HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. Programme with 144 credits

CBCS-Semester-Grading Pattern

w.e.f. June-2011

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

Part/Class	Subject code	Study Components	Instruction Hrs/ Week	Examination			Credit
				Internal	Uni. Exam	Total	
B.Sc. Semester -I		**Semester-I**					
		Core Compulsory (CC) Course					
	CC-I-1	Core Course-I (Paper-1)	4	30	70	100	4
	CC-II-1	Core Course-II (Paper-1)	4	30	70	100	4
	CC-III-1	Core Course-III (Paper-1)	4	30	70	100	4
		Practical Core (PC) Course					
	PC-I-1	Practical Core Course-I (Paper-1)	4		50	50	2
	PC-II-1	Practical Core Course-II (Paper-1)	4		50	50	2
	PC-III-1	Practical Core Course-III (Paper-1)	4		50	50	2
		Foundation Course (FC)					
	FC-1	Foundation (Compulsory) course (Generic) - English (L.L.)	2	15	35	50	2
		Elective Course (E)					
	EG-1	Elective (**Generic**) Course -I	2		50	50	2
	ES-1	Elective (**Subject**) Course -I	2		50	50	2
			30	**105**	**495**	**600**	**24**
B.Sc. Semester -II		**Semester-II**					
		Core Compulsory (CC)Course					
	CC-I-2	Core Course-I (Paper-1)	4	30	70	100	4
	CC-II-2	Core Course-II (Paper-1)	4	30	70	100	4
	CC-III-2	Core Course-III (Paper-1)	4	30	70	100	4
		Practical Core (PC) Course					
	PC-I-2	Practical Core Course-I (Paper-1)	4		50	50	2
	PC-II-2	Practical Core Course-II (Paper-1)	4		50	50	2
	PC-III-2	Practical Core Course-III (Paper-1)	4		50	50	2
		Foundation Course (FC)					
	FC-2	Foundation (Compulsory) course (Generic) - English (L.L.)	2	15	35	50	2
		Elective Course (E)					
	EG-2	Elective (**Generic**) Course -II	2		50	50	2
	ES-2	Elective (**Subject**) Course -II	2		50	50	2
			30	**105**	**495**	**600**	**24**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

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

CC BOT-111

(in force from June 2011)

Unit-I : Cell Biology

- The Cell theory, types of cells on the basis of Nucleus (Akaryota, Prokaryota & Eukaryota)
- Size, Shape & Number of Eukaryotic cells
- Comparison of ultra-structure of typical Prokaryotic & Eukaryotic cell-Plant cell and Animal cell
- Structure & function of Plasmodesmata
- Nucleus: history, distribution, parts, ultra-structure & function
- Chromosome: shape depends upon the position of centromere, ultra-structure and functions

Unit-II : Biology of Cryptogams (Algae & Fungi)

- General characters of Algae
- Economic importance of Algae (as food, fodder and fertilizer)
- Life history of *Spirogyra* with reference to
  - Systematic position with reasons (according to Smith)
  - Habit and Habitat, Vegetative structure and Reproduction
- General characters of Fungi
- Economic importance of Fungi (as food and medicine)
- Life history of *Mucor* with reference to
  - Systematic position with reasons (according to Ainsworth)
  - Habit and Habitat, Vegetative structure and Reproduction

Unit-III : Plant Anatomy

- General characteristics and functions of various kinds of plant tissues:
  - Meristematic, Simple tissues : Definition, (parenchyma, collenchyma and sclerenchyma fibres) and Complex tissues: Xylem, (thickenings in vessels / tracheids) Phloem: sieve tube
- Definition of Epidermal, Ground and Vascular tissue system
- Epidermal tissue system:
  - Uniseriate and Multiseriate epidermis
  - Types of Stomata (Dicot-Hibiscus & Monocot-Maize)
  - Types of Trichomes (Unicellular-stellate; Multicellular-unbranched & branched; Glandular)
  - Motor cells in Maize leaf
  - Cystolith in Banyan leaf
  - Sphaeroraphides in *Nerium* leaf
  - Velamen tissue in aerial root of Orchid
  - Structure and function of Periderm and Lenticel (Tinospora)

Unit-IV : Environmental Biology

- Definition, scope and Significance of Ecology for human
- Climatic factors: **Light:** Introduction, Light relation in plant. **Temperature:** Introduction, variation in temperature and its effect on distribution of plants
- Biotic factors: Positive Interrelationship
  - Symbiosis -Mutualism (Lichens, Symbiotic N_2 fixation, Mycorrhizae)
  - Commensalism - Epiphytes: Orchid
  - Negative Interrelationship
    - Exploitation-Parasitism(*Cuscuta*, *Loranthus*)
    - Predation(*Nepenthus*,*Utricularia*)
- Ecosystem Ecology: Definition, Kinds, Structure of ecosystem
- Ecological Pyramids: Pyramids of Number, Biomass and Energy

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

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

PC BOT-111

(in force from June 2011)

Unit-I : Cell Biology

- To study the various shape of cells through permanent / temporary slides:
  Amoeba, *Paramoecium*, Human RBC, Nerve cell, *Spirogyra* and Onion leaf scale.
- To study the various types of cells on the basis of Nucleus through micrographs / charts:
  Akaryota - Bacteriophage, Prokaryota - Cyanophycean cell & Eukaryota - typical Animal & Plant cell
- To study the Structure of Plasmodesmata through permanent / temporary slide from Date Palm seed
- To study the ultrastructure of Nucleus and Chromosomes through micrographs (SEM, TEM) / charts

Unit-II : Biology of Cryptogams (Algae & Fungi)

- To study the Life history of *Spirogyra* through:
  Mountings - Thallus and Reproductive structure
  Permanent Slides of - Thallus and Reproductive structure
- To study the Life history of *Mucor* through:
  Specimen - Bread / Roti with *Mucor*
  Mountings - Mycelium and Asexual and sexual Reproductive structures
  Permanent Slides of - Mycelium and Asexual and sexual Reproductive structures

Unit-III : Plant Anatomy

- To study the various types of Simple (parenchyma, collenchyma and sclerenchyma) and Complex tissues (thickenings in vessels / tracheids and sieve tube) from Sunflower and *Cucurbita* stems (T.S. and L.S.) through fresh and permanent preparations.
- To study the Epidermal tissue system through permanent / temporary slides:
  Uniseriate (Sunflower leaf) and Multiseriate (Banyan / *Nerium* leaf) epidermis
  Stomata structure (Dicot-*Hibiscus* & Monocot-Maize)
  Trichomes [Unicellular-stellate (*Abutilon*); Multicellular-unbranched (*Tridax*) & branched (*Withania*); Glandular (*Datura*)
  Motor cells in Maize leaf
  Cystolith in Banyan leaf
  Sphaeroraphides in *Nerium* leaf
  Velamen tissue in aerial root of Orchid
  Permanent slides of Periderm and Lenticel structure- *Tinospora*

Unit-IV : Environmental Biology

- To study of Biotic factors through specimens/charts/photographs
  Positive Interrelationship
  Symbiosis - Mutualism: Lichens, Root nodules, Mycorrhizae
  - Commensalism: Epiphytes - Orchid
  Negative Interrelationship
  Exploitation - Parasitism (*Cuscuta*, *Loranthus*)
  - Predation (*Nepenthus*, *Utricularia*)
- Charts / Photographs: Pyramids (Number, Biomass and Energy)

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CBCS - Semester - Grading Pattern
B.Sc. :: BOTANY Practical :: SEMESTER-I
PC BOT-111
(in force from June 2011)

Guideline for arrangement of specimens

1. Specimen A: *Spirogyra / Mucor*
2. Specimen B: *Spirogyra / Mucor*
3. Specimen C: Sunflower stem for Parenchyma / Collenchyma / Sclerenchyma

   OR

   Specimen C: *Cucurbita* stem for Thickenings in vessels / Sieve tube
4. Specimen D: Epidermal tissue system
   - Uniseriate: Sunflower leaf
   - Multiseriate: Banyan / *Nerium* leaf
   - Stomata structure: Dicot - *Hibiscus* and Monocot - Maize
   - Trichomes: Unicellular- *Abutilon*
     - Multicellular- *Tridax / Withania*
     - Glandular- *Datura*
   - Motor cells in Maize leaf
   - Cystolith in Banyan leaf
   - Sphaeroraphides in *Nerium* leaf
   - Velamen tissue in aerial root of Orchid
5. Identify and describe the peculiarities/structure observed in given specimens:
   a. Shape of cells (as per theory syllabus)
   b. Type of cell (on the basis of nucleus: Bacteriophage/Cyanophycean /Plant /Animal)
   c. Nucleus / Chromosome shape (as per theory syllabus)
   d. Periderm / Lenticel (Permanent slide- *Tinospora*)
   e. Symbiosis (Lichen / Root nodules / Micorrhizae)
   f. Exploitation (*Cuscuta* / *Loranthus* / *Utricularia* / *Nepenthus*)
   g. Ecological Pyramids (Number / Biomass / Energy)

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PC BOT-111
(in force from June 2011)

Date: Place:

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

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

1. Identify and describe structural peculiarities observed in the given plant specimen **A.** **07**
2. Make a temporary preparation of the reproductive organ from the given plant specimen **B**. Draw the neat and labeled diagram of it and show your preparation to the examiner. **07**
3. Take T.S. / L.S. of the given plant specimen **C** and, make the temporary preparation (slide). Stain if needed and, show_____ to the examiner. **07**
4. Make the temporary preparation (slide) of epidermal tissue structure from the given plant specimen **D.** Stain if needed and, show_____ to the examiner. **07**
5. Identify and describe the peculiarities/structure observed in given specimens: **14**

   a. Shape of cells (as per theory syllabus)

   b. Type of cell (on the basis of nucleus)

   c. Nucleus / Chromosome shape

   d. Periderm / Lenticel

   e. Symbiosis (Lichen / Root nodules / Micorrhizae)

   f. Exploitation (*Cuscuta / Loranthus / Utricularia / Nepenthus*)

   g. Ecological Pyramids

6. a. *Viva-voce* **04**

   b. Journal **04**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
B. Sc. :: BOTANY :: SEMESTER-II
CC BOT-122
(in force from June 2011)

Unit-I : Genetics

- Genetics: Introduction to genetics, Mendel's work and its results
- Mendel's Experiments: Monohybridisation and its experiment, Monohybrid ratio (3:1, 1:2:1)
  - Law of Dominance and Law of Segregation
  - Dihybridisation and its experiment, Dihybrid ratio (9:3:3:1)
  - Law of independent Assortment
  - Back cross and Test cross
- Gene Interactions:
  - (A) Incomplete Dominance and Co-dominance
  - (B) Epistasis:
    - Dominance Epistasis ratio (12:3:1),
    - Recessive Epistasis ratio (9:3:4),
    - Double recessive Epistasis ratio (9:7) and
    - Double dominance Epistasis ratio (15:1)

Unit-II : Biology of Cryptogams (Bryophytes & Pteridophytes)

- Silent futures of Bryophytes
- Life history of *Marchantia* with reference to:
  - Systematic position (Rothmaler and Proskaur) with reasons, Habit and Habitat, External and Internal structure of vegetative and reproductive organs, Fertilization, External and Internal structure of mature Sporophyte, Germination of Spores
- Silent futures of Pteridophytes
- Life history of *Nephrolepis* with reference to:
  - Systematic position (Smith) with reasons, Habit and Habitat, External structure of vegetative organs, External and Internal structure of fertile (reproductive) leaflet, Structure of mature Gametophyte along with sex organs and Fertilization.

Unit-III : Angiosperm Morphology (External)

- **Leaf**:
  - Phyllotaxy,
  - Stipules: Types and Modifications,
  - Venation,
  - Incision,
  - Simple and Compound leaves

Unit-IV : Plants and Human welfare

- Classification of Economic important plants (on the basis of uses)
- To study the following Economic important plant specimens with reference to its Botanical name, local name, family, useful part(s), Botanical characters, important chemical constituents and uses:

  Cereals: Wheat and Maize; Pulses: Pea and Cajan pea;
  Nuts: Cashewnut and Almond; Vegetables: Carrot and Potato;
  Fruits: Banana and Mango; Spices: Ginger and Clove;
  Beverages: Tea and Coffee; Sugar-yielding Plants: Sugar cane & Sugar beet.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

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

PC BOT-122 (in force from June 2011)

Unit-I : Genetics

- To study through Examples:
  (A) Mendel's Experiments: Monohybrid ratio (3:1/1:2:1), Dihybrid ratio (9:3:3:1)
  Back cross and Test cross
  (B) Epistasis:
  - Dominance Epistasis ratio (12:3:1),
  - Recessive Epistasis ratio (9:3:4),
  - Double recessive Epistasis ratio (9:7) and
  - Double dominance Epistasis ratio (15:1)

Unit-II : Biology of Cryptogams (Bryophytes & Pteridophytes)

- To study the Life history of *Marchantia* through:
  - Specimen - Vegetative Thallus and thallus with Gemma cup
  - Mountings - Thallus and Reproductive organs
  - Permanent Slides - Thallus, Gemma cup, Antheridia, Archegonia, Sporophyte
- To study the Life history of *Nephrolepis* through:
  - Specimen - Sporophytic plant (with Vegetative and Fertile leaflets)
  - Mountings - Hydathode, T.S. of leaflet passing through sori, Sporangia, Spores
  - Permanent Slides - T.S. of leaflet passing through sori, Prothallus: young & mature with Antheridia, Archegonia and Sporophyte

Unit-III : Angiosperm Morphology (External)

- To study the morphological plant specimens of **Leaf** through common examples:
  - **Phyllotaxy**: Alternate: Distichous - *Polyalthia*; Tristichous - *Cyperus*; Pentastichous - Shoeflower, Opposite: Superposed - *Quisqualis*; Decussate - *Calotropis*; Verticillate (Whorled) : *Nerium / Alstonia*
  - **Stipules**: Free lateral - Shoeflower; Adnate - *Rosa*; Interpetiolar - *Ixora*; Intrapetiolar – *Gardenia*; Ochreate - *Polygonum*; Foliaceous - *Pisum*; Spinous – *Zizyphus*, *Acacia*; Tendillar - *Smilax*; Convolute (scaly) - *Ficus*
  - **Venation**: Reticulate: Pinnate (Unicostate) - *Ficus*; Palmate (Multicostate) convergent - *Zizyphus*; Palmate (Multicostate) divergent - *Ricinus*
    Parallel: Pinnate (Unicostate) - *Canna*; Palmate (Multicostate) convergent - Maize; Palmate (Multicostate) divergent - Fan palm
  - **Incision**: Pinnatifid - Chrysanthemum; Pinnatipartite - *Argemone*; Pinnatisect - Marigold
    Palmatifid - Cotton; Palmatipartite - *Ricinus*; Palmatisect - *Ipomoea palmate*
  - **Simple leaf**: Shoe flower
    Compound leaves: Pinnate: Unipinnate - Paripinnate - *Cassia*; Imparipinnate - *Rosa*; Bipinnate - *Caesalpinia*; Tripinnate - *Moringa*; Decompound - *Coriander*, Palmate: Unifolioate - *Citrus*; Bifoliate - *Balanites*; Trifoliate - *Aegle*; Multifoliate (Digitate) - *Bombax*.

Unit-IV : Plants and Human welfare

- To study the following Economic important plant specimens / organ / product (fresh / preserved) with reference to its Botanical name, local name, family, useful part(s), Botanical characters, important chemical constituents and uses:
  - Cereals: Wheat and Maize;
  - Nuts: Cashewnut and Almond;
  - Fruits: Banana and Mango;
  - Beverages: Tea and Coffee;
  - Pulses: Pea and Cajan pea;
  - Vegetables: Carrot and Potato;
  - Spices: Ginger and Clove;
  - Sugar-yielding Plants: Sugar cane and Sugar beet

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
B. Sc. :: BOTANY Practical :: SEMESTER-II
PC BOT-122
(in force from June 2011)

Guideline for arrangement of specimens

1. Que. 1. **a** and **b**: Solve the Genetical problems as per theory syllabus and given slips.
2. Specimen **A**: *Marchantia / Nephrolepis*
3. Specimen **B**: *Marchantia / Nephrolepis*
4. Specimen **C** and **D:**
    i. **Cereals**: Wheat and Maize;
    ii. **Pulses**: Pea and Cajan pea;
    iii. **Nuts**: Cashewnut and Almond;
    iv. **Vegetables**: Carrot and Potato;
    v. **Fruits**: Banana and Mango;
    vi. **Spices**: Ginger and Clove;
    vii. **Beverages**: Tea and Coffee;
    viii. **Sugar-yielding Plants**: Sugar cane and Sugar beet
5. Identify and describe the peculiarities/structure observed in given specimens:
    a: Phyllotaxy
    b: Stipules
    c: Venation
    d: Incision
    e: Simple and compound leaves

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
B. Sc. :: BOTANY Practical :: SEMESTER-II
PC BOT-122
(in force from June 2011)

Date: Place:

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

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

1. **a**. Solve the given Genetical problem (as per given slip). **04**

   b. Solve the given Genetical problem (as per given slip). **06**

2. Identify and describe structural peculiarities observed in the given plant specimen **A.** **06**

3. Make a temporary preparation (slide) of the reproductive organ from the given plant specimen **B**. Draw the neat and labeled diagram of it and show your preparation to the examiner. **06**

4. Give Botanical name, local name, family, botanical characters, useful part(s), chemical constituent(s) and uses of given economic important plant specimens **C** and **D**. **10**

5. Identify and describe the external morphology observed in given specimens: **10**

   a: Phyllotaxy (as per theory syllabus)

   b: Stipules (as per theory syllabus)

   c: Venation (as per theory syllabus)

   d: Incision (as per theory syllabus)

   e: Simple and compound leaves (as per theory syllabus)

6. **a**. *Viva-voce* **04**

   b. Journal **04**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

List of Elective (Subject) Courses

(in force from June 2011)

Credits-2

Botany	Biotechnology
Wood Anatomy	Biodiversity
Water quality analysis	Biological evolution
Environment study	Biocomputing
DNA: the Molecule of life	Professional practice in Biotechnology
Biodiversity	Microbial ecology
Carbon credit	Clinical Biotechnology
Remote sensing	
Plant Breeding	
Plant Tissue Culture	
Horticulture	
	Zoology
Enzyme Technology	Zoo maintenance
Tissue culture technology	Museum curators
Waste Management	Pest control
Water Harvesting and conservation	First Aid and emergency services
Clinical Microbiology	Disaster management
Industrial Microbiology	Biodiversity
Bio instrumentation	Food and adulteration
r-DNA technology	Forensic science
Sustainable Agriculture	
Pollution Microbiology	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

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

Elective Course (Subject) :: ES BOT-111

Plant Tissue Culture

(in force from June 2011)

Credits-2

Unit-I Plant Tissue Culture-I

1. Introduction: Definition and Concept
2. History and Scope of Plant tissue culture
3. Laboratory design and layout- Washing, Store area, Preparation area and Culture room
4. Sterilization- Methods of Sterilization
5. Tools/Equipments (Principle and Operation)-Autoclave, LAF (Laminar Air Flow), pH meter, Balance, Incubator, Oven

Unit-II Plant Tissue Culture-II

1. Selection and Isolation of ex-Plant
2. Nutrient media- Preparation and Composition
3. Callus culture, Advantages and Applications
4. Micro-propagation
5. Biotechnological methods for Plant improvement

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CBCS - Semester - Grading Pattern

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

Elective Course (Subject) :: ES BOT-112

Plant Breeding

(in force from June 2011)

Credits-2

Unit-I Plant Breeding-I

1. Introduction: Aims and Objectives of Plant Breeding
2. Self-pollination and Cross-pollination methods
3. Selection-Methods of Selection in Plant Breeding for
   Self-pollinated plants
   Cross-pollinated plants

Unit-II Plant Breeding-II

1. Hybridization: Techniques and Tools
2. Hybridization: Methods of Hybridization in Plant Breeding for
   Self-pollinated plants
   Cross-pollinated plants
3. Hybrid Vigour

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CBCS - Semester - Grading Pattern
B. Sc. :: BOTANY :: SEMESTER-I
Elective Course (Subject) :: ES BOT-113

Horticulture

(in force from June 2011)
Credits-2

Unit-I Horticulture-I

1. Introduction: Aims, Objectives and Scope of Horticulture
2. Plant Propagation-Vegetative, Asexual and Sexual reproduction
3. Nursery Management

Unit-II Horticulture-I

1. Landscape: Principles, Types and Planning
2. Floriculture and its implements
3. Bonsai
4. Important Horticulture crops of Gujarat

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern B.Sc. Program

List of Elective (Generic) Courses

(in force from June 2011)

Credits-2

Elective (Generic) Course	
Semester-I	
Computer Skill-1	National Ethics
Human Society and Ethics	Indian Culture and Heritage
Society an Technology	Stress management
Indian Constitution	
Semester-II	
Environment science	Disaster management
Semester-III	
Computer Skill-II	Cultural heritage of Gujarat
Value Oriented education	Human resource development
Personality Development	
Semester-IV	
Basic computer applications	Presentation skills
Social ethics	Indian knowledge system
First aid and emergency care	
Semester-V	
Gandhi and phyloshopy	Library - a learning resource center
Indian religions	Handling of household equipments
Indian history	E-marketing (Telemarketing)
Indian geography	
Semester-VI	
Fundamental rights and duties	Hospitality
Vedic sciences	International relations
Indian Tribal Culture	