman M and Wakelin D. (2007). Mims' Medical Microbiology. 4th edition. Elsevier.
Joklik WK, Willett HP and Amos DB (1995). Zinsser Microbiology. 19th edition. Appleton-Centuary-Crofts publication.
Willey JM, Sherwood LM, and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. 7th edition. McGraw Hill Higher Education.
Microscopic Techniques in Biotechnology, Michael Hoppert

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. (Mathematics)

Detailed Syllabus as per NEP with Effect from July 2024

FACULTY:	**SCIENCE**
SUBJECT:	**MATHEMATICS**
PROGRAMME NAME:	**BACHELOR OF SCIENCE**
PROGRAMME CODE:	**SCIUG107**
SEMESTER:	**III to IV (2nd Year)**
TOTAL PAGE:	**01 TO 34 (with First Cover Page)**
DATE:	**Feb -2024**

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 III	MJDSC	MAT301	4	4	60	50	50	100	2.5Hrs	2/33
		Practical MAT301	10	2	60	25	25	50	Min 3 Hrs	4/33
		MAT301A	4	4	60	50	50	100	2.5Hrs	6/33
		Practical MAT301A	10	2	60	25	25	50	Min 3 Hrs	8/33
	MDC	MAT303	2	2	30	25	25	50	2Hrs	10/33
		Practical MAT303	10	2	60	25	25	50	Min 3 Hrs	12/33
	SEC	MAT306	2	2	30	25	25	50	2.0Hrs	14/33
Semester IV	MJDSC	MAT401	4	4	60	50	50	100	2.5Hrs	16/33
		Practical MAT401	10	2	60	25	25	50	Min 3 Hrs	18/33
		MAT401A	4	4	60	50	50	100	2.5Hrs	20/33
		Practical MAT401A	10	2	60	25	25	50	Min 3 Hrs	22/33
	MIDSC	MAT402	2	2	30	25	25	50	2Hrs	25/33
		Practical MAT402	10	2	60	25	25	50	Min 3 Hrs	27/33
	SEC	MAT406	2	2	30	25	25	50	2.0Hrs	29/33
Sem 3&Sem 4			Evaluation System for CCE and SEE							31/33

B.Sc. (Mathematics) SEMESTER-3 Syllabus

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**B.Sc.**
SEMESTER:	**III**
COURSE NAME:	**Major Discipline Theory Course**
COURSE CODE:	**SC23MJDSCMAT301**
PAPER NAME	**Calculus and Linear Algebra**
With Effect From :	**JULY 2024**
Total Theory Credits:	**04 (04 Period /Week)**
Exam Pattern:	**50 Marks (CCE) + 50 Marks (SEE) = 100 Marks**

Program Outcome :	
1	The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.
2	Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.
3	The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.
4	Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.

Course Outcomes:	
1	Able to verify the existence of limits and calculate the limit, if exists, of single variablefunction and utilize the concept of limit to verify the continuity of single variablefunction. Moreover, compute the higher order derivatives of given functions.
2	To understand the applications of Euler's theorem, Lagrange's method and Taylor's expansion.
3	Understand vector spaces over a field and subspaces with their properties. Also, able to understand linear independence, dependence, Basis and Dimension.
4	Understand the basics of linear transformation and define its characterization and classify various types of linear transformation and define its relation with matrices.

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	**1**	**Limit, continuity and partial Derivatives:** Functions of several variables, their limits and continuity, partial derivatives, differentiability and differential, chain rule, differential and derivatives of higher orders, condition for commutativity of independent variables in higher derivatives, derivatives of implicit functions.	**1**	**15**
2	**2**	**Applications of partial derivatives:** Euler's theorem for homogeneous functions, Extrema of functions several variables, application of Lagrange's method of undetermined multiplies, Taylor's and Maclaurin's expansion for functions of two variables, Tangent and normal plane to twist curve, Tangent plane and normal to surface.	**1**	**15**
3	**3**	**Vector Spaces:** Vector space-Definition and examples, Subspace, span of set, more about Subspaces,direct sum of subspaces, linearly dependent and independentsets, Bases and dimension.,	**1**	**15**
4	**4**	**Linear transformations:** Definition of linear transformation, range and kernel of a linear map, rank and nullity, rank-nullity theorem, inverse of linear transformation.	**1**	**15**

References:

1	**Textbook:**The main book for the course (Unit I and II) is '**Differential Calculus'** by Shantinarayan, S. Chand, New Delhi.
2	Advanced Calculus, D V Widder , Prentice Hall , New Delhi.
3	**An Introduction to Linear Algebra'** by V. Krishnamurthy, V P Mainra, J L Arora, Affiliated East-west Press Pvt Ltd., New Delhi.
4	Linear Algebra , Ramchandra Rao, P. Bhimasankar, Tata MacGrawHill

Further Reading:

1	KalanShashtra Part I , D H Pandya and N D Suthar, University GranthNirman Board (Gujarati)
2	KalanShashtra Part II, A M Vaudya and V H Pandya, University GranthNirman Board (Gujarati)

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**B.Sc.**
SEMESTER:	**III**
COURSE NAME:	**Major Discipline Practical Course** **Practical on Numerical Analysis**
COURSE CODE:	**SC23PMJDSCMAT301**
With Effect From :	**JULY 2023**
Total Practical Credits:	**02 (04 Period /Week) (Batch of 15 Students)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

Program Outcome :	
1	The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.
2	Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.
3	The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.
4	Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.

Course Outcome :	
1	To identify the solution of problems using Numerical Methods.
2	Able to find numerical solutions of system of linear equations and to check the accuracy of the solutions.
3	To learn about various interpolating and extrapolating methods to find numerical solutions.
4	To solve initial and boundary value problems in differential equations using numerical Methods.
Practical Details:	
1	Construct the Forward Difference Table and find given terms.
2	Construct the Backward Difference Table and find out given differences.
3	Represent given polynomial into Factorial polynomial and find second differences.
4	Application of Gregory-Newton forward Interpolation formula.
5	Application of Gregory-Newton Backward interpolation formula.
6	To find a real root of equation $f(x) = 0$ by Graphical Method
7	To find a real root of equation $f(x) = 0$ by Method of False Position
8	To find a real root of equation $f(x) = 0$by Bisection Method
9	To find a real root of equation $f(x) = 0$by Method of Iteration
10	To find a real root of equation $f(x) = 0$by Newton-Raphson Method.

References:	
1	Numerical Analysis by Kunz, McGraw Hill.
2	Numerical Analysis by R. Gupta, AnmolPub.Pvt.Ltd, New Delhi.
3	Numerical Methods,Dr.V.N.Vedomurthy, Vikas Publishing House Pvt.Ltd .
4	Numerical Analysis, P.N.Chatterji, Rajson'sPrakashanmandir, Meerut.
Further Reading:	
1	Numerical Methods in Engineering and Science, Dr.B.S.Grewal,Khanna Pub.
2	Numerical Analysis and Computational Procedures, S.A.Mollah, New Central Book Agency, Calcutta.

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**B.Sc.**
SEMESTER:	**III**
COURSE NAME:	**Major Discipline Theory Course**
COURSE CODE:	**SC23MJDSCMAT301A**
PAPER NAME	**Numerical Analysis**
With Effect From :	**JULY 2024**
Total Theory Credits:	**04 (04 Period /Week)**
Exam Pattern:	**50 Marks (CCE) + 50 Marks (SEE) = 100 Marks**

Program Outcome :	
1	The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.
2	Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.
3	The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.
4	Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.

Course Outcome:	
1	To identify the solution of problems using Numerical Methods.
2	Able to find numerical solutions of system of linear equations and to check the accuracy of the solutions.
3	To learn about various interpolating and extrapolating methods to find numerical solutions.
4	To solve initial and boundary value problems in differential equations using numerical Methods.

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	**1**	**Finite Differences and Theory of interpolation:** Ascending and descending differences, Symbolic operators, Relation between operators, Forward Difference Table and Backward Difference Table,Difference of polynomial, factorial polynomials.Interpolation**,** Gregory-Newton's forward differenceinterpolation formula and Gregory-Newton's backward difference interpolation formula and it's applications.	**1**	**15**
2	**2**	**Divided Differences&Central Difference interpolation formula:** Newton's divide difference interpolation formula, Lagrange's interpolation formula for equal and unequal intervals.Guass forward and backward formula, Stirling interpolation formula, Bessel's interpolation formula.	**1**	**15**
3	**3**	**Numerical differentiation and integral:** General Quadrature formula for equidistance ordinates, Trapezoidal rule, Simpson's 1/3th rule, Simpson's $3/8^{th}$ rule, Picard's method, Taylor's method, Euler's method.	**1**	**15**
4	**4**	**Methods of Solution of an Equation:** Method of solution of an equation like Graphical Method, Bisection method, Method of False Position(RegulaFalsi), Method of Iteration and its Graphical Representation, Newton Raphson Method and its applications.	**1**	**15**

References:	
1	Numerical Analysis by Kunz, McGraw Hill.
2	Numerical Analysis by R. Gupta, AnmolPub.Pvt.Ltd, New Delhi.
3	Numerical Methods byDr.V.N. Vedomurthy, Vikas Publishing House Pvt.Ltd .
4	Numerical Analysis byP.N.Chatterji,Rajson'sPrakashanMandir, Meerut.
Further Reading:	
1	Numerical Methods in Engineering and Science, Dr.B.S.Grewal,Khanna Pub.
2	Numerical Analysis and Computational Procedures, S.A.Mollah, New Central Book Agency, Calcutta.

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**B.Sc.**
SEMESTER:	**III**
COURSE NAME:	**Major Discipline Practical Course**
COURSE CODE:	**SC23PMJDSCMAT301A**
With Effect From :	**JULY 2024**
Total Practical Credits:	**02 (04 Period /Week)(Batch of 15 Students)**
Marks:	**External :25 + Internal : 25 = Total :50**
The basic requirement for the smooth and better conduction of the practical program:	
1	Must require a Computer operator 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	**Data Analysis with Microsoft Excel:** • Students should gain a good understanding of Excel functions and tools relevant to mathematical functions. • They should be able to use Excel for tasks like organizing data, generating charts, and performing basic statistical analyses.
2	**Mathematical Problem Solving with Microsoft Excel:** • Students should gain a good understanding of Excel functions and tools relevant to mathematical problem solving. • They should be able to use Excel for tasks like organizing large data and their solutions.
3	**Real-World Problem Solving with Microsoft Excel:** • It will help students in research projects for getting easy solutions to compact problems. • It will help to solve differentiation, Integration, Probability, Frequency distribution, regression analysis, correlation etc.

PRACTICALDETAILS	
Unit-1	**Microsoft Office Excel Tools used in Mathematical Research for solving system of Linear equations & Matrices**
1	**Solve Linear Programming Problems (Two Practical)** • Graphing an Inequality • Graphing Systems of Inequalities • Maximization& Minimization **(Questions to be asked in Practical: Solving a Linear Programming Problem using Excel Solver)**
2	**Solve Systems of Linear Equations and Matrices (Six Practical)** • Matrix Addition and Subtraction • Scalar and Matrix Multiplication • Product of Two Matrices • Inverse of a Matrix • Determinant of a Matrix • Solving System of Linear Equations Using Matrices **(Questions to be asked in Practical: Adding, Multiplying two matrices, Finding Inverse of Matrices, Finding Determinant of Matrix, Solve system of linear equations)**
Unit-2	**Statistical Data Analysis used in Mathematical Research& Power Point presentation (Seven Practical)**
1	**Statistical Data Analysis used in Mathematical Research** • Frequency Distributions • Mean of Frequency Distribution • Medianof Frequency Distribution • Mode of Frequency Distribution • Measures of Variation • Normal Distributions • Boxplots **(Questions to be asked in Practical: Ask for finding Mean, Median, Mode, Variance, Standard Deviation, Plotting from the given data)**
2	**Power Point presentation** **(Questions to be asked in Practical: To make a PowerPoint presentation on any theorem of syllabus)**
References:	
1	"Excel Spreadsheet Manual for Applied Mathematics" by StelaPudar-Hozo, Indiana University Northwest, Pearson Publication
2	"Microsoft PowerPoint 2019 Step by Step" by Joan Lambert and Joyce Cox:
3	"Microsoft Word 2019 For Dummies" by Dan Gookin:
4	"Microsoft Excel Data Analysis and Business Modeling" by Wayne L. Winston
Further Reading:	
1	"MathType Cookbook" by Richard L. Evans and W. J. “Jerry” Cody:
2	Applied Mathematics with Microsoft Excel by Chester Piascik published by Brooks/Cole
3	Microsoft Office Book by Rouf published by Innovative Solutions

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**B.Sc.**
SEMESTER:	**III**
COURSE NAME:	**Multi-Disciplinary Theory Course**
COURSE CODE:	**SC23MDCMAT303**
PAPER NAME	**Numerical Methods**
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	To identify the solution of problems using Numerical Methods.
2	Able to find numerical solutions of system of linear equations and to check the accuracy ofthe solutions.
3	To learn about various interpolating and extrapolating methods to find numericalsolutions.
4	To solve initial and boundary value problems in differential equations using numerical Methods.

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	**1**	**Methods of Solution of an Equation:** Method of solution of an equation like Graphical Method, Bisection method, Method of False Position(RegulaFalsi), Method of Iteration and its Graphical Representation, Newton Raphson Method and its applications.	**1**	**15**
2	**2**	**Finite Differences and Theory of interpolation:** Ascending and descending differences, Symbolic operators, Relation between operators, Forward Difference Table and Backward Difference Table,Difference of polynomial, factorial polynomials.Interpolation**,** Gregory-Newton's forward differenceinterpolation formula and Gregory-Newton's backward difference interpolation formula and it's applications.	**1**	**15**
References:				
1	Numerical Analysis by Kunz, McGraw Hill.			
2	Numerical Analysis by R. Gupta, Anmol Pub.Pvt.Ltd, New Delhi.			
3	Numerical Methods Dr.V.N.Vedomurthy, Vikas Publishing House Pvt. Ltd .			
4	Numerical Analysis P.N.ChatterjiRajson'sPrakashanMandir, Meerut.			
Further Reading:				
1	Numerical Methods in Engineering and Science, Dr.B.S.Grewal,Khanna Pub.			
2	Numerical Analysis and Computational Procedures, S.A.Mollah, New Central Book Agency, Calcutta.			

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**B.Sc.**
SEMESTER:	**III**
COURSE NAME:	**Multi-Disciplinary Practical Course** **Practical on Numerical Methods**
COURSE CODE:	**SC23PMDCMAT303**
With Effect From :	**JULY 2024**
Total Theory Credits:	**02 (04 Period /Week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

Program Outcome :	
1	The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.
2	Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.
3	The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.
4	Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.
Course Outcome:	
1	To identify the solution of problems using Numerical Methods.
2	Able to find numerical solutions of system of linear equations and to check the accuracy ofthe solutions.
3	To learn about various interpolating and extrapolating methods to find numericalsolutions.
4	To solve initial and boundary value problems in differential equations using numerical Methods.

Practical details :	
1	To find a real root of equation $f(x) = 0$ by Graphical Method
2	To find a real root of equation $f(x) = 0$ by Method of False Position
3	To find a real root of equation $f(x) = 0$ by Bisection Method
4	To find a real root of equation $f(x) = 0$ by Method of Iteration
5	To find a real root of equation $f(x) = 0$ by Newton-Raphson Method
6	Construct the Forward Difference Table and find given terms.
7	Construct the Backward Difference Table and find out given differences.
8	Represent given polynomial into Factorial polynomial and find second differences.
9	Application of Gregory-Newton forward Interpolation formula.
10	Application of Gregory-Newton Backward interpolation formula.
References:	
1	Numerical Analysis by Kunz, McGraw Hill.
2	Numerical Analysis by R. Gupta, Anmol Pub.Pvt.Ltd, New Delhi.
3	Numerical Analysis byP.N.Chatterji,Rajson'sPrakashanMandir, Meerut.
Further Reading:	
1	Numerical Methods in Engineering and Science, Dr.B.S.Grewal,Khanna Pub.
2	Numerical Analysis and Computational Procedures, S.A.Mollah, New Central Book Agency, Calcutta.

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**B.Sc.**
SEMESTER:	**III**
COURSE NAME:	**Skill Enhancement Theory Course**
COURSE CODE:	**SC23SECMAT306**
PAPER NAME:	**Mathematics for Competitive Exams-3**
With Effect From :	**JULY 2024**
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**	**Simple Interest** Simple Interest (SI) • Instalments Compound Interest Basic Formulae Related Compound Interest • Instalments **Ratio and Proportion** Ratio • Comparison of Ratios • Proportion **Mixture or Alligation** Mixture • Rule of Mixture or Alligation **Partnership** Types of Partnership • Types of Partners	**1**	**15**
2	**2**	**Unitary Method** Direct Proportion • Indirect Proportion **Problem Based on Ages** Important Rules for Problem Based on Ages **Work and Time** Basic Rules Related to Work and Time **Work and Wages** Important Points	**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,લિબર્ટીકેરિયરએકેડેમી.			

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIENCE/ HOME SCIENCE (B.Sc.) PROGRAMME
IN
ENGLISH

ABILITY ENHANCEMENT COURSE

SEMESTER: 3
1 SC23AECENG304 COURSE

SEMESTER: 4
2 SC23AECENG404 COURSE

SEMESTER SYSTEM

SCHEME OF EXAMINATION

AND

SYLLABUS

AS PER THE NEW N E P GUIDELINES

(FOR SEM 3 & 4 WITH EFFECT FROM JUNE-2023)

SCHEME OF EXAMINATION

ABILITY ENHANCEMENT COURSE

1 SC23AECENG304 COURSE

2 SC23AECENG404 COURSE

SCIENCE B.Sc. (ENGLISH)

(FOR BOTH SEMESTERS 3 & 4 COURSES)

Time: 2 Hrs. **Total Marks: 25**

Q.1 (A) Attempt five short questions out of eight. (From prescribed text) (Unit-I) (05)

Q.1 (B) Vocabulary Text Based (Match the Words) (Unit-I) (05)

Q.2 Fill in the blanks with multiple choices. Six blanks from each grammatical topic of Unit-II (Ten out of Twelve) (10)

Q.3 An unseen paragraph for comprehension with short questions (Unit-III) (05)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME: ABILITY ENHANCEMENT COURSE

SEMESTER 3

PROGRAM CODE: **SC23AECENG304**

ENGLISH

COURSE CODE **AEC 304**

EFFECTIVE FROM JUNE 2023 UNDER NEP

Total Credit – 02 (02 Period/Week)

Programme Outcome & Course Outcome:

1. **This course will enhance students' ability to learn and appreciate language through ShortStories/Essays**
2. **It will enhance students' communication skills**
3. **Impart employability skills to students**
4. **Prepare students for competitive examinations**
5. **It will inculcate and enhance reading habits in Under Graduate Students**
6. **It will enable students to learn basic grammar through the practice of prescribed topics**
7. **It will enable students to read and comprehend short passages**
8. **It will enhance the ability of students to write short answers**
9. **It will inculcate ability to draft emails**
10. **It will inculcate human values and ethics in order to enable students to become good citizens of the country**

Sr. No.	Unit		Credit	Hr
	Unit 1	Lesson 1 to 4 from text 'Glimpses' - Macmillan		
	Unit 2	Grammar- Tenses Concord		
	Unit 3	Comprehension of Unseen Passage		

Further Reading: **High School English Grammar- Wren and Martin**
Contemporary English Grammar- David Green