

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY
PATAN - 384 265
NAAC Accreditation Grade- "B"

FACULTY OF SCIENCE

B. Sc. Programme in BOTANY subject

Under CBCS :: Semester :: Grading Pattern
Syllabus and Examination Scheme for
Semesters V and VI
With effect from
June 2013 and December 2013
respectively

Date: 25/03/2012

Total Pages: 1 to 38

Syllabus for
B. Sc. (Semester V and VI) programme in
BOTANY
IN FORCE FROM
ACADEMIC YEAR
June 2013 and December 2013

Summary of the Programme

✓ Syllabus duration	Semester pattern i.e., Six
months	
✓ <i>No. of core compulsory (CC) course</i>	04 (<i>in each semester</i>)
✓ <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 (<i>in each semester</i>)
✓ Credits for ES course	02 (<i>in each semester</i>)
✓ 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	15 (on approval of AC and Exam. unit)

Under Choice Based Credit System-Semester-Grading System pattern

B. Sc. Programme in Botany

Semester-V and VI

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

CBCS in UG programme in **Botany Semester V and VI** shall be offered from the Academic year **June 2013 and December 2013** respectively.

- ✓ Botany subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2011-12.
- ✓ 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** 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**

Each Academic year shall consist of **two** semesters, each of **15weeks** 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 **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 s hall 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:

1. 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** as well as in **elective courses**.

2. The 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.

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

Written Test...	20 marks,
Assignments/MCQs/Very Short questions...	5 marks and
Attendance, Regularity, Punctuality...	5 marks.

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. 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
- ✓ Medium answer questions
- ✓ Long answer questions
- ✓ Examples/ Problems, etc.

5. 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.
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%** as decided by concern Board of Studies in Botany.
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.

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.

Selection of Elective (Subjective) course:

For semester-V and VI a common list of three courses is given below. Students are requested to select any one of three courses in Semester-V and then in Semester-VI one course may be selected from the rest of the two courses.

1. ES BOT-301:: *Pharmacognosy of Herbal Drugs*
2. ES BOT-302 :: *Fresh Water Ecology*
3. ES BOT-303 :: *Air Pollution*

Selection of Elective (Generic) course:

For all Semesters-I to VI a separate list consists of new courses of **Elective (Generic)** is given by the University in Paripatra Kramank: 172/2012. Students may select **any one** of the courses as mentioned below for Semester-V and VI separately. As per Paripatra in Semester-V there are **two** courses 1. **Indian constitution** and 2. **Data Base Management System (DBMS)**. In Semester-VI there are **two** courses 1. **Information Technology** and 2. **Naturopathy**.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN						
B.Sc. three year (General) Programme with 144 credits						
Semester-V and VI in BOTANY w.e.f. June-2013 and December-2013 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 (CC) Course					
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
	Soft-skill: Practical Core (PC) Course					
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)					
FG-31	Compulsory English (L.L.)	3	30	70	100	2
	Elective Course (EC)					
EG-31	Elective (Generic) Course	2		50	50	2
ES-31	Elective (Subject) Course	2		50	50	2
		30	150	650	800	24
Semester-VI						
	Core Compulsory (CC) Course					
CC-I-11	Core Course-I (Paper-11)	3	30	70	100	3
CC-I-12	Core Course-I (Paper-12)	3	30	70	100	3
CC-I-13	Core Course-II (Paper-13)	3	30	70	100	3
CC-I-14	Core Course-II (Paper-14)	3	30	70	100	3
	Soft-skill: Practical Core (PC) Course					
PC-I-11	Practical Core Course-I (Paper-11)	3		50	50	1.5
PC-I-12	Practical Core Course-I (Paper-12)	3		50	50	1.5
PC-I-13	Practical Core Course-II (Paper-13)	3		50	50	1.5
PC-I-14	Practical Core Course-II (Paper-14)	3		50	50	1.5
	Foundation Course (FC)					
FG-32	Compulsory English (L.L.)	3	30	70	100	2
	Elective Course (EC)					
EG-32	Elective (Generic) Course	2		50	50	2
ES-32	Elective (Subject) Course	2		50	50	2
		30	150	650	800	24

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Under CBCS-Semester-Grading pattern

B. Sc. (Semester-V and VI) Programme

Format for Question paper

Core Complementary Course in Botany

Time: **3 Hours**

[w. e. f. June 2013 and December 2013]

Total Marks: **70**

1. Long answered and medium answered/short note-typed questions from each Unit-I **20**
 - a. Long answered questions (Attempt any **two** from **three**, each of **7** marks)
 - b. Medium answered or short note-typed questions (Attempt any **two** from **three**, each of **3** marks)
2. Long answered and medium answered/short note-typed questions from each Unit-II **20**
 - a. Long answered questions (Attempt any **two** from **three**, each of **7** marks)
 - b. Medium answered or short note-typed questions (Attempt any **two** from **three**, each of **3** marks)
3. Long answered and medium answered/short note-typed questions from each Unit-III **20**
 - a. Long answered questions (Attempt any **two** from **three**, each of **7** marks)
 - b. Medium answered or short note-typed questions (Attempt any **two** from **three**, each of **3** marks)
4. Questions such as, MCQs, Fill in the blanks, Match the pairs, very short answered questions, etc. **10**
(Each of **1** Mark) [Total **10**, at least **three** questions from each Unit]

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Under CBCS-Semester-Grading pattern

B. Sc. (Semester-V and VI) Programme

Format for Question paper

Elective (Subject) Course in Botany

Time: **2 Hours**

[w. e. f. June 2013 and December 2013]

Total Marks: **50**

1. Long answered and medium answered/short note-typed questions from each Unit-I **20**
 - a. Long answered questions (Attempt any **two** from **three**, each of **7** marks)
 - b. Medium answered or short note-typed questions (Attempt any **two** from **three**, each of **3** marks)
2. Long answered and medium answered/short note-typed questions from each Unit-II **20**
 - a. Long answered questions (Attempt any **two** from **three**, each of **7** marks)
 - b. Medium answered or short note-typed questions (Attempt any **two** from **three**, each of **3** marks)
3. Questions such as, MCQs, Fill in the blanks, Match the pairs, very short answered questions, etc. **10**
(Each of **1** Mark) [Total **10**, **Five** questions from each Unit]

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Semester-V :: BOTANY:: Core Compulsory

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

CORE COMPULSORY COURSE

CC-BOT-311

(Algae, Fungi and Plant Pathology)

CC-BOT-312

(Bryophyta, Pteridophyta and Gymnosperms)

CC-BOT-313

(Angiosperm Families, Plant Ecology and Plant Anatomy)

CC-BOT-314

(Cell Biology & Genetics, Microbiology and Biostatistics)

CORE COMPULSORY PRACTICAL COURSE

PC-BOT-311

(Algae, Fungi, Plant Pathology and Bryophyta)

PC-BOT-312

(Pteridophyta, Gymnosperms, Angiosperm Families and Plant Ecology)

PC-BOT-313

(Plant Anatomy, Cell Biology & Genetics, Microbiology and Biostatistics)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
Under CBCS-Semester-Grading pattern
B.Sc. (Semester-V) Programme
Core Compulsory Course in BOTANY
CC-BOT-311(Algae, Fungi and Plant Pathology)

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

Credit: **3.0**
Credit: **1.5**

Unit-I :: Algae

- Cyanobacteria: General characters, Organization of Thallus: Unicellular forms, Colonial forms: Non-filamentous and Filamentous colonies. Economic importance of Cyanobacteria.
- General characters of Algae and Thallus organization of Algae: Colonial, Coenobium and Filamentous. Ultra structure of Algal (Eukaryotic) cell i.e., *Chlamydomonas* cell. Harmful aspects of Algae.
- Typical life histories of algae belonging to various divisions including classification (Smith, 1958), occurrence, structure, reproduction (excluding development):
 - Cyanophyta: *Nostoc*
 - Chlorophyta: *Oedogonium*
 - Phaeophyta: *Ectocarpus*
 - Rhodophyta: *Batrachospermum*

PRACTICALS:

Classify with reasons (up to family), identify and describe structural peculiarities of **Algae** mentioned in Theory syllabus.

Cyanophyta: *Nostoc*

- **Material:** Vegetative structure.
- **Permanent slide:** Thallus, Heterocyst.

Chlorophyta: *Oedogonium*

- **Material:** Vegetative structure (Thallus), Antheridium: Macrandrous sp., Oogonium: Macrandrous sp.
- **Permanent slide:** Thallus, Antheridium: Macrandrous sp., Antheridium: Nanandrous species., Oogonium: Macrandrous species., Zygote.

Phaeophyta: *Ectocarpus*

- **Material:** Veg. structure, asexual reproductive structures- Uni & Pluri-locular sporangia
- **Permanent slide:** Thallus, asexual reproduction- Uni and Pluri-locular sporangia.

Rhodophyta: *Batrachospermum*

- **Material:** Vegetative and reproductive structure - carposporangia and cystocarp
- **Permanent slide:** Thallus, cystocarp.

References:

- Hait G, Bhattacharya K and Ghosh A K (2008) *A Text Book of Botany, Vol-I*, New Central Book Agency (P) Ltd., Kolkata (1st Edition's Reprint).
- Singh V, Pande P C and Jain D K (2008-09) *A Text Book of Botany*, Rastogi Publications, Meerut (4th Revised Edition's Reprint).
- Vasishtha B R, Sinha A K and Singh V P (2007), *Botany for degree students-Algae (5th edition)*, S. Chand & Co. Ltd., New Delhi.
- Pandey B P (2001), *College Botany Vol. I*, S. Chand & Co. Ltd., New Delhi.
- Purohit S S and Deo P P (2005), *UGC Unified College Botany –First Year*, Student edition, Jodhpur.
- Gangulee S.C., Das K.S., Dutta C.D. and Kar (1985), *College Botany Vol. I, II & III*, New Central Book Agency, Kolkata.
- Pandey S N, Misra S P, Mukharjee and Trivedi P S (2003) *A Text Book of Botany Vol. I & II*, Vikas Publ. H. P L, N. Delhi.

Unit-II :: Fungi

- General characters, Modes of nutrition, Thallus organization: Unicellular, Filamentous - aseptate and septate mycelia.
- Typical life histories of fungi belonging to various divisions including Classification (G C Ainsworth, 1973), occurrence, structure, reproduction (excluding development):
 - Oomycetes: *Pythium*
 - Ascomycetes: *Erysiphae*
 - Basidiomycetes: *Agaricus*
- Forms of spore in Fungi: Asexual Spores, Sexual Spores.

PRACTICALS:

Classify with reasons (up to family), identify and describe structural peculiarities of **Fungi** mentioned in Theory syllabus.

Oomycetes: *Pythium*

- **Material:** Vegetative structure, Reproductive body: Asexual and Sexual.
- **Permanent slide:** Mycelium, Reproductive structure: Asexual, Sexual and Zygosporangium.

Ascomycetes: *Erysiphae*

- **Material:** Vegetative structure, reproductive body -cleistothecium.
- **Permanent slide:** Mycelium, reproductive structure - cleistothecium.

Basidiomycetes: *Agaricus*

- **Material:** reproductive fruiting bodies
- **Permanent slide:** reproductive structure, L. S. and T. S. of gills.

References:

- Hait G, Bhattacharya K and Ghosh A K (2008) A Text Book of Botany, Vol -I, New Central Book Agency (P) Ltd., Kolkata (1st Edition's Reprint).
- Singh V, Pande P C and Jain D K (2008-09) A Text Book of Botany, Rastogi Publications, Meerut (4th Revised Edition's Reprint).
- Sharma P D (2003) The Fungi, Rastogi Publications, Meerut (2nd Edition's Reprint).
- Vashishta B R and Sinha A K (2007) Botany for Degree Students –Fungi, S Chand & Company Ltd., New Delhi (1st Edition's Revised and Multicolour-Reprint).
- Vasishtha B R and Sinha A K (2002), Botany for degree students -Fungi (5th edition), S. Chand & Co. Ltd., New Delhi
- Sharma O P (2002), Text Book of Fungi (9th edition), Tata McGraw-Hill Publishing Co Ltd., Delhi
- Dubey H.C. (2005), An Introduction to Fungi, (3rd edition), Vikas Publishing House P. Ltd., New Delhi
- Sundra Rajan S (2001), Introduction to Fungi, (1st edition), Anmol Publications P. Ltd., New Delhi.
- Swanton E W (2002), Fungi (), Surbhi Publications, Jaipur
- Alexopoulos C.J., Mims C W and Blackwell M (2002) Introductory Mycology (3rd edition), John Wiley & Sons, New York.
- Sumbali Geeta (2005), The Fungi, Narosa Publishing House, New Delhi.
- Pandey B P (2002), Botany B Sc I, S Chand & Co L, New Delhi

Unit-III :: Plant Pathology

- The Fundamentals of Plant Pathology: Plant Pathogens: Bacteria, Virus and Fungi.
- Classification of plant diseases on the basis of nature of the causal agent and occurrence.
- General symptoms, causal organism, disease cycle and control measures of following Plant diseases:
 - White rust of Crucifer,
 - Black rust of Wheat and
 - Wilt of Cotton

PRACTICALS:

Plant diseases: Study through **Fresh/Preserved material and Permanent slide**

- **White rust of Crucifer**- reproductive structure-conidia
- **Black rust of Wheat**- reproductive structures-Telutospores, Uredospores
- **Wilt of Cotton**- reproductive structure-conidia, cleistothecium

References:

- Rangaswami G (1988) Diseases of Crop plants in India, Prentice -Hall of India Pvt. Ltd., New Delhi (3rd Edition).
- Pandey B P (2006) Plant Pathology-Pathogen and Plant Diseases, S Chand & Co. Ltd., New Delhi (1st Edition's Reprint).
- Mehrotra R S (1991) Plant Pathology, Tata McGraw -Hill Publishing Co. Pvt. Ltd., New Delhi (8th Edition's Reprint).
- Agrios George N (2004) Plant Pathology, Academic Press, Reed Elsevier India Pvt. Ltd., New Delhi (4th Edition/ 1st Indian Edition's Reprint).
- Sharma P D (2003) Microbiology and Plant Pathology, Rastogi Publications, Meerut (2nd Edition's Reprint).

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
Under CBCS-Semester-Grading pattern
B.Sc. (Semester-V) Programme
Core Compulsory Course in BOTANY
CC-BOT-312 (Bryophyta, Pteridophyta and Gymnosperms)

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

Credit: **3.0**
Credit: **1.5**

Unit-I :: Bryophyta

- General characters of Bryophyta. Origin of Bryophyta: From Algae and From Pteridophytes.
- Vegetative reproduction in Bryophytes.
- Typical life-histories of Bryophyta belonging to various divisions including Classification (Proskauer, 1957), Occurrence, External and Internal Structure of Thallus and Reproduction (excluding development).
 - Hepaticopsida: *Riccia*
 - Anthocerotopsida: *Anthoceros*
 - Bryopsida: *Funaria*

PRACTICALS:

Classify with reasons (up to family), identify and describe structural peculiarities of **Bryophytes** mentioned in Theory syllabus.

Hepaticopsida: *Riccia*

- **Material:** Vegetative structure: Thallus, Reproductive body: Antheridia and Archegonia.
- **Permanent slide:** Thallus (W M), V S of Thallus, Reproductive structure: Antheridia (W M) and Archegonia (W M), V S of Sporophyte/Capsule.

Anthocerotopsida: *Anthoceros*

- **Material:** Vegetative structure: Thallus, Reproductive body: Sporophyte/Capsule.
- **Permanent slide:** Thallus (W M), V S of Thallus, Reproductive structure: Antheridia (W M) and Archegonia (W M), T S of Sporophyte/Capsule V S of Sporophyte/Capsule.

Bryopsida: *Funaria*

- **Material:** Vegetative structure: Thallus, Sex organs, Sporophyte/Capsule, Spores, Peristomal teeth.
- **Permanent slide:** Thallus (W M), Sex organs, L.S. of capsule, Peristome, Protonema.

References:

- Singh V, Pande P C and Jain D K (2008-09) *A Text Book of Botany*, Rastogi Publications, Meerut(4th Revised Edition's Reprint).
- Vashishta B R and Sinha A K (2007) *Botany for Degree Students –Bryophyta*, S Chand & Company Ltd., New Delhi (1st Edition's Revised and Multicolour -Reprint).
- A V S S Sambamurty (2005), *A text book of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany* (), Parihar N.S. (), *Pteridophyta*

Unit-II :: Pteridophyta

- General characters of Pteridophyta. Apospory and Apogamy.
- Types of Stele in Pteridophytes.
- Typical life-histories of Pteridophyta belonging to various divisions including Classification (Smith, 1955), Occurrence, External and Internal Structure of Plant body and Reproduction (excluding development).
 - Lycophyta: *Selaginella*
 - ArthropHYta: *Equisetum*
 - Pterophyta: Leptosporangiopsida: *Marsilea*

PRACTICALS:

Classify with reasons (up to family), identify and describe structural peculiarities of **Pteridophytes** mentioned in Theory syllabus.

Lycophyta: *Selaginella*

- **Material:** Plant body (Veg organs -root, stem, rhizophoe, leaf), reproduction - cone/ strobilus.
- **Permanent slide:** Plant body (WM), T.S. of root, T.S. of stem, T.S. of rhizophore, leaf (WM), reproduction: L. S. of cone, Megaspore (WM), Microspore (WM).

ArthropHYta: *Equisetum*

- **Material:** Plant body (Veg. organs - stem, scaly leaves), reproduction - cone/ strobilus.
- **Permanent slide:** Plant body (WM), T. S. of stem, scaly leaves (WM), reproduction: L. S. of cone, T. S. of cone, Spores (WM).

Pterophyta: Leptosporangiopsida- *Marsilea*

- **Material:** Vegetative structure (External and Internal): Root, Stem, Leaf. Reproductive body: Sporocarp.
- **Permanent slide:** T S of Root, Stem, Leaf, Reproductive structure: T S/V S of Sporocarp, Microspore, Megaspore.

References:

- Singh V, Pande P C and Jain D K (2008-09) *A Text Book of Botany*, Rastogi Publications, Meerut(4th Revised Edition's Reprint).
- Vashishta B R and Sinha A K (2007) *Botany for Degree Students -Pteridophyta*, S Chand & Company Ltd., New Delhi (1st Edition's Revised and Multicolour -Reprint).
- Hait G, Bhattacharya K and Ghosh A K (2008) *A Text Book of Botany, Vol-I*, New Central Book Agency (P) Ltd., Kolkata(1st Edition's Reprint).

Unit-III :: Gymnosperms

- Introduction: Affinities of Gymnosperms with Pteridophytes and Angiosperms.
- Economic importance of Gymnosperms.
- Typical life-histories of Gymnosperms belonging to various divisions including Classification (Taylor, 1981), Occurrence, Structure and Reproduction (excluding development).
 - Coniferales: *Pinus*
 - Ephedrales: *Ephedra*

PRACTICALS:

Classify with reasons (up to family), identify and describe structural peculiarities of **Gymnosperms** mentioned in Theory syllabus.

Coniferales: *Pinus*

- **Material:** Vegetative organs-leaves (needles), reproductive structures- male cone, female cone, Microspores (pollen grains).
- **Permanent slide:** Sections of stem, T.S. of leaf, reproduction: L. S. of male cone, T. S. of ovule, Microspores/Pollen grains (WM).

Ephedrales: *Ephedra*

- **Material:** Vegetative organs. Reproductive structures- Male cone, Female cone, Microspores (pollen grains).
- **Permanent slide:** Sections of vegetative organs. L. S. of male cone, T. S. of ovule, Microspores/Pollen grains (WM).

References:

- Biswas C and Johri B M (2004) *The Gymnosperms*, Narosa Publishing House, New Delhi(2nd Reprint Edition).
- Vasishta P C (2005) *Botany for Degree Students Gymnosperms*, S Chand & Company Ltd., New Delhi(1st Edition's Reprint)
- Pandey B P (2003) *College Botany –Vol.-II*, S Chand & Company Ltd., New Delhi(1st Edition's Reprint)
- Pandey S N, Misra S P and Trivedi P S (2003) *A Text Book of Botany –Vol.-II*, Vikas Publishing House Pvt Ltd., New Delhi(11th Revised Edition's Reprint).
- Singh V, Pande P C and Jain D K (2008-09) *A Text Book of Botany*, Rastogi Publications, Meerut(4th Revised Edition's Reprint).
- Pandey B P (2003) *Simplified Course in Botany –B Sc-II*, S Chand & Company Ltd., New Delhi(1st Edition's Reprint)
- Bhatnagar S P and Moitra Alok (2006) *Gymnosperms*, New Age International (P) Ltd, Publishers., New Delhi(1st Edition's Reprint)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
Under CBCS-Semester-Grading pattern
B.Sc. (Semester-V) Programme

Core Compulsory Course in BOTANY

CC-BOT-313 (*Angiosperm Families, Plant Ecology and Plant Anatomy*)

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

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

Credit: **3.0**

Credit: **1.5**

Unit-I :: Angiosperm Families

- Studies of Angiosperm families:

Distinguishing characters and classification up to family with reasons as per Bentham and Hooker's (1862-80) system of classification of the following families including floral formula, floral diagram and botanical names of economically important any five plants:

- Dicotyledons:
 - **Polypetalae:** Tiliaceae, Rhamnaceae, Cucurbitaceae.
 - **Gamopetalae:** Solanaceae, Convolvulaceae, Scrophulariaceae, Bignoniaceae, Lamiaceae.
 - **Monochlamidae:** Amaranthaceae.
- Monocotyledons: Commelinaceae, Amaryllidaceae.

PRACTICALS:

Identify and classify (as per Bentham and Hooker's system) the family giving reasons and Draw diagrams: A flowering twig, L S of Flower, other floral structures, floral formula and floral diagram of locally available plant specimens of families as mentioned below.

Dicotyledons:

Polypetalae: Tiliaceae, Rhamnaceae, Cucurbitaceae.

Gamopetalae: Solanaceae, Convolvulaceae, Scrophulariaceae, Bignoniaceae, Lamiaceae.

Monochlamydae: Amaranthaceae.

Monocotyledons: Commelinaceae, Amaryllidaceae.

References:

Lawrence G H M (1967) *Taxonomy of Vascular Plants*, Oxford & IBH Publishing Co.Pvt Ltd., New Delhi (1st Indian Edition).

Singh V Pande P C and Jain D K (1995) *A Text Book of Botany-Angiosperms*, Rastogi Publications, Meerut(1st Edition's Reprint).

Singh V and Jain D K (1999) *Taxonomy of Angiosperms*, Rastogi Publications, Meerut(2nd Edition's Reprint).

Unit-II :: Plant Ecology

- Climatic Factors: Light factor: Light in relations to Plants. Temperature factor: Effects of temperature on Plants, Variations in temperature and its effects on distribution on Plants. Precipitation (Rainfall), Humidity in air and Wind.
- Biotic Factor: Positive interactions: Mutualism and Commensalism. Negative inter action: Parasitism and Predation. Abiotic environment: Liebig's Law of Minimum, Shelford's Law of Tolerance.

- Autecology: Introduction, Regeneration of a species: Seed output, Seed dispersal, Seed viability, Seed germination and reproductive capacity.
- Edaphic Factor: Soil: Soil Complex: Components and Properties: Mineral matter: Soil Texture, Soil structure and Porosity. Soil air, Soil Water, Soil Solution, Soil Organic matter and Soil Organisms.

PRACTICALS

- Study of ecological instruments:
 - Maximum and Minimum Thermometer
 - Dry and Wet Bulb Thermometer
 - Hygrometer
 - Anemometer
 - Rain guage
- To determine Carbonate, Nitrate and Base deficiency in scale of 0-5 in soil sample.
- To determine Chloride content in a water sample.
- To determine pH in a water and soil sample.
- To determine Total hardness of a water sample.
- To determine Carbonate and Bi-carbonate in a water sample.
- To determine field/water holding capacity of different soil samples.
- Mechanical separation of soil sample to study the percentage of different particles (contents) of soil samples.
- Study of Physical characters i.e., weight, length, width, volume, colour and shape of the seed.
- Biotic Interactions between living organisms:
 - Mutualism : Root nodules, Lichen (specimen and permanent slides)
 - Parasitism : *Cuscuta* (specimen and permanent slide), *Loranthus* (specimen)

References:

Sharma P D (2003) *Ecology and Environment*, Rastogi Publications, Meerut. (7th Edition's Reprint).
 Agrawal K C (2001) *Fundamentals of Environmental Biology*, Nidhi Publishers (India), Bikaner. (1st Edition).
 Subrahmanyam N S and Sambamurty A V S S (2000) *Ecology*, Narosa Publishing House, New Delhi. (1st Edition).
 Kormondy E J (2002) *Concept of Ecology*, Prentice-Hall of India Pvt Ltd., New Delhi(12th Indian Edition Reprint).

Unit-III :: Plant Anatomy

- Stomata: Structure and Function, Types -According to Metcalfe and Chalk (1950).
- Secretory Tissue: Glandular trichomes, Hydathodes, Resin ducts and Laticifers.
- Nodal Anatomy: Leaf Traces and Leaf gaps. Types of nodes.
- Ergastic substances: Food Products-Carbohydrates, Nitrogenous Products and Fats. Mineral crystals and Alkaloids.
- Leaf fall and wound healing.

PRACTICALS:

- ❖ To study the various types of Stomata as per theory syllabus:
Anomocytic: From any plant species of families Papaveraceae, Capparaceae, Nyctaginaceae. **Anisocytic**: From any plant species of families Brassicaceae, Solanaceae, Convolvulaceae. **Diacytic**: From any plant species of families Lamiaceae, Acanthaceae and **Paracytic**: From any plant species of family Rubiaceae.
- ❖ To study the **Glandular Trichomes** from *Datura*, *Ocimum* stem epidermis, fruit wall of *Boerhaavia diffusa*. **Hydathode** from *Colocasia* leaf, *Nephrolepis* leaflet. **Resin ducts** from *Pinus* leaflet, Sunflower stem.
- ❖ To study Articulated or Non-Articulated Latex tissue from the plant species of families viz., Convolvulaceae, Sapotaceae, Caricaceae, Asteraceae, Euphorbiaceae, Asclepiadaceae, Moraceae, Papaveraceae and Apocynaceae.

- ❖ To study the Uni_, Tri_ and Multilacunar nodes from stem (Nodal region) of *Annona*, *Azadirachta* and *Chenopodium* respectively.

- ❖ To study the ergastic substances with appropriate staining:
 - Starch grains: various types e.g., Caryopsis of Maize, Wheat, Rice and tuber of Potato.
 - Aleurone layer e.g., Maize. Aleurone crystals e.g., Seed of castor.
 - Fat particles e.g., seed of Castor, Groundnut and Coconut (endosperm).
 - Mineral Crystals e.g., **Calcium oxalate**: Raphids-Petiole of *Colocasia* and Stem of *Commelina*. Sphaeraphids: *Nerium* leaf. **Calcium carbonate**: Cystoliths-*Ficus* (Banyan) leaf
 - Alkaloids e.g., *Withania*-Root, *Vinca*-Stem and *Nicotiana*-leaf and leaf of *Adhatoda* and *Datura*.

References:

Singh V, Pande P C and Jain D K (1998) *Anatomy of Seed Plants*, Rastogi Publications, Meerut (1st Edition's Reprint).
 Pandey B P (1997) *Plant Anatomy*, S Chand & Co. Ltd, New Delhi. (1st Edition's Reprint).
 E John Jothi Prakash (2000) *A Text Book of Plant Anatomy*, Emkay Publications, Delhi. (2nd Revised Edition).
 Tayal M S (2001) *Plant Anatomy*, Rastogi Publications, Meerut (5th Edition's Reprint).

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-V) Programme

Core Compulsory Course in BOTANY

CC-BOT-314 (Cell Biology & Genetics, Microbiology and Biostatistics)

Theory teaching hours: 3 Hours/week

Practical teaching hours: 3 Hours/week

Credit: 3.0

Credit: 1.5

Unit-I :: Cell Biology & Genetics

▪ **Cell biology:**

- Mitochondria: Morphology and Ultra structure, Chemical composition and Functions. Plastids: Types of Plastids, Chloroplasts: Morphology, Chemical composition, Ultra structure and Functions.

▪ **Genetics:**

- Non-Mendelian Inheritance: Genetic Interaction: 9:6:1 and 13:3. Crossing over and Linkage maps: Recombination frequencies from a test cross and F_2 data. Linkage groups: Introduction, Chi-square test for segregation ratios and detection of linkage.
- Chromosomal Aberrations: Structural Changes in Chromosomes-Deletion, Duplication, Inversion, Translocation. Numerical Changes in Chromosomes -Euploidy: Monoploidy, Polyploidy: Autopolyploids, Allopolyploids. Aneuploidy: Monosomy, Nullisomy, Trisomy and Tetrasomy.

PRACTICALS:

Study of cell organelles (as per theory syllabus) through Permanent Slides/Charts/Models/Photographs .

Study of chromosomal aberrations (as per theory syllabus) through Charts/ Models/ Photographs.

Solve Genetical problems and conclude from topics given in the theory syllabus.

References:

Strickberger M W (2005) *Genetics*, Prentice-Hall of India Pvt Ltd., New Delhi(3rd Edition-EEE).

Rastogi Veer Bala (1991-92) *A Text Book of Genetics*, Kedar Nath Ram Nath, Meerut(9th Revised Edition).

Singh B D (2001) *Plant Breeding -Principles and Methods*, Kalyani Publishers, Ludhiana (1st Edition's Reprint).

Gupta P K (2005) *Genetics*, Prentice-Hall of India Pvt Ltd., New Delhi(3rd Edition-EEE).

Verma P S and Agarwal (2006) *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. S Chand & Company Ltd., New Delhi(1st Multicolour Edition-Reprint).

Sambamurty (), *Genetics (2nd edition)*

Gupta P K (2007), *Genetics-classical to modern (1st edition)*

Patel B C (2012) *Human Genetics (Manav Janinvignan-in Gujarati)* Gujarat Vishvakosh Trust, Ahmedabad-380 013 (1st edition).

Unit-II :: Microbiology (Bacteriology)

- Cell structure of Bacteria: Cellwall-structure and chemical composition, Cytoplasmic membrane, Mesosomes, Cytoplasmic inclusions and vacuoles, Nuclear material.
- Preparation for light microscope examination: Wet mount and Hanging drop technique. Fixed stained smear- Gram staining.

- Isolation, Maintenance and Preservation of Pure cultures: Streak -plate, Pour plate and Spread plate techniques. Maintenance and Preservation: Periodic transfer, overlaying cultures with mineral oil, Freeze-drying, storage at low temperatures.
- The Immune response: Antigens, Antibodies, Monoclonal antibodies.

PRACTICALS

- Study of bacterial cell through diagram, chart/microphotograph.
- Wet mount and Hanging drop technique.
- Fixed stained smear-Gram staining.
- Study of Microorganisms's Isolation techniques through prepared plates.
- Principles and working of following apparatus: Autoclave, Hot air oven and laminar air flow.
- Detection of Blood group-A, B, AB, O/Rh+, Rh- using Blood grouping test.

References:

Pelczar M J, Chan E C S and Krieg N R (2004) *Microbiology*, Tata McGraw-Hall Publishing Company Ltd., New Delhi (27th Reprint Edition).
 Dubey H C (2004), *Bacteria, Viruses and Fungi*, Vikas Publishing House P Ltd, New delhi
 Prescott, Harley and Klein, *Microbiology* (6th edition),
 Sharma P D (2007), *Microbiology* (6th edition),
 Patel R J and Patel K R (2000), *Experimental Microbiology Vol.-I*, Aditya, Amdavad.
 Powar and Daginawala (1997), *General Microbiology Vol.I & II*, Himalaya Publishing House, Mumbai.

Unit-III :: Biostatistics

- Measure of Dispersion-I: Definition, computation, Merits and Demerits and Properties of: Mean Deviation and Standard Deviation: Ungrouped data, Grouped data: Discrete series and Continuous series.
- Measure of Dispersion-II: Definition, computation, Merits and Demerits and Properties of: Variance and Co-efficient of Variance. Standard Error.
- Probability: Important terms, Definition of Probability, Theorems of Probability: The Addition Theorem and The Multiplication Theorem.

PRACTICALS

Solve and conclude the statistical problems on:

- Mean deviation,
- Standard deviation,
- Variance,
- Co-efficient of Variance
- Standard error and
- Probability.

References:

Banerjee P K (2004) *Introduction to Biostatistics [A Textbook of Biometry]*, S Chand & Company Ltd., New Delhi (1st Edition).
 Prasad S (2001) *Elements of Biostatistics*, Rastogi Publications, Meerut (1st Edition).
 Chandel S R S (2006) *A Hand Book of Agricultural Statistics*, Achal Prakashan Mandir, Kanpur (1st Edition).

Seat No. _____

Hemchandracharya North Gujarat University, Patan

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-V) Programme Practical Examination, November/December -20

Botany Practical - PC-BOT-311

[*Algae, Fungi, Plant Pathology and Bryophyta*]

[In force from **June 2013**]

Date: / /20

Time: **5 Hours**]

Place:

[Maximum Marks: **65**

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

1. Identify and classify giving suitable reasons (up to family) the specimens **A, B and C.** **18**
 2. Identify and describe the structural peculiarities observed in specimens **D, E and F.** **15**
 3. Make temporary slide of the reproductive organ from the specimen **G.** Draw labeled diagram and show your preparation to the examiner. **5**
 4. Expose the Pathogen from the given plant material **H** and prepare temporary slide. Make a labeled diagram and show your preparation to the examiner. **5**
 5. Identify and describe peculiarities seen in spot **I, J, K and L.** **12**
 6. (a) Submission and *viva-voce.* **7**
(b) Journal **3**
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Hemchandracharya North Gujarat University, Patan

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-V) Programme Practical Examination, November/December -20**Botany Practical - PC-BOT-312**[*Pteridophyta, Gymnosperms, Angiosperm Families and Plant Ecology*][In force from **June 2013**]**Date:** / /20Time: **5 Hours**]**Place:**[Maximum Marks: **65****Instruction:** Students are requested to follow instructions given by the examiners.

- | | | |
|----|---|-----------|
| 1. | Identify and classify giving suitable reasons (up to family) the specimens A . | 8 |
| 2. | Identify and describe the structural peculiarities observed in specimens B . | 8 |
| 3. | Make temporary slide of the reproductive organ from the specimen C . Draw labeled diagram and show your preparation to the examiner. | 5 |
| 4. | Refer to the given specimens D, E & F to their respective families giving reasons including floral formula and floral diagram. | 18 |
| 5. | Identify and describe peculiarities seen in spot G, H and I . | 12 |
| 6. | Determinefrom given water/soil sample J . Show your results to the examiner. | 4 |

OR

- | | | |
|----|--|----------|
| 6. | Determine Carbonate, Nitrate and Base deficiency in scale of 0 -5 from soil sample J . Show your results to the examiner. | |
| 7. | (a) Submission and viva-voce. | 7 |
| | (b) Journal | 3 |
-

Hemchandracharya North Gujarat University, Patan

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-V) Programme Practical Examination, November/December -20

Botany Practical - PC-BOT-313

[*Plant Anatomy, Cell Biology & Genetics, Microbiology and Biostatistics*]

[In force from **June 2013**]

Date: / /20

Time: **5 Hours**]

Place:

[Maximum Marks: **70**

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

- | | |
|---|-----------|
| 1. Solve and conclude the Genetical problems as per given slip. | 12 |
| A..... | |
| B..... | |
| 2. Solve and conclude the Statistical problems as per given slip. | 12 |
| C..... | |
| D..... | |
| 3. Showfrom plant material E , stains if necessary with appropriate staining.
Draw labeled diagram and show your preparation to the examiner. | 8 |
| 4. Expose and mount from the given material F . Stain if necessary. Show your preparation to your examiner. | 8 |
| 5. Proceed to perform Gram positive / Gram negative staining from sample G . Write principle of staining technique. Show your preparation to the examiner. | 8 |

OR

- | | |
|---|-----------|
| 5. Perform Bacterial /Protozoan motility of the given sample G by hanging drop method. | 8 |
| 6. Identify and describe the structural peculiarities observed in spot H, I and J . | 12 |
| 7. (a) Submission and viva-voce. | 7 |
| (b) Journal | 3 |

Semester-VI :: BOTANY :: Core Compulsory

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

CORE COMPULSORY COURSE

CC-BOT-321

(Molecular Biology, Plant Pathology & Lichens and Angiosperm Families)

CC-BOT-322

(Biochemistry and Plant Physiology)

CC-BOT-323

(Economic Botany, Plant Tissue Culture & Biotechnology and Genetics & Plant Ecology)

CC-BOT-324

(Plant Anatomy and Plant Breeding)

CORE COMPULSORY PRACTICAL COURSE

PC-BOT-321

(Molecular Biology, Plant Pathology & Lichens, Angiosperm Families and Biochemistry)

PC-BOT-322

(Plant Physiology, Plant Breeding)

PC-BOT-323

(Economic Botany, Plant Tissue Culture & Biotechnology, Genetics & Plant Ecology, Plant Anatomy)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
Under CBCS-Semester-Grading pattern
B.Sc. (Semester-VI) Programme
Core Compulsory Course in BOTANY

CC-BOT-321 (*Molecular Biology, Plant Pathology & Lichens and Angiosperm Families*)

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

Credit: **3.0**

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

Credit: **1.5**

Unit-I :: Molecular Biology

- Chemical Nature of Genetic materials: Molecular structure of De -oxy ribo Nucleic Acid-Watson and Crick model, Molecular structure of Ribo Nucleic Acid and Types of RNA.
- Replication of DNA: Mechanism of DNA replication in Eukaryotes and Prokaryotes.
- Transcription: Mechanism of Prokaryotic Transcription, Mechanism of Eukaryotic Transcription.
- Genetic Code and Translation: Genetic Code -Characteristics and Genetic codon/dictionary. Translation-Mechanism of Protein Synthesis.

PRACTICALS

Study through Permanent Slides/Charts/Models/Photographs:

- Watson and Crick's model of DNA / Molecular structure of DNA,
- Types of RNA / Molecular structure of RNA,
- DNA Replication,
- Transcription and
- Translation: Genetic code and Protein synthesis

Reference:

Verma P S and Agarwal (2006) *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology* .S Chand & Company Ltd., New Delhi(1st Multicolour Edition-Reprint).

Unit-II :: Plant Pathology & Lichens

- **Plant Pathology**
 - Defense Mechanisms in Plants: Morphological Defense Mechanism and Biochemical Defense Mechanism.
 - Dissemination of Plant Pathogens: Direct dissemination and Indirect dissemination.
 - ❖ Study of Plant Diseases: Following diseases of Plants, their symptoms, causal organisms, disease cycle and their control measures: 1. Late Blight of Potato 2. Tikka disease of Groundnut and 3. Powdery mildew of Cucurbits.
- **Lichens:**General Characters of Lichens, Classification of the Lichens -Ascolichens and Basidiolichens, Structure of Thallus- Crustose, Foliose and Fruticose and Reproduction of Lichen- Asexual and Sexual.

PRACTICALS

- Plant diseases: Study through **Fresh/Preserved material and Permanent slide**
 - **Late Blight of Potato** - reproductive structure-sporangia
 - **Tikka disease of Groundnut** - reproductive structure-conidia
 - **Powdery mildew of Cucurbits** - reproductive structures
- Study of different specimens: Crustose, Foliose and Fruticose.
- Material/Permanent slide: Thallus of Lichen, Fruiting bodies, T S of Lichen Thallus and V S of fruiting bodies.

References:

- Rangaswami G (1988) Diseases of Crop plants in India, Prentice -Hall of India Pvt. Ltd., New Delhi (3rd Edition).
- Pandey B P (2006) Plant Pathology-Pathogen and Plant Diseases, S Chand & Co. Ltd., New Delhi (1st Edition's Reprint).
- Mehrotra R S (1991) Plant Pathology, Tata McGraw -Hill Publishing Co. Pvt. Ltd., New Delhi (8th Edition's Reprint).
- Agrios George N (2004) Plant Pathology, Academic Press, Reed Elsevier India Pvt. Ltd., New Delhi (4th Edition/ 1st Indian Edition's Reprint).
- Sharma P D (2003) Microbiology and Plant Pathology, Rastogi Publications, Meerut (2nd Edition's Reprint).
- Hait G, Bhattacharya K and Ghosh A K (2008) *A Text Book of Botany, Vol-I*, New Central Book Agency (P) Ltd., Kolkata (1st Edition's Reprint).
- Singh V, Pande P C and Jain D K (2008-09) *A Text Book of Botany*, Rastogi Publications, Meerut (4th Revised Edition's Reprint).
- Sharma P D (2003) *The Fungi*, Rastogi Publications, Meerut (2nd Edition's Reprint).
- Vashishta B R and Sinha A K (2007) *Botany for Degree Students –Fungi*, S Chand & Company Ltd., New Delhi (1st Edition's Revised and Multicolour -Reprint).

Unit-III :: Angiosperm Families

- Classification (as per Bentham and Hooker's system), distinguishing characters, floral formula, floral diagram, common examples of economically important plants of the following families.
 - Dicotyledons:
 - **Polypetalae:** Cruciferae (Brassicaceae), Papaveraceae, Rutaceae.
 - **Gamopetalae:** Sapotaceae, Asteraceae.
 - **Monochlamydae:** Moraceae.
 - Monocotyledons: Cannaceae, Cyperaceae, Poaceae.
- Dichotomous Key
- Angiosperm Taxonomy in relation to anatomy and embryology.

PRACTICALS:

Identify and classify (as per Bentham and Hooker's system) the family giving reasons and Draw diagrams: A flowering twig, L S of Flower, other floral structures, floral formula and floral diagram of locally available plant specimens of families as mentioned below.

Dicotyledons:

Polypetalae: Cruciferae (Brassicaceae), Papaveraceae, Rutaceae.

Gamopetalae: Sapotaceae, Asteraceae.

Monochlamydae: Moraceae.

Monocotyledons: Cannaceae, Cyperaceae, Poaceae.

Prepare dichotomous key with the help of locally available plant species.

References:

- Singh V and Jain D K (2006), *Taxonomy of Angiosperms (2nd edition)*,
- Datta S C (2003), *Systematic Botany*, New Age International L Publishers, N Delhi
- Pandey B.P.(2004) *Text Book Of Botany – Angiosperms*, S Chand & C L,
- Singh V Pande P C and Jain D K (2003) *Taxonomy of Angiosperm* ,Rastogi
- Sugbramanyam N.S.(1999) *Modern Plant Taxonomy*, Vikas publishing House.
- Lawrence H M (1951) *Taxonomy of Vascular Plants*, Oxford Publication.
- Sambamurty A V S S (2005) *Taxonomy of Angiosperms, I K International P L, New Delhi*
- Pandey B.P. (2005) *Taxonomy of Angiosperms, S Chand*
- A.S. Foster & E.M. Gifford *Comparative Morphology of Vascular Plants*
- K.R. Sporne *The Morphology of Vascular Plants*
- R.N. Sutar *A Text Book of Systematic Botany*
- Y.D. Tyagi & S.Kshetrapal *An Introduction to Taxonomy of Angiosperms*
- P.C. Vashishta *Taxonomy of Angiosperms*.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-VI) Programme

Core Compulsory Course in BOTANY

CC-BOT-322 (Biochemistry and Plant Physiology)

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

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

Credit: **3.0**

Credit: **1.5**

Unit-I :: Biochemistry

- Lipids: Beta-Oxidation of Fatty acid: Activation of Fatty acid, Reaction of Fatty acid. Bio-synthesis of Fatty acid: Acetyl Co-A transport, Production of Malonyl Co-A, The Priming Phase and Elongation Phase.
- Vitamins: Definition, types and significance. Water soluble vitamins: their functions and deficiency disease. Fat soluble vitamins: their functions and deficiency disease.
- Enzymes: Definition, Nomenclature and Classification, Isoenzymes, Properties of Enzymes, Factors influencing action of Enzymes.

PRACTICALS

Major Experiments:

- To determine the effect of different concentration of substrate on enzyme amylase.
- To determine the effect of concentration of enzyme amylase on substrate.

Minor Experiments:

- Estimation of Free Fatty acids from fat/oil by titration method.

Demonstration Experiment:

- Demonstration of respiratory enzymes in plant tissues: Polyphenol oxidase, Dehydrogenase.

Study of deficiency diseases through charts/photographs.

References:

Deb A C (2008) *Fundamentals of Biochemistry*, New Central Book (P) Ltd., Kolkata(9th Edition Revised).

Jain J L, Jain Sanjaya and Jain Nitin (2005) *Fundamentals of Biochemistry*, S Chand & Co. Ltd., New Delhi(6th Revised Edition).

Unit-II :: Plant Physiology-I

- Translocation of Food in Plants: Phloem sap composition, Mechanism of Phloem transport: Pressure-driven Flow, Factors affecting Translocation,
- Photosynthesis-I: Light Reaction: Introduction, Hill reaction, Plant pigments, Light as a biological agent, Mechanism of Light absorption and emission, Light harvesting and transfer of Energy, Photosynthetic Unit, Red drop and Emerson Enhancement effect, Photosystem I and II. Photo-phosphorylation: Non-cyclic electron flow and Photo-phosphorylation, Cyclic electron flow and Photo-phosphorylation,
- Photosynthesis-II: Path of Carbon in Photosynthesis: C₃ Photosynthetic cycle, C₄ Photosynthetic cycle, Anatomical characteristics of C₄ Plants, Significance of C₄ Cycle, Crassulacean Acid Metabolism (CAM), Significance of CAM, Relationship between C₄ and CAM.

Unit-III :: Plant Physiology-II

- Respiration: Introduction, Glycolysis, Fermentation, Citric Acid Cycle, Oxidative Phosphorylation, Respiratory Quotient, Energy yield of Aerobic respiration.
- Photoperiodism: Definition, critical day length and types of plants [i.e., SDPs, LDPs and Day neutral Plants] and importance of both dark and light periods. Florigen concept and Vernalization.
- Seed Dormancy: Definition, causes of seed dormancy and measures to break seed dormancy.
- Physiological role of Phytohormones i.e., Auxins, Gibberellins, Cytokinins, Abscisic acid and Ethylene.

PRACTICALS

Physiological Experiments to be performed by students.

- Major experiments:
 - To isolate Plant pigments by solvent extraction method using separating funnel.
 - To determine Respiratory Quotient (RQ, i.e., CO₂/O₂) using Ganong's Respirometer.
 - To determine rate of Photosynthesis under varying CO₂ concentration.
 - To determine rate of Photosynthesis under different wavelengths of light.
 - To determine rate of Photosynthesis under various intensity of light.
- Minor experiments:
 - To show the process of Photosynthesis by Simple glass apparatus/Wilmott's Bubbler.
 - To separate Plant pigments using Paper Chromatography.

Physiological Experiments to be demonstrated to the students.

- To demonstrate alcoholic fermentation using Kuhne's tube.
- To demonstrate light is essential using Ganong's light screen.
- To demonstrate CO₂ is essential using Moll's half-leaf experiment.
- To demonstrate food translocation by phloem through ringing experiment.
- To demonstrate Hill's reaction.

References:

- Mukherji S and Ghosh A K (2005) *Plant Physiology*, New Central Book Agency (P) Ltd., Kolkata (1st Central Edition).
Devlin Robert M and Witham Francis H (1986) *Plant Physiology*, CBS Publishers and Distributors, Delhi (4th Edition/ 1st Indian Edition).
Gill P S (), *Plant Physiology* (1st edition)
Ross Salisbury (), *Plant Physiology* (4th edition)
Srivastava H S (2004), *Plant Physiology* (2nd edition)
Sundara Rajan S (), *Plant Physiology* (edition),
Sornathai Annie, Rajakumar K, Jayakumar M and Rajarathinam K (), *Plant Physiology* (edition),
Verma S K and Verma Mohit (), *Plant Physiology, Biochemistry and Biotechnology* (),
Verma V (), *A Text Book of Plant Physiology* (), Emkay Publication, New Delhi.
Sundara Rajan S (2001), *Practical Manual of Plant Ecology and Plant Physiology* (1st edition),
Jain V.K., *Fundamentals of Plant Physiology*
Pandey S.N. and B.K. Sinha, *Plant Physiology*
Verma P.S. and P.K. Agarwal, *Plant Physiology*

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
Under CBCS-Semester-Grading pattern
B.Sc. (Semester-VI) Programme
Core Compulsory Course in BOTANY

CC-BOT-323 (*Economic Botany, Plant Tissue Culture & Biotechnology and Genetics & Plant Ecology*)

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

Credit: **3.0**

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

Credit: **1.5**

Unit-I :: Economic Botany

- Introduction, cultivation, scientific name, family, useful part(s), chemical constituents and economic importance of the following plants:
 - **Oil seeds:** Ground nut, Mustard, Sunflower.
 - **Fibres:** Cotton, Jute.
 - **Medicinal Plants:** Root: Ashwagandha. Underground stem: Turmeric. Leaf: Arduisi. Fruit: Amla. Seed: Isabgul.
 - **Dyes:** Henna, Kesudo
 - **Wood:** Timber: Teak and Fire wood: Baval.

PRACTICALS

Give scientific name, family, useful part(s), chemical constituents and economic importance of given plants.

- **Oil seeds:** Ground nut, Mustard, Sunflower.
- **Fibers:** Cotton, Jute.
- **Root:** Ashwagandha, **Underground stem:** Turmeric,
- **Leaf:** Arduisi, **Fruit:** Amla, **Seed:** Isabgul
- **Dyes:** Henna, Kesudo **Timber:** Teak.
- **Fire wood:** Baval.

References:

Singh V, Pande P C and Jain D K (1998) *Anatomy of Seed Plants*, Rastogi Publications, Meerut (1st Edition's Reprint).

Pandey B P (1997) *Plant Anatomy*, S Chand & Co. Ltd, New Delhi. (1st Edition's Reprint).

E John Jothi Prakash (2000) *A Text Book of Plant Anatomy*, Emkay Publications, Delhi. (2nd Revised Edition).

Tayal M S (2001) *Plant Anatomy*, Rastogi Publications, Meerut (5th Edition's Reprint).

Unit-II :: Plant Tissue Culture & Biotechnology

- Plant Tissue Culture-I: Nutrition medium: Media composition-Inorganic nutrients, Carbon and energy source, Vitamins, Growth regulators, Organic supplements, Gelling agents and pH. Sterilization Techniques: Steam sterilization, Dry sterilization and Chemical sterilization of explants.
- Plant Tissue Culture-II: Types of Culture: Embryo culture, Callus culture and Meristem culture.
- Recombination DNA Technology: Gene cloning-I: Basic events in gene cloning, Enzymes for cutting-Restriction Endo-Nuclease-II, Enzymes for joining- DNA ligase, DNA-modifying enzymes-Kinase, Alkaline Phosphatase, DNA Polymerase and Terminal transferase. Linkers and adaptors.
- Recombination DNA Technology: Gene cloning-II: Features of vector, Vectors: Plasmids-pBR322, Cosmids and Bacteriophage -Lemda.

PRACTICALS

- Prepare Nutrition Media for Embryo culture, Callus culture and Meristem culture.
- Learn various sterilization techniques required for explants and media.
- Study of various vectors through charts/diagrams, etc.

References:

Chawla H S (2002) *Introduction to Plant Biotechnology*, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi(2nd Edition).

Unit-III :: Genetics & Plant Ecology

▪ Genetics

- Sex Determination and Sex Linkage: Chromosome Theory: Sex -chromosomes and Autosomes, Types of chromosomal mechanisms of Sex -determination. Sex-linkage: Sex-linked inheritance in *Drosophila*, Sex-linked inheritance in Man, Sex-influenced and sex-limited genes.
- Maternal Effects and Cytoplasmic Heredity: Maternal effect. Cytoplasmic Inheritance: Plastid inheritance in *Mirabilis jalapa* and male sterility in corn (*Zea mays*), Respiratory deficiencies.

▪ Plant Ecology

- Energy Flow in the Ecosystems: Single channel Energy model and Y-shaped Energy Flow Model. Bio-geo Chemical Cycles: Carbon, Nitrogen and water cycles.
- Production Ecology: Productivity: Definition, Primary Productivity -GPP and NPP, Measurement of Primary Productivity-Harvest method, Leaf Area Index method and Chlorophyll estimation method. Secondary Productivity.

PRACTICALS

- Study of sex determination, sex linkage, cytoplasmic inheritance through chart/diagram/photographs.
- Solve Genetical problems as per theory syllabus.
- To measure the Primary productivity as per theory syllabus.
- Study of energy models and bio-geo chemical cycles through chart/diagram/photographs.
- Calculation of leaf area index.
- To determine above and below ground Biomass by monolith (25cm x25cm x30cm) method.

References:

Sambamurty (), *Genetics* (2nd edition),

Rastogi Veer Bala () *A Text Book of Genetics* (9th edition)

Gupta P K (2009), *Genetics* (3rd edition),

Gupta P K (2007). *Genetics-classical to modern* (1st edition)

Sharma P D (2003) *Ecology and Environment*, Rastogi Publications, Meerut. (7th Edition's Reprint).

Agrawal K C (2001) *Fundamentals of Environmental Biology*, Nidhi Publishers (India), Bikaner. (1st Edition).

Subrahmanyam N S and Sambamurty A V S S (2000) *Ecology*, Narosa Publishing House, New Delhi. (1st Edition).

Kormondy E J (2002) *Concept of Ecology*, Prentice-Hall of India Pvt Ltd., New Delhi(12th Indian Edition Reprint).

Patel B C (2012) *Human Genetics (Manav Janinvignan -in Gujarati)* Gujarat Vishvakosh Trust, Ahmedabad -380 013 (1st edition).

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
Under CBCS-Semester-Grading pattern
B.Sc. (Semester-VI) Programme
Core Compulsory Course in BOTANY
CC-BOT-324 (Plant Anatomy and Plant Breeding)

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

Credit: **3.0**
Credit: **1.5**

Unit-I :: Plant Anatomy

- Root-Stem Transition: Definition and Types. Anatomy of Special organs: Epiphytic root-Orchid and Aerial/Stilt root-Banyan.
- Anatomy in relation to Taxonomy: Trichomes, Stomata, Epidermis, Internal structure of Leaf, Petiole and Node.
- Methods in Plant Anatomy: Collection of Material, Fixation and Preservation, Dehydration, Infiltration, Embedding and Block making. Sectioning with Microtome, Stains, Staining and Mounting.
- Anomalous Secondary Growth: Stem- *Boerhaavia*, *Achyranthes*, *Dracaena*. Root- *Ipomoea batatas*.

PRACTICALS

- To study the Anomalous Secondary Growth in stems of *Boerhaavia*, *Achyranthes*, *Dracaena* and root of *Ipomoea batatas*.
- To study the Anatomy of Orchid Root (Epiphyte) and Aerial/Stilt Root of Banyan.
- Any 3/more examples which are helpful in Taxonomy of each organ viz., Trichome, Stomata, Epidermis, Node from Plant specimens of allied genera or family.
- Paraffine Block making with Microtomy Technique of any plant material mentioned in Theory syllabus.
- Use of Appropriate Double staining Technique applied for sections embedded in Paraffine Rib bon or hand sections of fresh material as per theory syllabus.

References:

Singh V, Pande P C and Jain D K (1998) *Anatomy of Seed Plants*, Rastogi Publications, Meerut (1st Edition's Reprint).
Pandey B P (1997) *Plant Anatomy*, S Chand & Co. Ltd, New Delhi. (1st Edition's Reprint).
E John Jothi Prakash (2000) *A Text Book of Plant Anatomy*, Emkay Publications, Delhi. (2nd Revised Edition).
Tayal M S (2001) *Plant Anatomy*, Rastogi Publications, Meerut (5th Edition's Reprint).

Unit-II :: Plant Breeding-I

- Introduction: Definition, Origin and evolution of Crop plants: Centres of Origin and Patterns of Evolution. Origin of Crop Plants: Origin of Rice, Wheat, Cotton. Scope and Objectives of Plant Breeding.
- Artificial Vegetative Reproduction: Cutting, Layering, Grafting, Budding, Potting and re-potting. Sexual Reproduction: Apomixis-apospory and apogamy, Significance of Apomixis.
- Selection in Self-pollinated crops: The Pure-line selection - Purpose, Procedure, Merits and Demerits and Achievements. Mass selection - Purpose, Procedure, Merits and Demerits and Achievements. Comparison between Pure line selection and Mass selection.

Unit-III :: Plant Breeding-II

- Breeding Methods: Hybridization: Purpose and General Technique -Choice of Parents, Crossing Schedule, Emasculation and Bagging, Tagging, Pollination, Harvesting and Storing F1 seeds, Raising F1 generation, Selfing, Consequences of hybridization.
- Breeding Methods: Methods in Hybridization: Methods in Self -pollinated crop-Pedigree method: Procedure, and Merits and Demerits and Achievements. Bulk method-Procedure, Merits and Demerits and Achievements. Comparison between Bulk and Pedigree method.
- Hybrid vigour (Heterosis): Definition, its various effects, Causes: Dominance hypothesis and over dominance hypothesis, Achievements, Utilization and limitations.

PRACTICALS

- Preparation of male flowers for hybridization.
- Preparation of female flowers for hybridization.
- Describe the horticulture techniques: Cutting, Layering, Grafting, Budding, Potting and re -potting.
- Study of different methods of plant breeding through Charts/Models/Photographs/Specimens/Herbarium sheet.
- Make a modern new world species from old X new variety breeding with chromosome numbers.

References:

Kar Dipak Kumar and Halder Soma (2006) *Plant Breeding and Biometry*, New Central Book Agency (P) Ltd. Kolkata(1st Edition).

Singh B D (2001) *Plant Breeding-Principles and Methods*, Kalyani Publishers, Ludhiana(1st Edition's Reprint).

Seat No. _____

Hemchandracharya North Gujarat University, Patan

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-VI) Programme Practical Examination, April/May -20

Botany Practical - PC-BOT-321

[*Molecular Biology, Plant Pathology, Angiosperm Families and Biochemistry*]

[In force from **December 2013**]

Date: / /20

Time: **5 Hours**]

Place:

[Maximum Marks: **65**

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

1. Refer to the given specimens **A, B** and **C** to their respective families giving reasons including floral formula and floral diagram. **18**
 2. Perform the Biochemical experiment **D** assigned to you. Tabulate your observations and result. Draw graph if necessary. Show your result and conclusion to the examiner. **10**
 3. Expose the Pathogen from the given plant material **E** and prepare temporary slide. Make a labeled diagram and show your preparation to the examiner. **7**
 4. Identify and describe peculiarities seen in slide/specimen **F**. **6**
 5. Identify and describe peculiarities seen in spot **G** and **H**. **14**
 6. (a) Submission and *viva-voce*. **7**
(b) Journal **3**
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Seat No. _____

Hemchandracharya North Gujarat University, Patan

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-VI) Programme Practical Examination, April/May -20

Botany Practical - PC-BOT-322

[*Plant Physiology and Plant Breeding*]

[In force from **December 2013**]

Date: / /20

Place:

Time: **5 Hours**]

[Maximum Marks: **65**

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

1. Perform the Physiological experiment **A** assigned to you. Tabulate your observations and result. Draw graph if necessary. Show your result and conclusion to the examiner. **14**

 2. Perform the Physiological experiment **B** assigned to you. Tabulate your Observations and result. Draw graph if necessary. Show your result and Conclusion to the examiner. **10**

 3. Prepare Male flower and Female flower through proper technique of hybridization from the given material **D** and **E**, show your preparation to the examiner. **8**

 4. Perform _____ horticulture technique **F** assigned to you, and explain your result to the examiner. **8**

 5. Comment upon spot **G, H** and **I**. **15**

 6. (a) Submission and *viva-voce*. **7**
(b) Journal **3**
-

Hemchandracharya North Gujarat University, Patan

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-VI) Programme Practical Examination, April/May -20

Botany Practical - PC-BOT-323

[Genetics & Plant Ecology, Plant Anatomy, Economic Botany and Plant Tissue Culture & Biotechnology]

[In force from **December 2013**]

Date: / /20

Place:

Time: **5 Hours**]

[Maximum Marks: **70**

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

1. Showfrom plant material **A**, stains if necessary with appropriate staining. Draw labeled diagram and show your preparation to the examiner. 6
2. Make temporary double stained preparation of Anomalous Secondary Growth from the given material **B**. Draw a labeled diagram and show your preparation to the examiner. 10
3. Solve and conclude the Genetical problems as per given slip. 8
C.....
4. Identify and give scientific name, family and economic importance of specimens **D** and **E**. 12
5. Prepare the nutrition medium required and precautions to be taken for embryo/callus/meristem culture in the laboratory. 8

OR

Determine above/below ground biomass by monolith method **OR** Calculate Leaf Area Index.

6. Comment upon spot **F, G, H** and **I**. 16
7. (a) Submission and *viva-voce*. 7
(b) Journal 3

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-VI) Programme

Elective Subjective Course in BOTANY

ES-BOT-301(Pharmacognosy of Herbal Drugs)

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

Credit: **2.0**

Unit-I Pharmacognosy

- Introduction to Pharmacognosy: Definition, history and scope of Phrmacognosy.
- Sources and classification of drugs: Natural sources: Higher plants, Microbes, Marine and Mineral sources. Classification (only outline): Alphabetical, Morphological, Taxonomical, Chemical and Pharmacological.
- Alkaloids: Introduction, properties, classification and Pharmaceutical applications, Role of alkaloids in Plants.
- Pharmacognostical scheme for studying a drug. Systematic Pharmacognostic study of the following plants containing alkaloids (Botanical name, family, chemical composition and uses):
 - Sarpagandha (root),
 - Barmasi (leaf/whole plant) and
 - *Ephedra* (stem).

Unit-II Pharmacological study of herbal drugs

- Need for Phyto-pharmacological evaluation
- Evaluation of anti diabetic agents
- Evaluation of anti microbial agents
- Evaluation of anti diarrheal agents

References

Shah C S and Qadry J S(2005),*A Text Book Of Pharmacognosy*, B S Shah Prakashan, Amdavad.

Mohammed Ali(2008),*Text Book Of Pharmacognosy (2nd edition)*,CBS Publishers & Distributors, New Delhi.

Handa S S and Kapoor V K(2008),*Text Book Of Pharmacognosy (5th edition)*, Vallabh Prakashan,New Delhi.

Rangari V D(2004), *Pharmacognosy & Phytochemistry* , Career Publications, Nashik.

Ansari S H(2006), *Essentials of Pharmacognosy* , Birla Publications Pvt. Ltd., Delhi.

Kokate C K, Purohit A P and Gokhale S B(2008), *Pharmacognosy (42nd edition)*, Nirali Prakashan, Pune.

Khandelwal K R (2008), *Practical Pharmacognosy – Techniques & Experiments (19th edition)*, Nirali Prakashan, Pune.

Kokate C K(2005), *Practical Pharmacognosy (4th edition)*,Vallabh Prakashan, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Under CBCS-Semester-Grading pattern

B.Sc. (Semester-V &VI) Programme

Elective Subjective Course in BOTANY

ES-BOT-302 (*Fresh Water Ecology*)

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

Credit: **2.0**

Unit-I

- Definitions: Freshwater, Limnology, Lakes, Ponds, Benthos, Bogs, Marshes and Swamps.
- Properties of freshwater: Physio-chemical characteristic, Factors affecting to fresh water ecosystem: abiotic and biotic (Light, Temperature, Vegetation, etc.).
- Types of Freshwater Ecosystem/Classification of Freshwater Habitat - Lentic ecosystems (still water) and lotic ecosystems (flowing water).
- Structure of lake (Freshwater Zonation). Aquatic biodiversity (Freshwater only): Aquatic flora (Algae, fresher plants).

Unit-II

- Aquatic food web and food pyramids, primary productivity. Aquatic ecosystem: goods and services.
- Energy flow in freshwater ecosystem.
- Threats to aquatic ecosystem and remediation: Eutrophication, Acidification, Pollution.
- Global issues and legislation for conservation and management of aquatic systems.

References:

Brown L. (1971). Ecology of Fresh Water. Heinemann Educational Books Ltd, London.

Gopal, B, and Bhardwaj, N. (1979). Elements of ecology. Vikash Publishing House Pvt Ltd., New Delhi.

Sharma P. D. (7th Edition - Reprint 2003). Ecology and Environment. Rastogi Publications, Meerut.

Eugene P. Odum (1971). Fundamentals of Ecology. Toppan Company, Japan.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
Under CBCS-Semester-Grading pattern
B.Sc. (Semester-V & VI) Programme
Elective Subjective Course in BOTANY
ES-BOT-303 (Air Pollution)

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

Credit: **2.0**

Unit-I

- Define: Pollution (416) and pollutants (417). Various principal environmental pollutants with examples (416, 417). Kinds of pollutants: Non-degradable (418) and Bio-degradable (418).
- Air Pollution: Introduction (418), Air quality (419), sources and pollutants: Industrial Chimney wastes (419), Thermal power station (419) and Automobile (420 -421).
- Carbon Compounds: Carbon dioxide (423), Carbon monoxide (425).
- Sulphur compound: Sulphur dioxide (426), Hydrogen sulphide (428).

Unit-II

- Nitrogen oxides: Nitrogen oxide, Nitric oxide and Nitrogen dioxide (428 -429).
- Fluorocarbons (434) and Hydrocarbons (435). Metals (435) and Photo-chemicals products (436).
- Prevention and control of air pollution (444 -452).
- Green House Effect (423), Global Warming (425), Ozone -depletion (432), and Acid rain (429).

References:

Sharma P. D. (7th Edition - Reprint 2003). Ecology and Environment. Rastogi Publications, Meerut.