



HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN - 384 265

FACULTY OF SCIENCE

B.Sc. BOTANY

Semesters: V

SYLLABUS

Curriculum as per UGC Guideline

With Semester/CBCS/Grading Pattern

With effect from June - 2022 (and thereafter)

DATE: June, 2022

TOTAL PAGE: 27

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN - 384 265.



U.G. (B.Sc.) Programme

CBCS:: Semester :: Grading Pattern

With effect from: June 2022

FACULTY OF SCIENCE

Subject: BOTANY

B. Sc. Semesters: V

Total Pages: 01 to 27

Submitted on

Date: 20/10/2021

SUMMARY OF THE PROGRAMME

Summary of the Programme

✓ Syllabus duration	Semester pattern i.e., Six months
✓ <i>No. of core compulsory (CC) course</i>	04 (in each semester)
✓ <i>Credits per CC course</i>	03
✓ <i>Total credits for CC course</i>	12/Semester
✓ <i>Theory lectures per CC course</i>	03 / Week
✓ <i>Total Theory lectures for CC course</i>	12 / Week
✓ No. of Practical courses per semester	04 (each from CC course)
✓ Practical lectures	03 /Week/course/batch
✓ Total Practical lectures	12 / Week/ batch
✓ Credits per Practical course	1.5
✓ Total Credits of Practical course	06 /Semester
✓ No. of Practical course (<i>in Uni. Exam.</i>)	03 /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)

Under Choice Based Credit System-Semester-Grading System pattern

UG (B. Sc.) Programme in Botany

Semester - V

Salient Features:

- CBCS in UG programme in **Botany Semester V and VI** shall be offered from the Academic year **June 2022**.
- Botany subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2022-23.
- 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 four **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 **18 credits**. In short, **4.5 credits** multiplied by **4** 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 (02 credit)** and Interdisciplinary / Multidisciplinary / **Subject centric electives (02 credit)** shall have to be offered. Hence, a total credit weight-age for Elective courses shall be of **04 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**

- 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 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 form 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:

CORE COURSE:

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

ELECTIVE (SUBJECTIVE) COURSE:

Written Test...	15 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 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.

ELECTIVE (SUBJECTIVE) COURSE:

1. Elective (Subject) Course:: ES BOT-501:: NURSERY AND GARDENING

SELECTION OF ELECTIVE (GENERIC) COURSE:

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

SEM-V: CC-BOT-501: GENETICS

LEARNING OUTCOME:

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

- Have conceptual understanding of laws of inheritance, genetic basis of loci and alleles and their linkage.
- Comprehend the effect of chromosomal abnormalities in numerical as well as structural changes leading to genetic disorders.
- Develop critical understanding of chemical basis of genes and their interactions at population and evolutionary levels.
- Analyze the effect of mutations on gene functions and dosage.
- Examine the structure, function and replication of DNA.

SEM-V: CC-BOT-502: MOLECULAR BIOLOGY

LEARNING OUTCOME:

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

- Analyse the structures and chemical properties of DNA and RNA through various historic experiments.
- Differentiate the main types of prokaryotes through their grouping abilities and their characteristic
- Evaluate the experiments establishing central dogma and genetic code.
- Gain an understanding of various steps in transcription, protein synthesis and protein modification.

SEM-V: SEM-V: CC-BOT-503: PLANT ECOLOGY AND PHYTOGEOGRAPHY

LEARNING OUTCOME:

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

- Understand core concepts of biotic and abiotic
- Classify the soils on the basis of physical, chemical and biological components
- Analysis the phytogeography or phytogeographical division of India
- Evaluate energy sources of ecological system
- Assess the adaptation of plants in relation to light, temperature, water, wind and fire.
- Conduct experiments using skills appropriate to subdivisions

SEM-V: CC-BOT-504: PLANT SYSTEMATICS

LEARNING OUTCOME:

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

- Classify Plant systematics and recognize the importance of herbarium and Virtual herbarium
- Evaluate the Important herbaria and botanical gardens
- Interpret the rules of ICN in botanical nomenclature
- Assess terms and concepts related to Phylogenetic Systematics
- Generalize the characters of the families according to Bentham & Hooker's system of classification

SEM-V: ES-BOT-501: NURSERY AND GARDENING

LEARNING OUTCOME:

On completion of this course the students will be able to;

- Understand the process of sowing seeds in nursery
- List the various resources required for the development of nursery
- Distinguish among the different forms of sowing and growing plants
- Analyse the process of Vegetative propagation
- Appreciate the diversity of plants and selection of gardening
- Examine the cultivation of different vegetables and growth of plants in nursery and gardening

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

w.e.f. June-2022

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-V and VI in BOTANY w.e.f. June-2022 and December-2022 respectively						
General Pattern/Scheme of study components along with credits						
Study Components	Ins. Hrs/ Week	Examination			Credits	
		Internal Marks	Uni. Exam. Marks	Total Marks		
Semester-V						
	Core Compulsory Course(CCC)					
CC-I-7	Core Course-I (Paper-7)	3	30	70	100	3
CC-I-8	Core Course-I (Paper-8)	3	30	70	100	3
CC-I-9	Core Course-II (Paper-9)	3	30	70	100	3
CC-I-10	Core Course-II(Paper-10)	3	30	70	100	3
	Practical Core Course (PCC)					
PC-I-7	Practical Core Course-I (Paper-7)	3		50	50	1.5
PC-I-8	Practical Core Course-I (Paper-8)	3		50	50	1.5
PC-I-9	Practical Core Course-II (Paper-9)	3		50	50	1.5
PC-I-10	Practical Core Course-II (Paper-10)	3		50	50	1.5
	Foundation Course (FC)					
FC-5	Compulsory English (L.L.)	2	15	35	50	2
	Elective Course (EC)					
EC-9	Elective (Generic) Course- I	2	15	35	50	2
EC-10	Elective (Subject) Course- I	2	15	35	50	2
		30	165	585	750	24
Semester-VI						
	Core Compulsory Course(CCC)					
CC-I-7	Core Course-I (Paper-11)	3	30	70	100	3
CC-I-8	Core Course-I (Paper-12)	3	30	70	100	3
CC-I-9	Core Course-II (Paper-13)	3	30	70	100	3
CC-I-10	Core Course-II(Paper-14)	3	30	70	100	3
	Practical Core Course (PCC)					
PC-I-7	Practical Core Course-I (Paper-11)	3		50	50	1.5
PC-I-8	Practical Core Course-I (Paper-12)	3		50	50	1.5
PC-I-9	Practical Core Course-II (Paper-13)	3		50	50	1.5
PC-I-10	Practical Core Course-II (Paper-14)	3		50	50	1.5
	Foundation Course (FC)					
FC-6	Compulsory English (L.L.)	2	15	35	50	2
	Elective Course (EC)					
EC-11	Elective (Generic) Course- I	2	15	35	50	2
EC-12	Elective (Subject) Course- I	2	15	35	50	2
		30	165	585	750	24

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 – V)

(W.E.F. JUNE - 2022)

The university examination paper consists of four questions.

- First question is of 17 marks and will be from Unit – I.
- Second question is of 18 marks and will be from Unit – II.
- Third question is of 17 marks and will be from Unit – III.
- Fourth question is of 18 marks and will be from Unit – I TO III.

Time: 2.5 Hrs

Total Marks: 70

- | | |
|--|----|
| 1. Long answered and medium answered/short note-typed questions from Unit-I | 17 |
| a. Long answered questions (Attempt any one from two each of 10 marks) | |
| b. Medium answered or short note-typed questions (Attempt any one from two each of 8 marks) | |
| 2. Long answered and medium answered/short note-typed questions from Unit-II | 18 |
| a. Long answered questions (Attempt any one from two each of 10 marks) | |
| b. Medium answered or short note-typed questions (Attempt any one from two each of 7 marks) | |
| 3. Long answered and medium answered/short note-typed questions from Unit-III | 17 |
| a. Long answered questions (Attempt any one from two each of 10 marks) | |
| b. Medium answered or short note-typed questions (Attempt any one from two each of 8 marks) | |
| 4. a. Medium answered/short note-typed questions from Unit-I to III | 10 |
| (Attempt any two from three each of 05 marks) | |
| b. Questions such as, MCQs, Fill in the blanks, Match the pairs, very short answered questions, etc. | 08 |
| [Attempt eight questions, at least three questions from each Unit, Each of 1 Mark] | |

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B.Sc. Programme (CBCS - Semester - Grading Pattern)
B. Sc.: BOTANY :: SEMESTER END EXAMINATION
Format for Questions paper Elective Course in Botany
(B.Sc. Sem - V)
(W.E.F. JUNE - 2022)

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

Semester-V :: BOTANY :: Core Compulsory

**For Semester-end examination there will be
FOUR theory and
TWO practical courses as
mentioned below:**

CORE COMPULSORY COURSE:

**CC BOT-501
GENETICS**

**CC BOT-502
MOLECULAR BIOLOGY**

**CC BOT-503
PLANT ECOLOGY AND PHYTOGEOGRAPHY**

**CC BOT-504
PLANT SYSTEMATICS**

ELECTIVE (SUBJECT) COURSE:

**ES BOT -501
NURSERY AND GARDENING**

CORE COMPULSORY PRACTICAL COURSE

**PC BOT-501
GENETICS**

**PC BOT-502
MOLECULAR BIOLOGY**

**PC BOT-503
PLANT ECOLOGY AND PHYTOGEOGRAPHY**

**PC BOT-504
PLANT SYSTEMATICS**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-V) Programme

Core Compulsory Course in BOTANY

CC-BOT-501 GENETICS

Theory teaching hours: **3 Hours/week**

Credit: **3.0**

Practical teaching hours: **3 Hours/week**

Credit: **1.5**

Unit 1: Genetics-1

- Mendelism: History; Principles of inheritance, Chromosome theory of inheritance; Autosomes and sex chromosomes.
- Gene interaction and Incomplete dominance, co-dominance, Pleiotropy, Multiple alleles, Polygenic inheritance.
- Chloroplast mutation: Variegation in Four o'clock plant.
- Mitochondrial mutation: Petite in yeast.

Unit 2: Genetics-2

- Linkage and crossing over-Cytological basis of crossing over.
- Recombination frequency, two factor and three factor crosses.
- Interference and coincidence; Numericals based on gene mapping & Sex Linkage.
- Allele frequencies, Genotype frequencies, Hardy-Weinberg Law.

Unit 3: Genetics-3

- Deletion, Duplication, Inversion, Translocation, Position effect.
- Euploidy and Aneuploidy.
- Types of mutations; Molecular basis of Mutations.
- Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents).

Practicals:

1. Mendel's laws through seed ratios (3:1, 9:3:3:1, 1:2:1).
2. Laboratory exercises in probability and chi-square.
3. Chromosome mapping using point test cross data.
4. Incomplete dominance and gene interaction through seed ratios (9:7, 13:3, 15:1, 12:3:1, 9:3:4, 1: 4 :6 :4 : 1).
5. Blood Typing: ABO groups & Rh factor.
6. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes.
7. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.
8. Study of human genetic traits: Sickle cell anemia, Albinism, Colour blindness, Widow's peak, Rolling of tongue, Hitchhiker's thumb and Attached ear lobe.
9. Problems/Numericals on: Hardy-Weinberg Law.

Suggested Readings

1. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics, John Wiley & sons, India. 8th edition.
2. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition.
3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings, U.S.A. 9th edition.
4. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-V) Programme

Core Compulsory Course in BOTANY

CC-BOT-502 MOLECULAR BIOLOGY

Theory teaching hours: **3 Hours/week**

Credit: **3.0**

Practical teaching hours: **3 Hours/week**

Credit: **1.5**

Unit 1: Molecular Biology-1

- Historical perspective; DNA as the carrier of genetic information (Griffith's, Hershey & Chase, Avery, McLeod & McCarty, Fraenkel-Conrat's experiment).
- DNA Structure: Watson and Crick- historic perspective, DNA structure, Salient features of double helix.
- Types of DNA & RNA Structure.
- Types of genetic material, Organization of DNA- Prokaryotes and Eukaryotes.

Unit 2: Molecular Biology -2

- The Nucleosome Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin.
- The replication of DNA: General principles-bidirectional, semi- conservative and semi discontinuous replication.
- RNA priming; mode of replication, replication of linear ds-DNA, replication of the 5'end of linear chromosome; Enzymes involved in DNA replication.
- Prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in *E.coli*.

Unit 3: Molecular Biology -3

- Key experiments establishing-The Central Dogma (Adaptor hypothesis and discovery of mRNA template),
- Genetic code (deciphering & salient features)
- Transcription in prokaryotes and eukaryotes & Principles of transcriptional regulation.
- Various steps in protein synthesis: Proteins involved in initiation, elongation and termination of polypeptides, Post-translational modifications of proteins.

Practical

1. DNA isolation.
2. Photographs/ Charts : Nucleic acid (Structure and types of DNA and RNA) as genetic material and DNA as the carrier of genetic information (Griffith's, Hershey & Chase, Avery, McLeod & McCarty, Fraenkel-Conrat's experiment).
3. Study of prokaryotic and eukaryotic DNA replication mechanisms through photographs.
4. Study of prokaryotic and eukaryotic: transcription, translation, genetic code and RNA polymerase.

Suggested Readings

1. Watson J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R. (2007). Molecular Biology of the Gene, Pearson Benjamin Cummings, CSHL Press, New York, U.S.A. 6th edition.
2. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons Inc., U.S.A. 5th edition.
3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings. U.S.A. 9th edition.
4. Russell, P. J. (2010). i-Genetics- A Molecular Approach. Benjamin Cummings, U.S.A. 3rd edition.
5. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-V) Programme

Core Compulsory Course in BOTANY

CC-BOT-503 PLANT ECOLOGY AND PHYTOGEOGRAPHY

Theory teaching hours: **3 Hours/week**

Credit: **3.0**

Practical teaching hours: **3 Hours/week**

Credit: **1.5**

Unit 1: Plant Ecology-1

- Basic concepts; Levels of organization.
- Inter-relationships between the living world and the environment, the components and dynamism, homeostasis.
- Importance; Origin; Formation; Composition; Physical; Chemical and Biological components of soil.
- Soil profile; Role of climate in soil development.

Unit 2: Plant Ecology-2

- Importance: States of water in the environment; Atmospheric moisture; Precipitation types (rain, fog, snow, hail, dew).
- Hydrological Cycle; Water in soil.
- Trophic organization, basic source of energy, autotrophy, heterotrophy; symbiosis, Mutualism, commensalism, Parasitism, Predation; Food chains and webs; ecological pyramids.
- Characters of communities: analytical and synthetic; biomass, standing crop, Biogeochemical cycles: Cycling of Carbon, Nitrogen and Phosphorus.

Unit 3: Plant Ecology-3

- Concept of ecological amplitude; Habitat and niche;
- Structure; Processes; Trophic organisation; Food chains and Food webs; Ecological pyramids. Principles and models of energy flow, Production and productivity.
- Continental drift and Phytogeographical regions of India.
- Ecological adaptations: Hydrophytes (*Hydrilla, Eichornia*),
 Xerophytic (*Nerium, Capparis*)

Practical

1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, Sling Psychrometer / hygrometer and rain gauge.
2. Determination of pH of various soil and water samples (pH meter or universal indicator).
3. Analysis for carbonates, nitrates and base deficiency from three soil samples by rapid field tests (0 to 5 scale).
4. Determination of chlorides, and total hardness of different water samples by titration method.
5. Comparison of water holding capacity of three soil samples.
6. Determination of minimum size of quadrat and minimum number of quadrat for the study of herbaceous vegetation in the college campus, by species area curve method (species to be listed).
7. Quantitative analysis of herbaceous vegetation (Any five) in the college campus for frequency and comparison with Raunkiaer's frequency distribution law.
8. Quantitative analysis of herbaceous vegetation (Any five) for density and abundance in the college campus.
9. Ecological adaptations: Hydrophytes (*Hydrilla* stem / *Eichornia* petiole),
 Xerophytic (*Nerium* leaf / *Capparis* stem)
10. Biotic Interactions between living organisms:
 Mutualism : Root nodules, Lichen (specimen and permanent slides)
 Commensalism: Orchid (specimen)
 Parasitism : *Cuscuta* (specimen and permanent slide), *Loranthus* (specimen)
 Predation: *Utricularia*, *Nepenthes*
11. Field visit to familiarise students with ecology of different sites.

Suggested Readings

1. Odum, E.P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition.
2. Singh, J.S., Singh, S.P., Gupta, S. (2006). Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi, India.
3. Sharma, P.D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.

4. Wilkinson, D.M. (2007). *Fundamental Processes in Ecology: An Earth Systems Approach*. Oxford University Press. U.S.A.
5. Kormondy, E.J. (1996). *Concepts of ecology*. PHI Learning Pvt. Ltd., Delhi, India. 4th edition.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-V) Programme

Core Compulsory Course in BOTANY

CC-BOT-504 PLANT SYSTEMATICS

Theory teaching hours: **3 Hours/week**

Credit: **3.0**

Practical teaching hours: **3 Hours/week**

Credit: **1.5**

Unit 1: Plant systematics-1

- Introduction to systematics; Plant identification, Classification, Nomenclature.
- Taxonomic evidences from palynology, cytology and phytochemistry.
- Field inventory; Functions of Herbarium; Important herbaria of the world (Any five) and India (Any five).
- Botanical gardens of the India (Any five) and Gujarat.

Unit 2: Plant systematics-2

- Virtual herbarium; E-flora; Documentation: Flora, Monographs, Journals.
- Concept of taxa (family, genus, species); Categories and taxonomic hierarchy.
- Species concept (taxonomic, biological, evolutionary).
- Principles and rules (ICBN); Ranks and names; Typification, author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids.

Unit 3: Plant systematics-3

- Origin and evolution of angiosperms.
- Classification systems of Bentham and Hooker and Brief reference of Angiosperm Phylogeny Group (APG IV) classification.
- Study of Dicotyledon Families:
 - Polypetalae: Brassicaceae (Cruciferae), Rhamnaceae, Myrtaceae
 - Gamopetalae: Asteraceae (Compositae), Solanaceae, Lamiaceae (Labiatae).
 - Monochlamydae : Euphorbiaceae, Amaranthaceae.
- Study of Monocotyledon Families:
 - Liliaceae and Poaceae (Gramineae).

Practical

Study of vegetative and floral characters of the following families (Habitat and Botanical Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):

- Study of Families: (Classification upto family with reasons):
 - Brassicaceae (Cruciferae)
 - Rhamnaceae
 - Myrtaceae
 - Asteraceae (Compositae)
 - Solanaceae
 - Lamiaceae (Labiatae)
 - Euphorbiaceae
 - Amaranthaceae
 - Liliaceae
 - Poaceae (Gramineae)
- Digital photographs/Sketch (minimum one from each from family)

Suggested Readings

1. Singh, (2012). Plant Systematics: Theory and Practice Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
2. Jeffrey, C. (1982). An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge.
3. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. (2002). Plant Systematics-A Phylogenetic Approach. Sinauer Associates Inc., U.S.A. 2nd edition.
4. Maheshwari, J.K. (1963). Flora of Delhi. CSIR, New Delhi.
5. Radford, A.E. (1986). Fundamentals of Plant Systematics. Harper and Row, New York.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-V) Programme

Core Compulsory Course in BOTANY

ES-BOT-501 NURSERY AND GARDENING

Theory teaching hours: **2 Hours/week**

Credit: **2**

Unit 1: Nursery

- Definition, objectives, scope and nursery management.
- Planning and seasonal activities - Planting - direct seeding and transplant.
- Seed storage: Seed banks, factors affecting seed viability, genetic erosion - Seed production technology - seed testing and certification.
- Transplanting of seedlings - Study of cultivation of different vegetables: cabbage, brinjal, lady's finger, onion, garlic, tomatoes, and carrots - Storage and marketing procedures.

Unit 2: Gardening

- Definition, objectives and scope - different types of gardening - landscape and home gardening - parks and its components.
- Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.
- Air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings.
- Hardening of plants - green house - mist chamber, shed root, shade house and glass house.

Suggested Readings

1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co.,
New Delhi.
2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
3. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
4. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co.,
New Delhi.
5. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture and Cooperation,
National _Seed Corporation Ltd., New Delhi.
6. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco,
USA.

Hemchandracharya North Gujarat University, Patan
B.Sc. Semester-V Practical Examination, June (2022)
BOTANY Practical – PC- BOT-501 & 502
(Genetics and Molecular Biology)

Date:

Centre:

Time: 12:00 to 5:00

Total Marks- 100

Instruction: Students are requested to follow instructions given by the examiners.

1. Examples: 30

“I” Solve and conclude the Genetical problem (Three Point Test Cross) as per given slip.

“II” Solve and conclude the Genetical problem (Gene Interaction) as per given slip.

“III” Solve and conclude the Genetical problems (Hardy-Weinberg Law) as per given slip.

2. Estimation: 20

Isolation of DNA from grinded Onion sample “A” by heat and cool method.

3. Write the critical notes on: 14

Chromosomal aberration - “B”

Human genetic traits - “C”

4. Writing exercise on: 21

Comment upon spot “D” (Molecular Biology-Unit-I).

Comment upon spot “E” (Molecular Biology-Unit-II).

Comment upon spot “F” (Molecular Biology-Unit-III).

5. a. Certified Journal 10

b. Submission and viva-voce 05

Hemchandracharya North Gujarat University, Patan
B.Sc. Semester-V Practical Examination, June (2022)
BOTANY Practical – PC- BOT-503 & 504
(Plant Ecology & Phytogeography, and Plant Systematics)

Date:

Centre:

Time: 12:00 to 5:00

Total Marks- 100

Instruction: Students are requested to follow instructions given by the examiners.

1. Determine the **minimum size of quadrat** by species area curve and calculate the **Density/Abundance/Frequency** (any five species). **15**

2. Determine the **Carbonate / Nitrate / Base deficiency / water holding capacity** from two soil samples **“A” and “B”** **10**

or

Determine the **pH / Chloride / Total hardness** from given two water samples **“A” and “B”**

3. To study of the **ecological adaptations** from specimen **“C”** **10**

4. Refer to respective **families** with giving reasons from specimens **“D” and “E”**. Including floral formula and floral diagram. **20**

5. **Writing exercise on:** **15**
 Comment upon spot **“F”** - (Plant systemic-Unit-I).
 Comment upon spot **“G”** - (Plant systemic -Unit-II).
 Comment upon spot **“H”** - (Plant systemic -Unit-III).

6. **Write the critical notes on:** **15**
 Comment upon spot **“I”** - (Ecological Instruments)
 Comment upon spot **“J”** - (Biotic Interactions)
 Comment upon spot **“K”** - (Energy flow and biogeochemical cycles)

7. **a. Certified Journal** **10**
 b. Submission and viva-voce **05**