

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

PATAN- 384 265

**Modified Detailed Syllabus of CBCS
PROGRAMME Pattern for B. Sc.(Mathematics)
Semester System**

PROGRAM CODE : HNGU1054

With Effect from June: 2021

FACULTY : SCIENCE

SUBJECT : MATHEMATICS

CLASS : Bachelor of Science.

SEMESTER : III to IV

TOTAL PAGES : 01 TO 11 (WITH COURSE STRUCTURE)



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**I/c. Registrar
Hemchandracharya
North Gujarat University
PATAN**

Hemchandracharya North Gujarat University, Patan-384265.

B.Sc. (Mathematics): PROGRAMME Structure under CBCS

With Effect from June: 2021

Mission: Our mission is to provide opportunities for developing basic-quality mathematical skills and achievement for their betterment of life through scientific and technological development.

Learning outcomes: Four major focusing areas: Logical Reasoning & Motivation; Analysis & Problem solving; Information & Technology Proficiency.

Vision: To Motivate Individuals to excel in the mathematical basic knowledge-driven environment of the 21st century through curriculum and train integrally human resources through teaching. We **Focus** on quality education.

(1) EDUCATIONAL AIMS:

Mathematics is one of the fundamental disciplines in science. It is the basic for all the disciplines. To make education more effective and learner centric, restructuring of curriculum becomes essential. As a positive step in this direction and in order to respond to the emerging trends in the global scenario, it is decided to introduce the Choice Based Credit System (CBCS) from the academic year 2011-12 and modified it after three years. Under this system, the academic programme becomes student-oriented, relevant, interdisciplinary and flexible.

(2) *CONDITIONS FOR ADMISSION :*

A candidate who has passed the H Sec-Science Degree examination of the state or any other examinations accepted by the Syndicate as equivalent thereto shall be eligible for admission to this B Sc Programme in Mathematics on full-time basis of study.

INTAKE rules for admission are as per University notification from time to time.

Students are allowed to take admissions to successive semesters under carry over benefit facility as per the norm decided by the university.

(3) *LEARNING OUTCOMES :*

The programme leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding in the following areas:

- **Knowledge and understanding:** When one has completed this degree he/she will have knowledge and understanding of the fundamental concepts, principles and techniques from a range of topic areas.



- **Cognitive skills:** When one has completed this degree he/she will be able to understand how to solve some problems using the methods taught and develop abstract mathematical thinking.
- **Practical skills:** When one has completed this degree, he/she will be able to demonstrate the communicate clearly knowledge, ideas and conclusions about mathematics and improve his/her own learning and performance.

(4) DURATION OF THE COURSE:

The CBCS pattern B. Sc. programme with multidisciplinary approach in Mathematics is offered on a full-time basis. The duration of the course is of three academic years consisting of six semesters each of 15 weeks duration.

(5) TEACHING, LEARNING METHODS:

All relevant material is provided and taught in the course texts and through the study of set books. One will build up knowledge gradually, with sufficient in-text examples to support one's understanding. He/She will be able to assess his/her own progress and understanding by using the in-text problems and exercises at the end of each unit in form of practical using computer in computer laboratory.

(6) COURSE OF STUDY:

The curriculum has five major components:

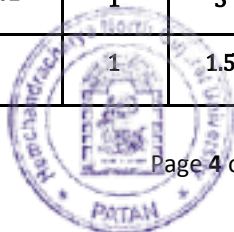
1. *Principle/Core Courses (CC MAT)*
2. *Practical courses (PC MAT)*
3. *Elective Opt. Disciplinary courses (ES MAT)*
4. *Elective Generic course*
5. *Foundation Course*

There are at least 144 Credit COURSEs prescribed in the above classification as per the university norms to be studied to acquire B.Sc. Degree in Mathematics.



⇒ COURSE STRUCTURE ☒

Course	Courses	Credit /course	Teaching Hrs Total	Total Credits	Examination			Total Marks
					Internal	Hours	External	
SEMESTER-I								
Principle/Core Courses: CC-MAT-111	1	4	4	4	30	2.5	70	100
Practical/ PC MAT-111	1	2	4	2	-	5	50	50
Elective Opt. Disciplinary: ES-MAT -11 Set Theory & Functions	1	2	2	2	15	2	35	50
Elective Generic	1	2	2	2	15	2	35	50
Foundation Course	1	2	2	2	15	2	35	50
SEMESTER-II								
Principle/Core Courses: CC-MAT-122	1	4	4	4	30	2.5	70	100
Practical/ PC MAT-122	1	2	4	2	-	5	50	50
Elective Opt. Disciplinary: ESMAT -21 Industrial Mathematics	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	50	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-III								
Principle/Core Courses: CC-MAT-301	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-302	1	3	3	3	30	2.5	70	100
Practical /PC- MAT-301	1	1.5	3	1.5	-	5	50	50
Practical /PC -MAT-302	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT -31 Numerical Solution of Equations	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-IV								
Principle/Core Courses: CC-MAT-401	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-402	1	3	3	3	30	2.5	70	100
Practical/ PC- MAT-401	1	1.5	3	1.5	-	5	50	50



Practical/ PC MATH-402	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT -41 Improper Intrgrals	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-V								
Principle/Core Courses: CC-MAT-501	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-502	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-503	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-504	1	3	3	3	30	2.5	70	100
Practical/PC MAT-501	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-502	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-503	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-504	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ESMAT -51 Theory of Equations	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-VI								
Principle/Core Courses: CC-MAT-601	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-602	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-603	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-604	1	3	3	3	30	2.5	70	100
Practical/PC MAT-601	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-602	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-603	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-604	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT -61 Business Statistics	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50

**N.B.: Work-load depends on the number of students and the number of Batches/Groups
for Practical and Cognitive-skill based Course.**



B.Sc. (Mathematics) Semester-4

CC-MAT-401 Integral Calculus

Unit-01 Riemann integral:

Upper, lower Riemann integral for a function of one variable defined over $[a,b]$, Riemann integral and its properties, fundamental theorem of calculus, mean value theorem, change of variable.

Unit-02 Improper Integral and Multiple Integral:

Repeated integral, double integral, integral on non-rectangular region, transformation to polar co-ordinate, change of order of integration, triple integration, and transformation to polar and cylindrical co-ordinate.

Unit-03 Vector analysis, line and surface integral:

[**Revision (not for Examination):** Gradient of scalar functions, divergence and curl of vector functions]

Line integral, surface integral, Green's theorem, Stock's theorem and its applications

- **Textbook:**

Integral Calculus, Shantinayyan S. Chand, New Delhi (Course Book)

- **Reference Book:**

1. Advanced Calculus, D V Widder , Prentice Hall , New Delhi
2. Advanced Calculus Vol : I & II, T M Apostol, Blaisdoll
3. Advanced Calculus, R C Buck, MacMillan

CC-MAT-402: Linear Algebra

Unit-01 Vector spaces:

Vector space, subspace, span of set, more about subspaces, linearly dependent and independent, dimension and basis.

Unit-02 Matrix and linear transformations:

Definition of linear transformation, range and kernel of a linear map, rank and nullity, rank-nullity theorem, inverse of linear transformation, definition of matrix of linear transformation, linear transformation associated with matrix and matrix associate with linear transformation, the dimension of $L(U, V)$ and its determination, rank and nullity of a matrix.

Unit-03 Inner product space:

Definition of inner product space, norm, orthogonality, Schwarz's and triangular inequality, parallelogram law, orthonormal basis, Gram-Schmidt orthogonalization process (without proof) and its applications, Eigen value and Eigen vector of a linear transformation, characteristic polynomial, Caley-Hamilton theorem and its applications.



- **Textbook:**
An Introduction to Linear Algebra' by V. Krishnamurthy, V P Mainra, J L Arora, Affiliated East-west Press Pvt. Ltd., New Delhi.
- **Reference Books:**
 1. Linear Algebra , Ramchandra Rao, P. Bhimasankar, Tata MacGrawHill
 2. Topics in Algebra, I N Herstein, Wiley Eastern Ltd
 3. Linear Algebra, S K Berberion, Oxford University Press
 4. Linear Algebra Problem Book, P R Holmos, Cambridge University Press
 5. Linera Algebra, Sharma and Vashishtha, Krishna Prakashan, Meerut
 6. Linear Algebra, Gupta K P, PragatiPrakashan, Meerut
 7. Linear Algebra, G Paria, New Central book agency Ltd, Calcutta.

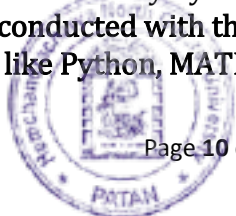
PC –MAT-401 Practicals on Integral Calculus

1. To find the inverse of a Linear transformation
2. To find composition of linear maps
3. Applications of Range and Kernel of a linear map
4. Application of Rank Nullity theorem
5. Applications of Matrix associated with linear transformation
6. Applications of Linear map associated with matrix
7. Verifications on Rank-Nullity theorem
8. Application of Gram Schmidt orthonormalization process
9. Applications of Cayley-Hamilton Theorem
10. Application of line integral
11. Applications of surface integral
12. Application of Green's Theorem
13. Application of Stokes' theorem
14. Application of divergence theorems

PC–MAT-402 PRACTICALS OF LINEAR ALGEBRA

1. Applications of Vector spaces
2. Applications of Subspaces
3. Applications of Basis and Dimension of vector spaces
4. Applications of expansion of linearly independent set up to a basis of a vector space
5. Verification on Dimension theorem
6. Applications of Linear transformations
7. To find the inverse of a linear transformation
8. To find composition of linear maps
9. Applications of Range and Kernel of a linear map
10. Application of Rank Nullity theorem
11. Applications of Matrix associated with linear transformation
12. Applications of Linear map associated with matrix
13. Verifications on Rank-Nullity theorem
14. Application of Gram Schmidt orthonormalization process
15. Applications of Cayley-Hamilton Theorem.

[Practicals should be conducted with the help of either scientific Calculator or appropriate software like Python, MATLAB, SciLab]



ES-MAT-41: Improper Integral

Unit-1 Gamma Function:

Definitions of Gamma function and its properties, Applications of gamma functions, several forms of Gamma functions

Unit-2 Beta Function:

Definition of Beta functions and its properties, Applications of Beta functions, Relation between Beta and Gamma function, several forms of Beta functions

- **Reference Books :**

1. Advanced Calculus, D V Widder , Prentice Hall , New Delhi
2. Advanced Calculus Vol : I & II, T M Apostol, Blaisdoll
3. Advanced Calculus, R C Buck, MacMillan





હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

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

ફોન:(૦૨૭૬૬) ૨૩૭૦૦૦

ફેક્સ : (૦૨૭૬૬) ૨૩૧૯૧૭

Email : regi@ngu.ac.in

Website : www.ngu.ac.in

પરિપત્ર ક્રમાંક — ૧૬૮ / ૨૦૨૧

વિષય: વિજ્ઞાન વિદ્યાશાખાના સ્નાતક કક્ષાના નવા અભ્યાસક્રમો અંગે...

આ યુનિવર્સિટી સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, વિજ્ઞાન વિદ્યાશાખાએ કરેલ ભલામણ અનુસાર નીચેના વિષયોના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો **જૂન — ૨૦૨૧ થી ક્રમશઃ અમલ માં આવે તે રીતે** એકેડેમિક કાઉન્સિલએ તેની તા. ૦૮/૦૬/૨૦૨૧ ની સભા ના નિર્દિષ્ટ ઠરાવો થી મંજૂર કરેલ છે. જેનો અમલ કરવા સારૂ સંબંધિતોને આ સાથે મોકલવામાં આવે છે, જેનો યુસ્ત અમલ થવા વિનંતી છે.

ક્રમનં.	અભ્યાસક્રમ	એકેડેમિક સભાના ઠરાવક્રમાંક	સેમેસ્ટર	પાના નંબર
૧	બાયોટેકનોલોજી	૨૬	સેમ.—૩ થી ૬	૧ થી ૩૯
૨	વનસ્પતિશાસ્ત્ર	૨૭	સેમ.—૩ અને ૪	૧ થી ૩૪
૩	ભૌતિકશાસ્ત્ર	૨૯	સેમ.—૩ અને ૪	૧ થી ૨૩
૪	રસાયણશાસ્ત્ર	૩૦	સેમ.—૩ અને ૪	૧ થી ૧૯

આ બાબતની સંબંધિત અધ્યાપકો તથા વિદ્યાર્થીઓને આપના સ્તરેથી જાણ કરવા વિનંતી છે.

- નોંધ: (૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજ ના ગ્રંથાલયમાં મૂકવાની રહેશે.
(૨) આ અભ્યાસક્રમ યુનિવર્સિટીની વેબ સાઈટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરાવવામાં આવનાર છે.

સહી/—

અધ્યક્ષ

કુલસચિવવતી

બિડાણ: ઉપર મુજબ

નં.—એ કે / અ× સ / ૧૪૭૫ / ૨૦૨૧

તારીખ : ૨૧ / ૦૬ / ૨૦૨૧

પ્રતિ,

૧. અધ્યક્ષશ્રી/ કો.ઓર્ડીનેટરશ્રી —વિજ્ઞાન વિદ્યાશાખા અંતર્ગત અનુસ્નાતક વિભાગો, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.
૨. સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓ
૩. ડૉ. જગદીશ એચ. પ્રજાપતિ (ડીનશ્રી — વિજ્ઞાન વિદ્યાશાખા), સરકારી સાયન્સ કોલેજ, શ્રાદ્ધ. જિ. બનાસકાંઠા
૪. વિજ્ઞાન વિદ્યાશાખા હેઠળના વિષયોની અભ્યાસ સમિતિઓના ચેરમેનશ્રીઓ.
૫. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (પાંચ નકલ)
૬. ઈનચાર્જ ઓફિસરશ્રી, સબસેન્ટર, ખેડબ્રહ્મા કેમ્પસ, મુ. વડાલી, જિ. સાબરકાંઠા. (હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ.)
૭. ગ્રંથપાલશ્રી, હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઈલ માટે)
૮. સીસ્ટમ એનાલીસ્ટ, કોમ્પ્યુટર (રીઝલ્ટ) સેન્ટર, હેમ.ઉ.ગુ. યુનિવર્સિટી, પાટણ તરફ વેબસાઈટ પર મૂકવા સારૂ.
૯. પ્રવેશ પ્રશાખા (એકેડેમિક શાખા) હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ.
૧૦. મુખ્ય હિસાબી અધિકારીશ્રી (મહેકમ), હેમ. ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ તરફ પરિપત્રની કૌટુંબિક અર્થે
૧૧. સિલેક્ટ ફાઈલે— (૨ નકલ)

Hemchandracharya North Gujarat University PATAN



B.SC. BIOTECHNOLOGY SEM 4 SYLLABUS

w.e.f June 2021



Shri...
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B.Sc Semester IV

Biotechnology

Principles of metabolism II


Semester IV

BT-401

Learning Outcomes:

1. Describe the distinct metabolic pathways used by cells to harvest the energy stored in glucose under aerobic conditions.
2. Know the specific locations of these pathways in a generalized eukaryotic cell.
3. Understand the chemical relationship between the glucose molecules used by cells as fuel and the carbon dioxide generated by the same cells as waste.
4. Trace the path of high-energy electrons from glucose to water in aerobic respiration.
5. Describe glycolysis in general terms, including the molecules that exist at its start and its end, as well as its net versus total ATP production.
6. Explain how the electron transport chain uses the high energy electrons harvested originally from glucose to provide the direct source of energy used by ATP synthase to make ATP.
7. Explain why the NADH produced in glycolysis and the NADH and FADH₂ produced in the Krebs cycle differ from one other in the amount of energy they provide for the production ATP by oxidative phosphorylation.
8. Understand how proteins and fats are metabolized.
9. Compare the number of ATPs produced in the degradation of carbohydrates, proteins, and fats.
10. Compare the overall amount of ATP produced by the complete metabolic breakdown of one molecule of glucose under aerobic conditions with the ATP produced from the breakdown of one glucose molecule under anaerobic conditions.
11. Describe how the NADH molecules produced during glycolysis are oxidized back to NAD⁺ under aerobic and anaerobic conditions and explain why this oxidation is important to glucose metabolism and ATP production.




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12. Describe fermentation in plant and animal cells and explain the importance of this process in terms of energy harvest and ATP production.
13. Compare and contrast the various secondary metabolites described in the chapter

Unit I Glucose metabolism

- 1.1 glycolysis
- 1.2 Fate of pyruvate under aerobic and anaerobic condition
- 1.3 Alcohol and lactic acid fermentation.
- 1.4 Gluconeogenesis
- 1.5 Pentose Phosphate pathway

Unit II Lipid, amino acid and nucleotide metabolism

- 2.1 Fatty acid catabolism: beta oxidation
- 2.2 Fatty acid biosynthesis.
- 2.3 Overview of amino acid metabolism, urea cycle.
- 2.4 Overview of nucleotide metabolism

Unit III Oxidative phosphorylation

- 3.1 Concept of standard redox potential E° and redox potential
- 3.2 Electron carriers of mitochondrial ETS
- 3.3 Complexes of mitochondrial Electron Transport System (ETS)
- 3.4 Chemo-osmotic hypothesis for ATP synthesis.

Unit IV Photosynthesis

- 4.1 Pigments involved in photochemical phase of photosynthesis.
- 4.2 Cyclic and noncyclic electron flow during light reaction of photosynthesis.
- 4.3 Biosynthetic phase of photosynthesis: Calvin cycle, photorespiration.
- 4.4 Biosynthetic phase of photosynthesis: C₄ pathway.




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B.Sc Semester IV

Biotechnology

Food biotechnology and microbial disease

Semester IV

BT-402

Learning Outcomes:

1. Analyse the importance of microorganisms in foods and understand the biotic and abiotic factors that affect their development in these substrates.
2. Analyse, summarise, resolve problems and make professional decisions.
3. Apply the scientific method to resolving problems.
4. Design experiments and interpret the results.
5. Develop individual learning strategies and planning and organisation skills.
6. Evaluate the behaviour of reactors depending on their operating mode.
7. Recognise the importance of fermentation processes and appreciate the role of microorganisms in industrial processes.
8. Relate the characteristics of foods to their physical properties.
9. Show sensitivity to environmental, sanitary and social issues.
10. Understand the different types of microbial diseases
11. Agents responsible for spreading microbial diseases
12. Prevention and control of microbial types of diseases
13. Treatment available to cure different microbial diseases

Unit 1

- 1.1 Use of microorganisms in preparation of various food products.
- 1.2 fermented dairy products
- 1.3 Different fermented food products




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1.4 Pro biotics

Unit 2

2.1 spoilage of food: spoilage of vegetables, meat, egg

2.2 food preservation: principles.

2.3 chemical and physical methods of food preservation

Unit 3

3.1 Microbial pathogenesis:

3.2. Key bacterial diseases.

3.3 important viral diseases.

3.4 Examples of fungal disuse.

Unit 4

4.1 Introduction of terms: Sterilization, Disinfection, Antiseptic, Germicide, Chemotherapy, Antibiotic etc.

4.2 **Physical agent:** Mode of action and application of Temperature. Radiation and Filtration.

4.3 **Chemical agent:** Mode of action and application of Phenol, alcoholic and halogen compounds.

4.4 **Chemical agent:** Mode of action and application of Heavy metal and Gaseous agent




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B.Sc Semester IV

Biotechnology: Subjective elective

Plant growth regulators

Semester IV

BT-ES-1

Learning Outcomes:

1. Understand the structure and properties of each plant hormone
2. Understand the plant hormones and their roles in plant development
3. Understand physiological responses produced by plants against environmental stresses
4. Understand the physiological effects of plant hormones in plants

Unit -1 plant growth regulators-1

1. Definition: types and discovery of various PGR
2. Auxin and its derivatives.
3. Gibberellins and its applications.
4. Cytokinins (= Kinins),

Unit -2 Plant growth regulators 2

1. General growth inhibitors: Acid and ethylene
2. Application of PGR in plant tissue culture
3. Oligosaccharins and Other Natural Growth Hormones In Plants




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B.Sc. Semester IV

Biotechnology: Subjective elective

Basic of Forensic Science

Semester IV

BT-ES-2

Learning Outcomes:

1. The detail study will help to understand about the basics and different branches of Forensic Sciences.
2. Will help to know about the working and functioning of Forensic science laboratories.
3. Will learn the Police science its role in criminal investigation and Prevention of crime

Unit -1 Fundamentals of Forensic Science

1. Introduction and principles of forensic science
2. Role of biotechnology in forensic science
3. Tools and design of forensic biotechnology laboratory
4. Isolation of DNA from sample of crime scene

Unit -2 Techniques of Forensic Biotechnology

1. DNA Fingerprinting/RFLP for solving crime
2. PCR: principle, method and application in forensic science
3. DNA profiling for forensic medicine
4. Ethics, rules related to forensic sciences




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B.Sc Semester IV

Biotechnology

Semester IV

Practicals

1. MBRT of milk samples
2. Isolation of any bacteria from food sample.
3. Isolation of spoilage microorganism from spoiled vegetable.
4. Preparation of pro biotic product
5. Study the effect of Chemicals
6. Study the effect of Heavy metal,
7. Study the effect of Antibiotics
8. Lipid estimation
9. Amino acid estimation
10. Quantification of DNA.
11. Urea estimation by DAM




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NAAC A (3.02) State University

PATAN - 384 265

FACULTY OF SCIENCE

B.Sc. BOTANY

Semesters: IV

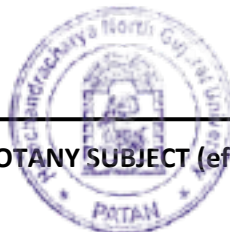
SYLLABUS

Curriculum as per UGC Guideline

With Semester/CBCS/Grading Pattern

With effect from June - 2021 (and thereafter)

DATE: June, 2021



 TOTAL PAGE: 19

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U.G. (B.Sc.) Programme

CBCS:: Semester :: Grading Pattern

With effect from: June - 2021

FACULTY OF SCIENCE

Subject: BOTANY

B. Sc. Semesters: IV

Total Pages: 01 to 19

Submitted on

Date: 07/04/2021



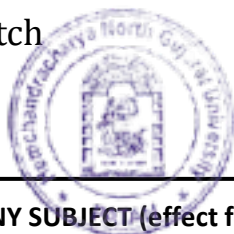
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SUMMARY OF THE PROGRAMME

Summary of the Programme

✓ Syllabus duration	Semester pattern i.e., Six months
✓ <i>No. of core compulsory (CC) course</i>	02 (in each semester)
✓ <i>Credits per CC course</i>	03
✓ <i>Total credits for CC course</i>	06/Semester
✓ <i>Theory lectures per CC course</i>	03 /week
✓ <i>Total Theory lectures for CC course</i>	06 /week
✓ No. of Practical courses per semester	02
✓ Practical lectures	03 /week/course/batch
✓ Total Practical lectures	06 /week/ batch
✓ Credits per Practical course	1.5
✓ Total Credits of Practical course	03 /Semester
✓ No. of Practical course (in Uni. Exam.)	02 /Semester
✓ No. of Elective Subjective (ES) course	01 (in each semester)
✓ Credits for ES course	02 (in each semester)
✓ Theory lectures per ES course	02/week
✓ No. of Elective Generic (EG) course	01
✓ Credits for EG course	02
✓ Theory lectures per EG course	02/week
✓ Examination (including Preparation)(weeks)	05
✓ No. of Days per week	06
✓ Weeks (days) available for Teaching	15 (90)
✓ Duration of each lecture (minutes)	55
✓ No. of students/batch	20 (on approval of AC and Exam. unit)



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Under Choice Based Credit System-Semester-Grading System pattern

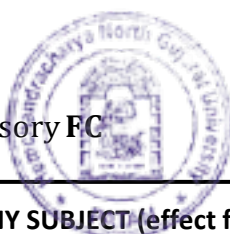
U G (B. Sc.) Programme in Botany

Semester - IV

Salient Features:

- CBCS in UG programme in **Botany Semester IV** shall be offered from the Academic year **June 2021**.
- Botany subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2021-22.
- A student will have to get enrolled a **Core course** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting an **Elective** as well as **Foundation** courses from a pool of courses.
- Each course shall be assigned a specific number of **Credits**.
- A Core course is the course which should compulsorily be studied by a candidate as a Core requirement so as to get degree in a said discipline of study.
- There shall be **Two Core Compulsory** courses (Theory) each with **3 credits** in each semester and their practical's each with **1.5 credits**. Thus, a credit weight-age in **B.Sc.** programme for each semester core course shall be of **6 credits**. In short, **9 credits** multiplied by **2** subjects equal to total of **18 credits**.
- In addition to the Core courses, a student will have to choose Elective as well as Foundation courses from a pool of courses.
- **Two** courses of **Elective**, one each from **Generic Elective** and Interdisciplinary / Multidisciplinary / **Subject centric electives** shall have to be offered. The credit weight-age for each Elective course shall be of **02 Credits**. Hence, a total credit weight-age for Elective courses shall be of **4 credits**.
- One **Foundation** (English Language L.L.) course shall have to be offered. The credit weight-age for Foundation course shall be of **02 credits**.
- Each course shall have a unique Course code. The Core courses, Elective courses and the Foundation courses shall be abbreviated respectively as **CC, PC, EG, ES and FC**.

1. Core Compulsory **CC**
Practical Core (Core Elective) **PC**
2. Elective Generic **EG**
Elective Subject **ES**
3. Foundation Compulsory **FC**




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- Each Academic year shall consist of **two** semesters, each of **15 weeks** of teaching equivalent to 90 working days. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.
- The course with **4 credits** shall be of **60 hrs** (15 weeks x 4 credits) duration. The course with **3 credits shall** be of **45 hrs** (15 weeks x 3 credits) duration. The course with **2 credits** shall be of **30 hrs** (15 weeks x 2 credits) duration.
- **A general framework for Bachelor of Science (B.Sc.) programme shall be as follows:**

Semester wise credits						Total credits of the Programme
I	II	III	IV	V	VI	
24	24	24	24	24	24	144

- **The semester wise weight age of core, elective and foundation courses shall be as follows:**

Academic year	Core compulsory Courses	Elective courses	Foundation courses
Semester I & II	65-75%	15-20%	10-15%
Semester III & IV	65-75%	15-20%	10-15%
Semester V & VI	65-75%	15-20%	10-15%

- **Attendance:**

The Attendance Rules as per the norms of Hemchandracharya North Gujarat University.

- **Medium of Instruction:**

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

- **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.* core, discipline electives, generic electives and skill enhancement courses are to be considered as parameters for assessing the achievement of students in botany. 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. The oral and written examinations (Scheduled and surprise tests).
2. Closed-book and open-book tests.
3. Problem-solving exercises.
4. Practical assignments and laboratory reports.
5. Observation of practical skills.
6. Individual and group project reports.
7. Efficient delivery using seminar presentations.
8. Viva voce interviews are majorly adopted assessment methods for this curriculum.
9. The computerized adaptive testing, literature surveys and evaluations, peers and self-assessment, outputs from individual and collaborative work are also other important approaches for assessment purposes.
10. A student shall be evaluated through Comprehensive Continuous Assessment (CCA)/ (**Internal Evaluation**) as well as the **End of Semester examination (External Evaluation)**. The weight-age of CCA shall be 30%, whereas the weight-age of the Semester end examination shall be 70%. There will be **no internal evaluation in practical courses**.
11. In Semester assessment (CCA)/ (**Internal Evaluation**) is spread through the duration of the course and is to be done by the Teacher teaching the course. BoS of the subjects will decide various criteria and their weight-age for CCA. The assessment is to be done by various means including:
 - ✓ Written Tests
 - ✓ MCQs based Tests/Quiz
 - ✓ Presentations/Seminars
 - ✓ Project work/Field work
 - ✓ Group discussions/Group activities
 - ✓ Assignments, etc.

12. The distribution of **Internal Evaluation** is given as per criteria given below for **30** marks:

Written Test...	20 marks,
Assignments/MCQs/Very Short questions...	05 marks and Attendance and
Regularity, Punctuality...	05 marks.



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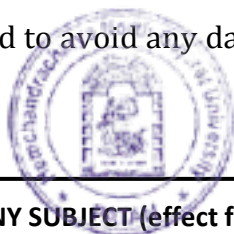
13. The **End of Semester examination (External Evaluation)** shall have an assessment based upon following perspective with respect to all the courses:
 - a. Evaluation with respect to Knowledge
 - b. Evaluation with respect to Understanding
 - c. Evaluation with respect to Skill
 - d. Evaluation with respect to Application
 - e. Higher Order Thinking Skills
14. With respect to all the above components, there shall be following types of Questions from each unit of the course.
 - a. MCQs/Fill in the blanks/ Match the pairs, etc
 - b. Short answer questions
 - c. Medium answer questions
 - d. Long answer questions
 - e. Examples/ Problems, etc.
15. 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.
16. It will be compulsory for a candidate to obtain passing percentage in both Internal as well as External Evaluation. The passing marks for each course shall be **40%** as decided by concern Board of Studies in Botany.
17. Promotion, Re-Admission and Time for Completion of Course, Procedure for Awarding Grades, Provision for Appeal, etc. as decided by the Hemchandracharya North Gujarat University.

STUDY TOUR:

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

SUBMISSION:

Instead of submission of Herbarium sheets and/or specimens at the time of final (Uni.) practical examination student may submit photographs/ drawings/ charts/ models or CD having such photographs/drawings of plant species to conserve plant species in their natural habitats and to avoid any damage to plant species and its natural habitat.



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ELECTIVE (SUBJECTIVE) COURSE:

For semester- IV a list of course is given below.

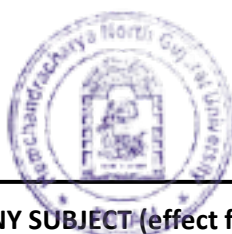
1. Elective (Subject) Course :: ES BOT-401 :: Plant Breeding

SELECTION OF ELECTIVE (GENERIC) COURSE:

- For semester-III and IV a separate consists of courses is offered by university. Students may select **any one** of them from offered courses in Semester-III and Semester-IV separately.

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.




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B. Sc. Semester-IV

CC-BOT-401: Anatomy of Angiosperms

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

- Develop an understanding of concepts and fundamentals of plant anatomy examine the internal anatomy of plant systems and organs.
- Develop critical understanding on the evolution of concept of organization of shoot and root apex.
- Analyze the composition of different parts of plants and their relationships.
- Evaluate the adaptive and protective systems of plants.

CC-BOT-402: Economic Botany

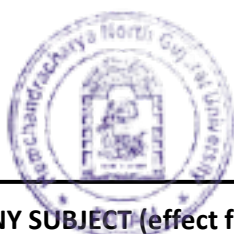
LEARNING OUTCOMES: On completion of this course, the students will be able to:

- Understand core concepts of Economic Botany and relate with environment, populations, communities, and ecosystems.
- Develop critical understanding on the evolution of concept of organization of apex new crops/varieties, importance of germplasm diversity, issues related to access and ownership.
- Develop a basic knowledge of taxonomic diversity and important families of useful plants.
- Increase the awareness and appreciation of plants & plant products encountered in everyday life.
- Appreciate the diversity of plants and the plant products in human use.

ES-BOT-401: Plant Breeding

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

- Develop conceptual understanding of plant genetic resources, plant breeding, gene bank and gene pool.
- Familiarize with genetic basis of heterosis.
- Classify Sexual and Asexual modes of reproduction.
- Explain monogenic and polygenic inheritance.
- Reflect upon the role of various non- conventional methods used in crop improvement.



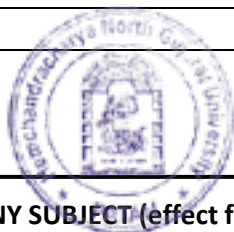

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B.Sc. Programme with 144 credits CBCS-Semester-Grading Pattern

w.e.f. June-2021

General Pattern/Scheme of study components along with credits for Science faculty.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN						
B.Sc. three year (General) Programme with 144 credits Semester-III and IV in BOTANY w.e.f. June-2021						
General Pattern/Scheme of study components along with credits						
Study Components	Ins. Hrs/ Week	Examination			Credit	
		Internal Marks	Uni. Exam. Marks	Total Marks		
Semester-III						
Core Compulsory (CC) Course						
CC-I-3	Core Course-I (Paper-3)	3	30	70	100	3
CC-I-4	Core Course-I (Paper-4)	3	30	70	100	3
CC-II-3	Core Course-II (Paper-3)	3	30	70	100	3
CC-II-4	Core Course-II (Paper-4)	3	30	70	100	3
Soft-skill: Practical Core (PC) Course						
PC-I-3	Practical Core Course-I (Paper-3)	3		50	50	1.5
PC-I-4	Practical Core Course-I (Paper-4)	3		50	50	1.5
PC-II-3	Practical Core Course-II (Paper-3)	3		50	50	1.5
PC-II-4	Practical Core Course-II (Paper-4)	3		50	50	1.5
Foundation Course (FC)						
FG-21	Compulsory English (L.L.)	2	15	35	50	2
Elective Course (EC)						
EG-21	Elective (Generic) Course	2	15	35	50	2
ES-21	Elective (Subject) Course	2	15	35	50	2
		30	165	585	750	24
Semester-IV						
Core Compulsory (CC) Course						
CC-I-5	Core Course-I (Paper-5)	3	30	70	100	3
CC-I-6	Core Course-I (Paper-6)	3	30	70	100	3
CC-II-5	Core Course-II (Paper-5)	3	30	70	100	3
CC-II-6	Core Course-II (Paper-6)	3	30	70	100	3
Soft-skill: Practical Core (PC) Course						
PC-I-3	Practical Core Course-I (Paper-5)	3		50	50	1.5
PC-I-4	Practical Core Course-I (Paper-6)	3		50	50	1.5
PC-II-3	Practical Core Course-II (Paper-5)	3		50	50	1.5
PC-II-4	Practical Core Course-II (Paper-6)	3		50	50	1.5
Foundation Course (FC)						
FG-21	Compulsory English (L.L.)	2	15	35	50	2
Elective Course (EC)						
EG-21	Elective (Generic) Course	2	15	35	50	2
ES-21	Elective (Subject) Course	2	15	35	50	2
		30	165	585	750	24



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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

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

Format for Questions paper Core Compulsory Course in Botany

(B.Sc. Sem. – IV)

(W.E.F. JUNE - 2021)

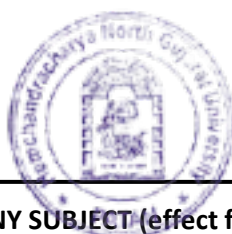
The university examination paper consists of four questions.

- First question is of 20 marks and will be from Unit – I.
- Second question is of 20 marks and will be from Unit – II.
- Third question is of 20 marks and will be from Unit – III.
- Fourth question is of 10 marks and will be from Unit – I TO IV.

Time: 2.5 Hrs

Total Marks: 70

- | | |
|--|----|
| 1. Long answered and medium answered/short note-typed questions from Unit-I | 18 |
| a. Long answered questions (Attempt any two from three each of 5 marks) | |
| b. Medium answered or short note-typed questions (Attempt any two from three each of 4 marks) | |
| 2. Long answered and medium answered/short note-typed questions from Unit-II | 17 |
| a. Long answered questions (Attempt any two from three each of 5 marks) | |
| b. Medium answered or short note-typed questions (Attempt any two from three , 4+3 marks) | |
| 3. Long answered and medium answered/short note-typed questions from Unit-III | 18 |
| a. Long answered questions (Attempt any two from three each of 5 marks) | |
| b. Medium answered or short note-typed questions (Attempt any two from three , 4+3 marks) | |
| 4. a. Answer the following questions (any six out of eight)
(Objective type short questions) | 12 |
| b. Answer the following questions (any 5 out of seven)
(MCQs) | 05 |




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

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

Format for Questions paper Elective Course in Botany

(B.Sc. Sem - IV)

(W.E.F. JUNE - 2021)

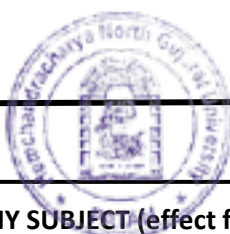
The university examination paper consists of three questions.

- First question is of 12 marks and will be from Unit - I.
- Second question is of 12 marks and will be from Unit - II.
- Third question is of 11 marks and will be from Unit - I & II.

Time: 2 Hrs

Total Marks: 35

Q.1 (a) Attempt any one out of two.	06 Marks
(b) Attempt any two out of three.	06 Marks
Q.2 (a) Attempt any one out of two.	06 Marks
(b) Attempt any two out of three.	06 Marks
Q.3 (a) Attempt any three out of five (SQ).	06 Marks
(b) Attempt any five out of eight.	05 Marks



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B. Sc. Semester-IV
Botany :: CC-BOT-401
Anatomy of Angiosperms
(Credits: Theory-3, Practical-1.5)
Theory Lectures: 54

Unit 1: Anatomy

(18 lectures)

- The three tissue systems, types of cells and tissues.
- Classification of tissues; Simple and complex tissues; tracheary elements and sieve elements.
- Types of vascular bundles; Structure of dicot & monocot stem and leaf.
- Ergastic substances (starch grains of Potato & Wheat, Aleurone layer of Maize, Aleurone crystal of Castor seed), Hydathodes, Cavities, Cystolith and Laticifers.

Unit 2: Meristems

(18 Lectures)

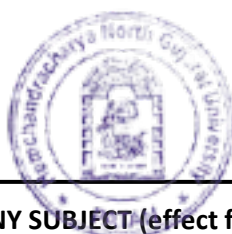
Definition & characteristics of meristem, Evolution concept of organization of shoot apex (Apical cell theory, Histogen theory and Tunica Corpus theory).

- Organization of root apex (Histogen theory, Korper-Kappe theory and Quiescent centre theory).
- Epidermal tissue system; cuticle, epicuticular waxes.
- Trichomes (Uni-and Multicellular, Glandular and Nonglandular, two examples of each), Stomata: types, location, structure & function, classification (Metcalfe and Chalk).

Unit 3: Secondary growth

(18 Lectures)

- Structure, function and activity of cambium; Secondary growth definition and types- normal and anomalous.
- Secondary growth in **Sunflower** stem and root.
- Anomalous Secondary growth in **Salvadora** stem and **Tinospora** aerial root.
- Sapwood and heartwood; Ring and diffuse porous wood; Tyloses, Periderm and Lenticels.




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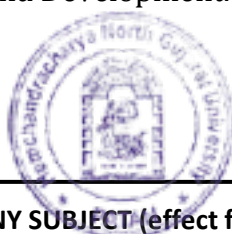
B. Sc. Semester-IV
Botany :: PC-BOT-401
Anatomy of Angiosperms

Practicals:

1. Study of anatomical details through permanent slides/temporary stain mounts/macerations/ museum specimens with the help of suitable examples.
2. Ergastic substances (Aleurone layer of Maize, Aleurone crystal of Castor seed), Hydathodes, Cavities, Cystolith (*Ficus* leaf).
3. Apical meristem of root and shoot.
4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings (Sunflower & *Cucurbita* stem).
5. Wood: ring porous; diffuse porous; tyloses; heart- and sapwood (chart).
6. Phloem: Sieve tubes-sieve plates; companion cells (*Cucurbita* stem).
7. Epidermal system: stomata types (Dicot & Monocot); trichomes: non-glandular (*Abutilon*/Cotton), glandular (*Ocimum*), Periderm (PS) & Lenticels (PS).
8. Root: Secondary growth (Sunflower root & aerial root of *Tinospora*).
9. Stem: secondary growth (Sunflower & *Salvadora* stem).

Suggested Readings

1. Dickison, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA.
2. Fahn, A. (1974). Plant Anatomy. Pergmon Press, USA.
3. Mauseth, J.D. (1988). Plant Anatomy. The Benjammin/Cummings Publisher, USA.
4. Evert, R.F. (2006) Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc.




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B. Sc. Semester-IV

Botany :: CC-BOT-402

Economic Botany

(Credits: Theory-3, Practical-1.5)

Theory Lectures: 54

Unit 1: Plant Resources-1

(18 lectures)

- Introduction of plant resources.
- Concept of centres of origin, their importance with reference to Vavilov's work.
- Classification of economic important plants based on their uses.
- Origin, morphology, processing and uses of **Wheat** and **Rice**, Brief account of **millet**s.

Unit 2: Plant Resources- 2

(18 lectures)

- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Chick pea** and **Pigeon pea**.
- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Potato**.
- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of spices: **Clove** and **Black Pepper**.
- Morphology and processing of **Sugarcane**, products and by-products of sugarcane industry.

Unit 3: Plant Resources- 3

(18 lectures)

- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Groundnut** and **Mustard**.
- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Fennel**.
- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Tea**.
- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Cotton** and **Jute**.




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B. Sc. Semester-IV
Botany :: PC-BOT-402
Economic Botany

Practicals:

Write Scientific name, Family, Useful part, Chemical constitutes, economic important and draw labelled diagram of plant:

1. **Cereals:**

- **Wheat** (habit sketch, starch grains, micro-chemical tests).
- **Rice** (habit sketch, study of paddy and grain, starch grains, micro-chemical tests).

2. **Legumes:**

- **Chick pea** and **Pigeon pea** (habit, fruit, seed structure, micro-chemical tests).

3. **Sources of oils and fats:**

- **Mustard** and **Groundnut** –plant specimen, seeds; tests for fats in crushed seeds.

4. **Sources of sugars and starches:**

- **Sugarcane**
- **Potato:** Potato tuber morphology, w.m. starch grains, Iodine test).

5. **Spices:**

- **Black pepper** (habit),
- **Fennel** (habit) and
- **Clove** (habit).

6. **Beverages:**

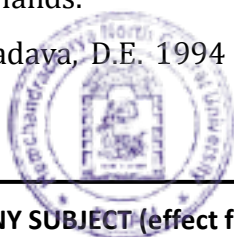
- **Tea** (plant specimen and tea leaves).

7. **Fiber-yielding plants:**

- **Cotton** (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose),
- **Jute** (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).

Suggested Readings

1. Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
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.



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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B. Sc.: BOTANY :: SEMESTER-IV

ES -BOT-401 :: Plant Breeding

(Credits: Theory-2)

Theory Lectures: 30

(Effective from June 2021)

Unit 1: Plant Breeding

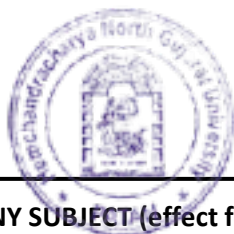
(15 lectures)

- Introduction, definition and objectives of plant breeding.
- Breeding systems: modes of reproduction in crop plants.
- Important achievements and undesirable consequences of plant breeding.
- Vegetatively propagated plants – Procedure, advantages and limitations.

Unit 2: Inbreeding depression and heterosis

(15 lectures)

- History, genetic basis of inbreeding depression and heterosis; Applications.
- Selection methods: Mass selection and Pure line selection.
- Hybridization procedure
- Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.




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CBCS - Semester - Grading Pattern

B. Sc. :: BOTANY Practical :: SEMESTER-IV

PC-BOT-401

(Effective from June-2021)

Date:

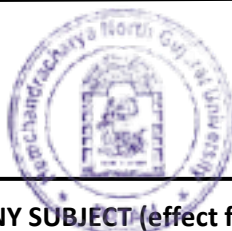
Place:

Time: 5 Hrs

Total Marks: 50

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

1. Show _____ from plant material **A** stain if necessary with appropriate staining. Draw labelled diagram and show your preparation to the examiner (Unit 1). **08**
2. Expose and mount _____ from given material **B** stain if necessary show your Preparation to your examiner (Unit 2). **08**
3. Make a temporary stained preparation of specimen **C** for secondary growth. Draw labelled Diagram and show your preparation to the examiner (Unit 3). **08**
4. Identify and describe the anatomical structure observed in **16**
 - 1) Specimen – **D**: Permanent slide/charts (Unit – I)
 - 2) Specimen – **E**: Permanent slide/charts (Unit – II)
 - 3) Specimen – **F**: Permanent slide/charts (Unit – III)
 - 4) Specimen – **G**: Permanent slide/charts (Unit – I, II and III)
5. a. *Viva-voce* **05**
b. Journal **05**




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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B. Sc. :: BOTANY Practical :: SEMESTER-IV

PC-BOT-402

(Effective from June 2021)

Date:

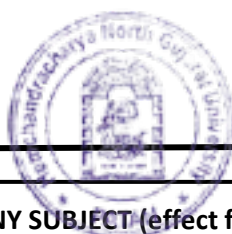
Place:

Time: 5 Hrs

Total Marks: 50

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

1. Perform the micro chemical tests for detection of organic molecule (Starch grain) in given sample **A** and describe the plant in details containing this molecule. Show your result to the examiner. **08**
2. Perform the micro chemical tests for detection of organic molecule (Legume protein) in given sample **B** and describe the plant in details containing this molecule. Show your result to the examiner. **08**
3. Perform the micro chemical tests for detection of organic molecule (Fats, Lignin, and Cellulose) in given sample **C** and describe the plant in details containing this molecule. Show your result to the examiner. **08**
4. Identify and write scientific name, family, useful part, economic important and draw labelled diagram (except Que: 1,2 & 3): **16**
 1. Specimen – **D**
 2. Specimen – **E**
 3. Specimen – **F**
 4. Specimen – **G**
5. a. *Viva-voce* **05**
b. Journal **05**



[Signature]

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN-384265

Faculty of Science

B.Sc. Chemistry

Syllabus

Semester-III & IV

W.E.F June-2021 (and thereafter)

CURRICULUM

Hemchandracharya

North Gujarat University,

Patan.

B.Sc. (Chemistry)

(W.E.F June: 2021)





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General Information of B.Sc Chemistry Semester III & IV
Syllabus According To CBCS Pattern

1. The medium of instruction, question papers as well as answers in examinations will be Gujarati /English. Students are permitted to write answers in English or Gujarati language.
 2. Passing standard: 40% as per the revised rules and regulation of Hemchandracharya North Gujarat University, Patan (AK/A×S/6179/2021, Date 29/01/2021).
 3. Viva voice will be pertaining to practicals.
 4. The result sheet of all semesters will contain the name of elective papers selected by the candidate. The grade and the credit secured.
 5. The proposed new courses in chemistry for under graduate classes are reassigned in accordance to semester/CBCS/Grading system with new educational policy. The new course is based on model curriculum of the university grants commission.
- Its objectives are as under:**
- A. To meet the growing demand of specialization and Advanced courses in applied Science.
 - B. To help the colleges to update and modernize their laboratories.
 - C. To redesign the courses with special emphasis on local requirements, environment and to link the courses, with requirements of the industries and research.
6. There will be two papers of chemistry are core compulsory and one paper of subject elective in theory and five hours for practical in the University Examination. The pattern will be as follow.
 7. This syllabus is to be completed by assigning three periods of one hour each for each paper of theory and two practicals of three hours each per week & the number of students in practical batch should not exceed twenty.
 8. The number of students in practical batch in University Examination should not exceed twenty four between two examiners.
 9. For semester III the papers; CCCH-301, CCCH-302 are core compulsory. Furthermore, students will have to choice any one of SECH-301A & SECH-301B and Practicals LCCH-301 & LCCH-302.
 10. For semester IV the papers; CCCH-401, CCCH-402 are core compulsory. Furthermore, students will have to choice any one of SECH-401A & SECH-401B and Practicals LCCH-401 & LCCH-402.




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CHEMISTRY
B.Sc. Semester: IV

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN			
Programme code :	-	Programme Name :	B.Sc.
Faculty :	SCIENCE	Semester :	IV
Subject :	CHEMISTRY		
Effective from :	June- 2021		

Sr.	Paper Code	Name of Paper	Credit
1	CC CH - 401	CORE COMPULSORY- CHEMISTRY - I	3
2	CC CH - 402	CORE COMPULSORY- CHEMISTRY - II	3
3	SE CH - 401 A	SUBJECT ELECTIVE - NAME REACTIONS	2
	SE CH - 401 B	SUBJECT ELECTIVE - GREEN CHEMISTRY	
4	FC	FOUNDATION COURSE - ENGLISH	2
5	GEC	GENERIC ELECTIVE	2
6	LC CH - 401	LABORATORY COURSE - I	1.5
7	LC CH - 402	LABORATORY COURSE - II	1.5
8		TWO PAPERS OF SECOND CORE SUBJECT	6
9		TWO PRACTICALS OF SECOND CORE SUBJECT	3
		Total	24



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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. Semester: III & IV CHEMISTRY SYLLABUS (Effective from June 2021)

This syllabus is to be completed by assigning three period of one hour each for core course, two period of one hour each for subject Elective course. And two practical's of three hours each per week. The number of students in a practical batch should not exceed twenty four.

PATTERN OF EXAMINATION:

There will be two papers for core compulsory and one paper for subject elective theory and five hours/day for two days per batch Practicals in the university examination. The pattern of examination will be as follows.

Theory & practical Exam	Time Duration	Marks External	Marks Internal
Core course - I	2.5 hours	70	30
Core course – II	2.5 hours	70	30
Subject elective course	2 hours	35	15
Laboratory course - I	5 hours	50
Laboratory course - II	5 hours	50

Theory Examination Pattern: (For Core Papers)

Time : 2.5 hrs.

Total Marks : 70

Que. No: 1	Write any Two out of Three Questions	18 Marks
Que. No: 2	Write any Two out of Three Questions	17 Marks
Que. No: 3	Write any Two out of Three Questions	18 Marks
Que. No: 4	Write any Two out of Three Questions	17 Marks

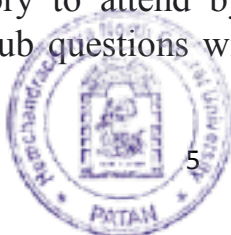
Theory Examination Pattern: (For Elective Papers)

Time : 2 hrs.

Total Marks : 35

Que. No: 1	Write any Two out of Three Questions	18 Marks
Que. No: 2	Write any Two out of Three Questions	17 Marks

Note: If there are more than one concept or style of question are present in any paper or any unit like as theory and examples and when that both type of the questions will be compulsory to attend by students, than paper setter can ask different way like.. a & b sub questions with internal option, in the place of the style shown above.



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Hemchandracharya North Gujarat University, Patan
B.Sc. Semester - IV
Chemistry (CC CH : 401)

Unit 1: CFT & Co-Ordination Compounds

(16 Hrs.)

(A) CRYSTAL FIELD THEORY :

- Splitting of d-orbitals Oh and Td
- Application of CFT:
 - For determination of colour of complexes
 - Use of CFSE Value.
- Limitation of CFT
- Isomerism in complexes
- Low spin and high spin complexes.

(B) MAGNETIC PROPERTIES OF CO-ORDINATION COMPOUNDS :

- Type of magnetic behavior
- Method of determining magnetic susceptibility.
- Spin only formula.
- Magnetic properties for 3rd metal complexes.

Unit 2 : CARBOHYDRATES :

(16 Hrs)

- Introduction
- Classification and nomenclature of Mono Saccharides.
- Reactions of Glucose and Fructose.
(Methylation, Acetylation, Oxidation with Br₂ water and Conc. HNO₃ , Reaction with HCN , NH₂OH , C₆H₅NHNH₂ , 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
 - (1) Glucose from Fructose (2) Fructose from Glucose
 - (3) Glucose from Manose (4) Manose from Glucose
 - (5) Glucose from Arabinose (6) Arabinose from Glucose




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Unit: III PHYSICAL PROPERTIES OF LIQUID:

(16 Hrs)

- Vapour pressure,
- Surface tension,
 - (1) Measurement and Application of surface tension by Stalagmometer
 - (2) Perachore and its applications.
- Viscosity
 - (1) Measurement and Application of viscosity by Ostwald viscometer.
- Refractive index
 - (1) Specific refraction
 - (2) Molar refraction
 - (3) Measurement and Application of Refractive index by abbe's Refractometer.
- Optical activity
 - (1) Measurement and Application of optical activity by Polari meter.
- Dipole moment and its measurement and its applications.
- Numerical.

Note: The nomenclature of Inorganic and organic compounds should be done as per Recommendation of 2004 IUPAC Draft.



Hemchandracharya North Gujarat University, Patan
B.Sc. Semester - IV
Chemistry (CC CH : 402)

Unit1: BORON HYDRIDE: (16 Hrs)

- Introduction
- Classification of hydrides.
- Preparation, properties structure and use of Diborane.
- Bridge bonding in B_2H_6 (M.O. and sp^3 approach).
- Structure of higher Borones: B_4H_{10} , B_5H_9 , B_5H_{11} , B_6H_{10} , $B_{10}H_{14}$.

Unit 2: ULTRAVIOLET SPECTROSCOPY : (16 Hrs)

- Type of electronic transitions.
- Effect of conjugation.
- Concept of Chromophores and Auxochromes.
- Bathochromic, Hypsochromic, Hyper chromic, and Hypochromic shifts.
- Woodward – Fisher rules.
- Problems of conjugated enes, enones and aromatic ketones, aldehydes, acids and esters using empirical rules.

Unit 3: PHASE RULE: (16 Hrs)

- Gibbs Phase rule- statement and meaning of terms- phase, component, degree of freedom,
- Derivation of phase rule,
- Advantages and limitations of phase rule,
- One component system
 - 1) water system,
 - 2) Sulphur system,
- Reduced phase rule of condensed system,
- Two component system:
 - 1) Pb - Ag system,
 - 2) Zn - Mg system,
 - 3) KI - water system,
- Dehydration of $CuSO_4 \cdot 5H_2O$
- Steam distillation
- Numerical.

Note: The nomenclature of Inorganic and organic compounds should be done as per Recommendation of 2004 IUPAC Draft.



REF:-

❖ **Inorganic Chemistry:**

1. Inorganic Chemistry by James e. Huheey “Fourth Edition”
2. Advance Inorganic Chemistry- Satya prakash. G.D.Tuli, S.K.Basu, R.D.Madan, S.Chand Vol-II.
3. Advance Inorganic Chemistry - Satya prakash, S.Chand, Vol-I.PAGE NO-819-828.

❖ **Organic Chemistry:**

1. Organic Chemistry by Morrison and Boyd.4th ed. Pearson Education-2003
2. Organic Chemistry by Pine, Hendrickson, Cram and Hammond 4th ed. By P.S.Kalsi.
3. Advance Organic Chemistry by Jerry March.
4. Advance Organic Chemistry by Arun Bahal 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 Gurdeep R Chatwal 4th ed. Himalaya public House.
7. Text book of Organic Chemistry by Arun Bahal, B.S.Bahal, S.Chand.
8. Spectroscopy of Organic Compounds 6th Ed. By P.S.Kalsi.
9. Organic Chemistry by I.R.Finar.
10. Organic Spectroscopy by Williams and Kemp.
11. Spectroscopic Methods in Organic Chemistry by Dubey H.Williams and Ian Fleming.

❖ **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.Mishra.
5. Essential of Physical Chemistry by B.S.Bahal, Arun Bahal, G.D.Tully.
6. Physical Chemistry by P.W.Atkins, 5th ed., Oxford 1994 7th ed. 2002
7. Physical Chemistry by R.A.Alberty and R.J.Silbey, John Willey, 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.



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**B.Sc. Semester - IV
Chemistry (SE CH : 401 A)**

**NAME REACTIONS
(Subject Elective)**

Unit – I: Name Reactions -I :

(16 Hrs)

Mechanism, Synthesis and applications

- Arndt – Eistert Reaction.
- Hofmann Rearrangement.
- Aldol Condensation.
- Diels – Alder Reaction.
- Riemann tiemann reaction

Unit – II: Name Reactions -II

(16 Hrs)

Mechanism, Synthesis and applications

- Dickmann Condensation.
- Mannich Reaction.
- Clemmensen Reduction
- Wolff kishner Reduction
- Dakin Oxidation.

REF :-

1. Name Reaction by Prof. G.S.Kapadia, Uni.Granth Nirman Board.
2. Name Reaction by Jie Jack Li, Springer International Edition.
3. Reaction Mechanism and Reagents in Organic Chemistry by G.R.Chatwal.



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B.Sc. Semester - IV
Chemistry (SE CH: 401 B)
GREEN CHEMISTRY
(Subject Elective)

Unit I: BASICS OF GREEN CHEMISTRY: (16 Hrs)

- The need for green Chemistry.
- Eco-efficiency-environmental protection laws,
- Challenges – pollution control and pollution,
- Green methods, green products, recycling of wastes
- Twelve principles of green chemistry,
- Inception of green chemistry-awards for green chemistry,
- International organizations promoting green chemistry.

Unit: II: DESIGNING GREEN SYNTHESIS (16 Hrs)

- Choice of starting materials, choice of reagents, choice of catalysts.
- Bio catalysts, polymer supported catalysts, choice of solvents.
- Synthesis involving basic principles of green chemistry.
- Examples – adipic acid, catechol, methyl methacrylate, urethane, aromatic amines (4-aminodiphenylamine), benzyl bromide, acetaldehyde, citral, ibuprofen, Paracetamol.

REF :

1. V.K.Ahluwalia & M.R.Kidwai : New Trends in Green Chemistry, Anamalaya Publishers (2005).
2. V.Kumar, An Introduction to Green Chemistry, Vishal Publishing Co.Jalandhar, 2007.
3. Sanghi A Shrivastav Green Chemistry




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Hemchandracharya North Gujarat University , Patan
B.Sc Semester - IV
Laboratory Course – I & II (Chemistry)

Lab Course : I Organic Chemistry

Separation of Organic Mixture : (Any Six)
Mixture Containing Two Compounds (Only Water Insoluble Solid Compounds)

Lab Course : II Physical Chemistry :

Conductometer:

- 1) To determine the cell constant by KCl solution and to determine the normality and amount of HCl / CH₃COOH Vs NaOH.

P^H - meter

- 1) To determine the normality and amount of HCl Vs NaOH.
- 2) Determine the Dissociation constant of the acid of mixtures of CH₃COONa and CH₃COOH by determine the P^H.

Refractometer (Any One)

- 1) 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 mixture C by Abbe's Refractometer.
- 2) Determine the molar refraction of CH₃COOC₂H₅ , CH₃COOC₃H₇ and CH₃COOC₄H₉ and show the constancy of reaction equivalent of – CH₂ - Group by Abbe's Refractometer.

Viscometer:

- 1) To determine the viscosity of liquid A, B and Mixture C (A+B) and determine the percentage composition of A and B in the mixture C by graphical method.

Stalagmometer: (Any One)

- 1) To determine the surface tension and compare cleaning – efficiency of two samples of a detergent or soap with stalagmo meter.
- 2) Determine the surface tension of the given liquid A, B, and mixture C (A+B) and Calculate the percentage of A and B in the mixture C.

Chemical Kinetics: (Any One)

- 1) Finding the relative strength of HCl and H₂SO₄ from the Catalytic method.
(finding the relative strength of two acids by hydrolysis of methyl acetate)
- 2) Determining the degree of hydrolysis between Urea and HCl by Catalytic method.




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University Exam Pattern for B.Sc Sem - IV : (Two Days per Batch)

Name of Practical	Day	Marks
Lab. Course – I Organic Separation	First day (5 hours)	40 + 5(viva) = 45
Lab. Course – II Physical Chemistry	Second day (5 hours)	40 + 5(viva) = 45
	Journal	10
	Total	100

REF:-

1. Advanced practical chemistry, Jagdamba Singh, Pragati prakashan
2. A Manual of practical Engineering Chemistry, Dr.M.S.Sudha Jain, S.Chand & Company Ltd.
3. Vogel's Qualitative inorganic Analysis, 7th Edition, G.svehla




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NAAC 'A' (CGPA) Accredited (State University)

U.G. (B. Sc.) Programme
CBCS :: Semester :: Grading Pattern

With effect from: June 2021

Faculty

Science

Subject

PHYSICS

NEW SYLLABUS / SCHEME

B.Sc. Semesters III & IV




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Choice Based Credit System-Semester-Grading System In Under Graduate B Sc Programme

B Sc Semester 3 and 4

The 11th Five Year plan of India proposed various measures for academic reforms in higher education. Keeping in view the challenges of the changed times and make the higher education in Indian Universities compatible with the universities in developed nations, the UGC (11th Plan, March 2009) and later on the Association of Indian Universities (AIU) stressed on the following recommendations:

- ❖ Semester System
- ❖ Choice Based Credit System.
- ❖ Curriculum Development
- ❖ Examination Reforms
- ❖ Administrative Reforms

All the above recommendations for reforms have been reviewed in by representatives of various universities in the Gujarat State and considered for implementation with the aim of transforming Higher Education-**a transformation where students change from being passive recipients of knowledge to becoming active participants of the knowledge imbibing process.** The education system in the State thus changes from a teacher-centric to **learner- centric** mode. It should aim at all-round integral development of students' personality so that they become good citizens of the new world order.

Salient Features of CBCS in UG Programme:

1. Physics subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2021-22.
2. A student will have to get enrolled a **Core course** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting an **Elective** as well as **Foundation** courses from a pool of courses.
3. Each course shall be assigned a specific number of **Credits**.
4. A Core course is the course which should compulsorily be studied by a candidate as a Core requirement so as to get degree in a said discipline of study.
5. There shall be four **Core Compulsory** courses (Theory) each with **3 credits** and their practical's each with **1.5 credits**. Thus, a credit weight-age in Sem-III & IV of **B Sc** programme for each core course shall be of **4.5 credits**. In short, 4.5 credits multiplied by 4 core compulsory courses equal to total of **18 credits**.



2


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PATAN

6. In addition to the Core courses, a student will have to choose Elective as well as Foundation courses from a pool of courses.
7. **Two** courses of **Elective**, one each from **Generic Elective** and Interdisciplinary / Multidisciplinary / **Subject centric electives** shall have to be offered. The credit weight-age for each Elective course shall be of **02 Credits**. Hence, a total credit weight-age for Elective courses shall be of **4 credits**.
8. One **Foundation** (English Language) course shall have to be offered. The credit weight-age for Foundation course shall be of **02 credits**.

Each course shall have a unique Course code. The Core courses, Elective courses and the Foundation courses shall be abbreviated respectively as **CC, PC, EG, ES and FC**.

1. **Core Compulsory - CC and Practical Core - PC**
2. **Core Compulsory - CC and Practical Core - PC**
3. **Elective Generic - EG and Elective Subject - ES**
4. **Foundation Compulsory- FC**

Each Academic year shall consist of **two** semesters, each of **15 weeks** of teaching equivalent to 90 working days. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.

The course with **4 credits** shall be of **60 hrs (15 weeks x 4 credits)** duration. The course with **3 credits** shall be of **45 hrs (15 weeks x 3 credits)** duration. The course with **2 credits** shall be of **30 hrs (15 weeks x 2 credits)** duration.


A general framework for Bachelor of Science (B Sc) Programme shall be as follows:

Semester wise credits						Total credits of the Programme
I	II	III	IV	V	VI	
24	24	24	24	24	24	144

The semester wise weight-age of core, elective and foundation courses shall be as follows:

Academic Year	Core Compulsory Courses	Elective courses	Foundation courses
Semester I & II	65-75%	15-20%	10-15%
Semester III & IV	65-75%	15-20%	10-15%
Semester V & VI	65-75%	15-20%	10-15%




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Attendance:

The Attendance Rules as per the norms of Hemchandracharya North Gujarat University.

Medium of Instruction:

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

Language of Question paper:

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

Evaluation Methods:

1. A student shall be evaluated through Comprehensive Continuous Assessment (CCA) or (Internal Evaluation) as well as the **End of Semester examination (External Evaluation)**. The weight-age of CCA or IA shall be 30%, where as the weight-age of the Semester end examination shall be 70%.

There will be no internal evaluation in Practical Courses as well as in elective courses.

2. The Semester assessment (CCA) or (Internal Evaluation) is spread through the duration of the course and is to be done by the Teacher teaching the course. The assessment is to be done by various means including:

- ✓ Internal Test - 20 Marks
- ✓ Assignments - 05 Marks
- ✓ Attendance - 05 Marks

The performance of student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points. Evaluation for each course shall be done by continuous internal assessment as well as semester end exam and will be consolidated at the end of the course.

3. The **End of Semester examination (External Evaluation)** shall have an assessment based upon following perspective with respect to all the courses:

- ✓ Evaluation with respect to Knowledge
- ✓ Evaluation with respect to Understanding
- ✓ Evaluation with respect to Skill
- ✓ Evaluation with respect to Application



✓ Higher Order Thinking Skills

4. With respect to all the above components, there shall be following types of Questions from each unit of the course.

- ✓ MCQs/Fill in the blanks/ Match the pairs, etc
- ✓ Short answer questions /Defenation
- ✓ Medium answer questions
- ✓ Long answer questions
- ✓ Examples/ Problems, etc

5. The End of Semester Examination (Theory) will be conducted by the University. A Certified Journal of the respective core compulsory course shall be produced at the time of practical examination and it must compulsory. In Practical Exam there will be two practicals (each from PC-301 & PC-302) **each of 50 marks (35-marks for practical + 15 marks for Viva)** and duration of each practical will be 3 hours. **Numbers of student in a practical exam will be 20 to 24 and Numbers of examiners will be 2.**

Marking Scheme of B Sc sem 3 and 4 Physics Practicalfor each one

- | | |
|---|------|
| 1. Understanding – Approach – Attitude for Experiment | - 10 |
| 2. Observation table with Reading, Unit | - 10 |
| 3. Calculation with proper formula and Graph | - 08 |
| 4. Accuracy | - 02 |
| 5. Viva (Ques related experiment and about basic physics) | - 15 |
| 6. Certified Journal | - 05 |

Total - 50

6. **It will be compulsory for a candidate to obtain passing percentage in both Internal as well as External Evaluation. The passing marks for each course shall be 40%, or as decided by concern Board of Studies of the Subject.**

7. 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.




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HEMCHANDRACHARYA
NORTH GUJARAT UNIVERSITY, PATAN
B.Sc. Programme with 144 credits CBCS-Semester-Grading Pattern
w.e.f. June-2021

General Pattern / Scheme of study components along with credits for Science faculty.

Part/ Class	Course	Study Components	Instruction Hrs/ Week	Examination			Credit
				Internal	Uni. Exam	Total	
B. Sc. Sem –III	Semester-III						
	Core Compulsory (CC) Course						
	CC-I-3	Core Course-I (Paper-3)	3	30	70	100	3
	CC-I-4	Core Course-I (Paper-4)	3	30	70	100	3
	CC-II-3	Core Course-II (Paper-3)	3	30	70	100	3
	CC-II-4	Core Course-II (Paper-4)	3	30	70	100	3
	Practical Core (PC) Course						
	PC-I-3	Practical Core Course-I (Paper-3)	3		50	50	1.5
	PC-I-4	Practical Core Course-I (Paper-4)	3		50	50	1.5
	PC-II-3	Practical Core Course-II (Paper-3)	3		50	50	1.5
	PC-II-4	Practical Core Course-II (Paper-4)	3		50	50	1.5
	Foundation Course (FC)						
	FC-3	Foundation (Generic) Course – III Compulsory English (L.L.)	2	15	35	50	2
	Elective Course (E)						
	EG-3	Elective (Generic) Course –III	2	15	35	50	2
	ES-3	Elective (Subject) Course –III	2	15	35	50	2
		30	165	585	750	24	
B. Sc. Sem-IV	Semester-IV						
	Core Compulsory (CC) Course						
	CC-I-5	Core Course-I (Paper-5)	3	30	70	100	3
	CC-I-6	Core Course-I (Paper-6)	3	30	70	100	3
	CC-II-5	Core Course-II (Paper-5)	3	30	70	100	3
	CC-II-6	Core Course-II (Paper-6)	3	30	70	100	3
	Practical Core (PC) Course						
	PC-I-5	Practical Core Course-I (Paper-5)	3		50	50	1.5
	PC-I-6	Practical Core Course-I (Paper-6)	3		50	50	1.5
	PC-II-5	Practical Core Course-II (Paper-5)	3		50	50	1.5
	PC-II-6	Practical Core Course-II (Paper-6)	3		50	50	1.5
	Foundation Course (FC)						
	FC-4	Foundation (Generic) Course – IV Compulsory English (L.L.)	2	15	35	50	2
	Elective Course (E)						
	EG-4	Elective (Generic) Course –IV	2	15	35	50	2
	ES-4	Elective (Subject) Course –IV	2	15	35	50	2
		30	165	585	750	24	



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Hemchandracharya North Gujarat University, Patan

B.Sc. Programme for semester 3 & 4

(CBCS-Semester-Grading pattern)

Semester end Examination

Format for Question paper **Elective Courses (Subject)** in Physics

w.e.f. June-2021

There will be three questions.

First question will be from Unit - I,

Second question from Unit-II, and

Third question will be from both the Units.

All the questions are detailed as under.

Time: 2Hrs

Total Marks: 35

- | | | |
|---|---|----------|
| 1 | (a) Attempt Any One out of Two (Theory questions) | 06 Marks |
| | (b) Attempt any two Out of Three
(Theory type or Application/Example/Problem) | 06 Marks |
| 2 | (a) Attempt Any One out of Two (Theory questions) | 06 Marks |
| | (b) Attempt any two Out of Three
(Theory type or Application/Example/Problem) | 06 Marks |
| 3 | (a) Attempt any three out of Five (Short or objective type questions) | 06 Marks |
| | (b) Attempt any Five Out of Eight (Objective / MCQ) | 05 Marks |




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B.Sc. Programme for semester 3 & 4

(CBCS-Semester-Grading pattern)

Semester end Examination

Format for Question paper Core Compulsory Courses in Physics

w.e.f. June-2021

There will be four questions. All questions are of 18, 17, 18, 17 marks each.

First question will be from Unit - I, Second question will be from Unit-II,

Third question will be from Unit-III, **Forth question will be from all three Units.**

Detailed about all the questions is as under.

Time: 2.5 Hrs

Total Marks: 70

- | | | |
|-------|---|----------|
| 1 (a) | Answer any One out of Two (Long Theory type questions) | 07 Marks |
| (b) | Answer any Two Out of Three
(Short Note/Application/Example/Problem) | 10 Marks |
| 2 (a) | Answer any One out of Two (Long Theory type questions) | 08 Marks |
| (b) | Answer any Two Out of Three
(Short Note/Application/Example/Problem) | 10 Marks |
| 3 (a) | Answer any One out of Two (Long Theory type questions) | 07 Marks |
| (b) | Answer any Two Out of Three
(Short Note/Application/Example/Problem) | 10 Marks |
| 4 (a) | Answer the following (Any Six out of Eight)
(Short answer or objective type questions) | 12 Marks |
| (b) | Answer the following (Any Five out of Seven)
(Very Short answer or MCQ type questions) | 06 Marks |



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[Handwritten Signature]

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER IV

(PHYSICS SYLLABUS: Effective from June - 2021)

CC - PHYSICS - 401

UNIT I CLASSICAL MECHANICS

Mechanics of a Single Particle and of System of Particles:

Equation of Motion (3.3), (a) Motion under Constant Force, (b) Motion under a Force which depends on Time only, (d) Case (1) Motion of a particle subjected to a Resistive Force, Case (2) Motion of particle falling under the action of Gravity near the surface of Earth.(3.3) Mechanics of system of particles (3.5), Angular Momentum of the system (3.5 a), Energy of the System(3.5 b), Kinetic Energy of the system(3.5 c), Motion of system with variable mass(3.6) *Related Examples, Problems, MCQ & Short Questions*

Special Theory Relativity:

Newtonian Relativity(14.1), Michelson-Morley experiment(14.2), Special theory of relativity(14.3), Lorentz Transformation(14.4), Consequences of Lorentz Transformation(14.5) - (a) Relativity of simultaneity (b) Lorentz-fitz Gerald length Contraction (c) Time dilation, Addition of Velocities (14.6), Variation of mass with Velocity(14.7) Mass- energy relation (14.8) *Related Examples, Problems, MCQ & Short Questions*

Basic Reference:

Introduction to Classical Mechanics by R G Takwale & P S Puranik McGrawHill Education (India) Private Limited

Other References:

1. Concept of Modern Physics by Besier McGraw-Hill
2. Elements of Special Relativity by S.P. Singh & M.k.Bagde S. Chand & Co. New Delhi.
3. Properties of Matter by Brijlal, N.Subrahmanyam, S.chand.
4. Classical Mechanics by Goldstein Narosa Publishing House New Delhi
5. Classical Mechanics by Yashavant Waghmare
6. Classical Mechanics by N C Rana and P S Joag

UNIT II NUCLEAR PHYSICS

Detectors and Accelerators:

Introduction (1.1.1), Interaction between Particles and Matter (A brief survey) (1.1.2), Detectors for Nuclear Particles (1.1.3), (i) Proportional counter (iii) scintillation counter (iv) Solid State or Semiconductor detectors, **Particle Accelerators**(1.1.4),: Need for an Accelerator of charged Particles : (ii) The Cyclotron, (iii) Synchrotron.



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Radioactivity: (Review of Radioactive decay laws, half life, mean life time etc.)

Radioactive growth and decay (2.6), Ideal equilibrium (2.7), Transient equilibrium and secular equilibrium (2.8) Radioactive series (2.9) Determination of the age of the Earth (2.12), Carbon Dating-Archaeological Time Scale(2.13)

The Q-Equation:

Introduction (3.1), Types of Nuclear Reaction (3.2), The Balance of Mass and Energy in Nuclear Reaction (3.3), The Q-equation (3.4), solution of the Q-Equation (3.5)

Basic reference:

Nuclear Physics by S. B. Patel (New age International (p) Ltd. Publishers)

Other References:

1. Elements of Nuclear physics by M.L.Pandya & R.P.S. Yadav Kedarnath Rmnath Meerut
2. Nuclear Physics by Kaplan
3. Nuclear Physics by D C tayal, Himalaya Publishing House

UNIT III PLASMA PHYSICS

The Basic concepts of Plasma:

Introduction (1.1), Composition and Characteristics of a Plasma (1.2), Collisions (1.3), Elastic collisions (1.3.1), Inelastic collisions (1.3.2), Surface Phenomena (1.4), Transport Phenomena (1.5), Diffusion and Mobility (1.6) , Viscosity, Conductivity (1.7) , Recombination(1.8), Ohm's law (1.9), Gas Discharge (1.10), Composition of various natural and Man-made Plasma (1.11), Plasma Diagnostics (1.12), Plasma waves and Instabilities Confinement of Plasma (1.13), Space Plasma (1.14). *Related Examples, Problems, MCQ & Short Questions*

Motion of Charge and velocity in Magnetic and Electric Field

Introduction : Microscopic and Macroscopic approach (2.1), Maxwell's equation Equation of continuity (2.2), (i)Motion of charged particle in electric and magnetic field, (ii) Larmour Radius and Larmour Frequency, (iii) Kinetic Energy (2.3),Uniform magnetic Field and Oscilating electric field(2.4), Magnetic Trap and Double Mirror (2.9.1), Van Allen Radiation Belt(2.9.3) *Related Examples, Problems, MCQ & Short Questions*

Basic Reference :

Elements of Plasma physics by S.N. Goswami New Central book Agency (p) Ltd., Calcutta.

Other References:

1. Introduction to Plasma Physics and Controlled Fusion Vol-1 F.F.Chen.
2. Plasma physics by S.N.Sen



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CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER IV
(PHYSICS SYLLABUS : Effective from June - 2021)

CC - PHYSICS – 402

UNIT I STATISTICAL MECHANICS

Statistical Mechanics : Microscopic & Macroscopic States:

Microscopic states (4.1) Macroscopic States (4.2) Phase Space (4.3) μ -Space (4.4), τ -Space, (4.5), Postulate of equal a priori probability(4.6)

Statistical ensemble :

Micro canonical ensemble (5.1), canonical ensemble(5.2), Alternative method for the derivation of canonical distribution(5.3) Mean Value and Fluctuations(5.4), Grand canonical ensemble(5.5), Alternative derivation of Grand canonical distribution(5.6), Fluctuations in the number of particle of a system in a grand canonical distribution(5.7), Reduction of Gibb's distribution to maxwell's and Boltzman distribution(5.8), Barometric formula (5.9), Experimental verification of the Boltzman distribution(5.10)

Related Examples, Problems, MCQ & Short Questions

Basic Reference :

Fundamentalas of Statistical Mechanics 2nd edition by B B LAUD, New Age International Publishers

Other Reference :

1. Statistical Mechanics and Properties of Matter by E.S.R. Gopal Mc Millan Co. of India Ltd.
2. Statistical Mechanics by B K Agarwal – Melvin Eisner, New Age Inte.Publication

UNIT II MATHEMATICAL PHYSICS AND QUANTAM MECHANICS

Fouries series:

Introduction (7.1), Periodic functions (7.2), Application of Fourier series (7.3), Average values of a function (7.4), Fourier Co-efficient (7.5), Diriclet's condition (7.6), Complex form of Fourier Series(7.7), Other Interval even and odd function(7.8), Parceval Theorem(7.11) *Related Examples, Problems, MCQ & Short Questions*

Basic Reference:

Mathematical method for physical sciences by M.L.Boss John wiley Publication.

Other References:

1. Mathematical method for Engineer and Physicist by L. A. Pipes Tata Mc-Graw Hill Publication
2. Mathematical Physics by B D Gupta



Schrodinger Equations and Stationary States:

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), Normalization and Probability Interpretation(2.4), Non-Normalizable Wave functions and Box Normalization(2.5). Conservation of Probability(2.6), Expectation values, Ehrenfest's Theorem(2.7), Admissibility Condition on the Wave function(2.8), Stationary States- The time Independent Schrodinger Equation (2.9), Particle in a Square Well Potential, Bound States in a square well ($E < 0$) *Related Examples, Problems, MCQ & Short Questions*

Basic Reference: *A Text Book of Quantum Mechanics by Mathews and K.Venkatesan
Tata Mc-Graw Hill Publication*

Other reference:

Quantum Quantum Mechanics by John L. Powell and Bend Crasemann
Quantum Quantum Mechanics by Ghatak and Lokanathan
Quantum Quantum Mechanics by Schiff

UNIT III ELECTRONICS

Digital Electronics:

Introduction (21.1), Number system used in Digital Electronics (21.2), Decimal, Binary, Hexadecimal and Octal (21.2.1 to 21.2.4), Binary Codes-(A) BCD, (B) Gray, (C) Excess-3 Codes (21.4), Universal Gate -NAND Gate, Bubbled OR Gate, Universal Gate-NOR Gate, Bubbled AND Gate, To Prepare NOT, AND and OR Gate Using Univarsal Gate (NAND Gate), Arithmetic Circuits – Exclusive – OR Gate (21.9), Application of X-OR Gate: (i) Binary to Gray Code Converter (ii) A Parity Checker (iii) The Half Adder (iv) The Full Adder (v) Parallel Adder (vi) Half Subtractor, (vii) Full subtractor. *Related Examples, Problems, MCQ & Short Questions*

Basic Reference:

Hand book of Electronics by Gupta & Kumar 30th Revised Edi., 2002 Pragati Prakashan, Meerut.

Solid state Devices:

JFET (12.1 to 12.6), UJT (26.6, 26.6.1 to 26.6.3), SCR
Related Examples, Problems, MCQ & Short Questions

Basic Reference:

Electronics and Radio Engineering by M.L.Gupta (9th Edition -2002) D Raj & Sons.



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B. Sc. SEMESTER IV

(PHYSICS SYLLABUS : Effective from June - 2021)

**Elective Subjective :: PHYSICS : ES - 05
ASTRO / SPACE PHYSICS**

UNIT I

Sun and Solar Radiation:

Introduction, Astronomical background, General description of the sun, Solar structure, Sun's outer layers, Composition, Visible features on the sun, More about sun's outer atmosphere, Temperature of the corona, Solar activity and Sunspot cycles.

UNIT-II

Cosmic rays and High energy astrophysics

An introduction to cosmic rays and high energy astrophysics: primary cosmic radiation, energy spectrum of primary cosmic rays, secondary cosmic rays, effect of geomagnetic field on cosmic rays, time variation of cosmic rays, photons in primary cosmic rays, origin of cosmic rays, basic facts about cosmic rays, region of confinement

Basic Reference:

*An Introductory Course on Space Science and Earth's Environment by S.S.Degaonker
(Gujarat University Publication, Ahmedabad)*



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CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER IV
(PHYSICS SYLLABUS : Effective from June - 2021)

Elective Subjective :: PHYSICS : ES – 06
MEDICAL PHYSICS

UNIT I

Medical Imaging Physics

Introduction: What is Medical Physics ? Evolution of Medical Imaging, X-ray diagnostics and imaging, Physics of NMR(Nuclear Magnetic Resonance), NMR Imaging, MRI Radiological Imaging, Ultrasound Imaging, Physics of Doppler with Applications and modes, Vascular Doppler.

Radiography: Filters, Grids, cassette, X-ray film, Film processing, Fluoroscopy, Computed tomography scanner – Principle and Function, display, generations, mammography, Thyroid uptake system and gamma camera (only Principle, function and Display)

UNIT-II

Radiation Oncology Physics: External Beam Therapy (Basic Idea), Telecobalt, Conformal Radiation Therapy (CRT), 3D CRT, IMRT, Image Guided Radiotherapy, EPID, Rapid arc, Proton Therapy, Gamma Knife, Cyber Knife, Contact beam Therapy (Basic Idea), Brachy Therapy-LDR and HDR, Intra Operative Brachy therapy, Radiotherapy, Kilo Voltage Machines, Deep therapy Machine, Telecobalt Machines, Medical Linear accelerator, Basics of Teletherapy units, deep X-ray, Telecobalts units, Radiation Protection, External beam characteristics, dose maximum and build up bolus, percentage depth dose, tissue maximum ratio, and tissue phantom ratio, planned target volume and gross tumour volume.

Reference :

1. Physics of the human Body , by Irving P Herman Springer -2007
2. Medical Physics by J R Cameron and J G Skofronick, Wiley 1978
3. Handbook of Physics in Diagnostic Imaging, by R S Livingstone, B I publication Pvt Ltd
4. The Physics of Radiology by H E Johns and Cunningham
5. Physics of Radiation Therapy by F M Khan –Williams and Wilkins,3rd Edition- 2003
6. The Essential Physics of Medical Imaging: Bushburg,Seiberg,Leidholdt and Boone Lippincot, Williams and Wilkins,2nd Edition- 2002



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CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER IV

(PHYSICS PRACTICAL SYLLABUS : Effective from June - 2021)

(PC – PHY - 401)

LABORATORY EXPERIMENT

- 1) To determine wavelength of bright lines of Mercury light using Grating.
ગ્રેટિંગની મદદથી મરક્યુરી પ્રકાશની ત્રીવ્ર રેખાની તરંગલંબાઈ મેળવો.
- 2) To Find out of Resolving Power of Telescope.
ટેલિસ્કોપની વિભેદન શક્તિ શોધવી.
- 3) Study of X –ray diffraction using Powder pattern.
X –ray વિવર્તન ભાતનો અભ્યાસ પાવડર ભાતની રીત વડે મેળવો.
- 4) A Study of Decay of Temperature when body is allowed to cool (Thermocouple).
જ્યારે પદાર્થને ઠંડો કરવામાં આવે ત્યારે તાપમાનમાં થતો ક્ષય મેળવો.
- 5) To study elliptically polarized light using Photocell and quarter wave plate.
ફોટો સેલ અને ક્વાર્ટર વેવ પ્લેટની મદદથી દીર્ઘવૃત્તીય ધ્રુવીભૂત પ્રકાશનો અભ્યાસ કરવો.
- 6) To find out Activation energy of a Semiconductor.
અર્ધવાહકની સંક્રિયાણ ઉર્જા શોધવી .
- 7) Numerical Analysis (Newton’s Forward and Backward Interpolation Formula)
સંખ્યાત્મક પૃથ્થકરણ (આંતરેશન)
- 8) To Find out The Resolving Power of Prism.
પ્રીઝમની વિભેદન શક્તિ શોધવી.

ઉઠો, જાગો અને લક્ષ્યની પ્રાપ્તિ સુધી અવિરત પ્રયત્નશીલ રહો



HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER IV
(PHYSICS PRACTICAL SYLLABUS : Effective from June - 2021)
(PC – PHY - 402)
LABORATORY EXPERIMENT

- 1) To Determine Current Sensitivity, Voltage Sensitivity, Figure of Merit and R_g of B.G.
B.G ની પ્રવાહ સંવેદિતા, વોલ્ટેજ સંવેદિતા, ફિગર ઓફ મેરીટ અને R_g મેળવો.
- 2) To Determine High Resistance by equal Deflection Method.
સમાન આવર્તનની રીત વડે ગુરુ અવરોધ મેળવો.
- 3) To Determine Low Value of 'C' using Schering Bridge.
શેરીંગ બ્રીજની મદદથી લીકેજ કેપેસિટન્સ 'C' મેળવો.
- 5) Study of Characteristics of a Photodiode and Draw the Graph of $I_D \rightarrow V_D$.
ફોટોડાયોડની લાક્ષણિકતાઓ મેળવો અને $I_D \rightarrow V_D$ નો આલેખ દોરો.
- 6) Comparison of Capacity (C_1/C_2) by De-Sauty Method.
ડીસોટીની રીત વડે વીજક્ષમતા (C_1/C_2) ની સરખામણી કરવી.
- 7) Low Resistance by Method of Projection.
પ્રક્ષેપનની રીત વડે લઘુ અવરોધ શોધવો.
- 8) Langrange's Forward Formula and Backward Formula (Interpolation)
લાગ્રાંજની ફોરવર્ડ ફોર્મુલા અને બેકવર્ડ ફોર્મુલા (આંતરેશન)
- 9) To find The H-Parameter's from The Transistor in Common Emitter Configuration.
કોમન એમીટર ટ્રાન્ઝિસ્ટરની લાક્ષણિકતાઓ પરથી એચ-પેરામીટર શોધવા.

સર્વ દિશાઓમાંથી ઉત્તમ અને સુંદર વિચારો પ્રાપ્ત થાઓ

