

# હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

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પરિપત્ર ક્રમાંક - ૧૨૮ / ૨૦૧૯

વિષય :- વિજ્ઞાન વિદ્યાશાખાના બોટની વિષયના અનુસ્નાતક કક્ષાના સેમેસ્ટર-૧ અને ૨ ના અભ્યાસક્રમ અંગે...

સંદર્ભ :- પરિપત્ર ક્રમાંક : ૭૨/૨૦૧૯

આ યુનિવર્સિટીના લાઈફ સાયંસ વિભાગના અધ્યક્ષશ્રી તથા સંલગ્ન વિજ્ઞાન વિદ્યાશાખાની તમામ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, આ યુનિવર્સિટીના તારીખ : ૦૮/૦૫/૨૦૧૯ ના પરિપત્ર નંબર - ૭૨/૨૦૧૯, જાવક નંબર- એકે/અ×સ/૭૮૬/૨૦૧૯ થી બોટની વિષયનો સેમેસ્ટર-૧ થી ૪ નો અનુસ્નાતક કક્ષાનો અભ્યાસક્રમ પરિપત્રીત કરેલ છે, જેમાં લાઈફ સાયંસ વિભાગના અધ્યક્ષશ્રીને સોંપવામાં આવેલ જવાબદારી અન્વયે તેઓશ્રીએ સુધારા સૂચવતો રજૂ કરેલ નવો એમ.એસસી. બોટનીનો સેમેસ્ટર-૧ અને ૨ નો સામેલ પરિશિષ્ટ મુજબનો સુધારેલ અભ્યાસક્રમ / સ્કીમ જૂન-૨૦૧૯ થી ક્રમશઃ અમલમાં આવે તે રીતે એકેડેમિક કાઉન્સિલવતી માન.કુલપતિશ્રીએ મંજૂર કરેલ છે. જેનો અમલ થવા સારૂ સંબંધિતોને આથી આ સાથે મોકલવામાં આવે છે.

આ બાબતની સંબંધિતોને આપના સ્તરેથી જાણ કરવા વિનંતી છે.

નોંધ: (૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજ / વિભાગના ગ્રંથાલયમાં મૂકવાની રહેશે.

(૨) આ પરિપત્ર યુનિવર્સિટીની વેબ સાઈટ [www.ngu.ac.in](http://www.ngu.ac.in) પર પણ ઉપલબ્ધ કરાવવામાં આવનાર છે.

નં.-એ કે/અ×સ/૧૦૮૫/૨૦૧૯

તારીખ: ૭/૦૮/૨૦૧૯

પ્રતિ

૧. અધ્યક્ષી, લાઈફ સાયંસ વિભાગ, હેમ. ઉ.ગુ.યુનિવર્સિટી, પાટણ

૨. સંલગ્ન સાયંસ કોલેજોના આચાર્યશ્રીઓ

૩. અધ્યક્ષશ્રી/ કો.ઓર્ડીનેટરશ્રી-વિજ્ઞાન વિદ્યાશાખા અંતર્ગત વિષયોના અનુસ્નાતક વિભાગો, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.

૪. ડૉ. એમ. બી. પ્રજાપતિ (ડીનશ્રી), ગણિતશાસ્ત્ર વિભાગ, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.

૫. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (પાંચ નકલ)

૬. ગ્રંથપાલશ્રી, હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઈલ માટે)

૭. સિસ્ટમ એનાલીસ્ટશ્રી, કોમ્પ્યુટર (રીઝલ્ટ) સેન્ટર, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ. તરફ પરિણામ માટે તથા વેબસાઈટ પર મૂકવા સારૂ.

૮. અનુસ્નાતક પ્રશાખા (એકેડેમીક શાખા) હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ.

૯. મુખ્ય હિસાબી અધિકારીશ્રી (મહેકમ), હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ તરફ → પરિપત્રની ફાઈલ અર્થે

૧૦. સિલેક્ટ ફાઈલ. (૨ નકલ)

કુલસચિવવતી

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

## Faculty of Science

### M. Sc. BOTANY

Syllabus/ scheme

### Sem. – 1



Sem/CBCS/Grading pattern

*w.e.f. June-2019*

Date:01/08/2019

Total page:24

<b>HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN</b>	
<b>M. Sc. (BOTANY) CBCS Syllabus 2019</b>	
<b>Document code</b>	<b>Syllabus BOT 2019</b>
<b>Name of faculty</b>	<b>Science</b>
<b>Faculty code</b>	<b>SCI</b>
<b>Programme name</b>	<b>BOTANY</b>
<b>Programme code</b>	<b>BOT</b>
<b>Effective from</b>	<b>June-2019</b>

The proposed new structure for M. Sc. course is based on Choice Based Credit System (CBCS) which is in force June-2019.

### **CBCS Course Pattern**

1. This programme is divided into **Four Semesters** (Two Years). The duration of an academic year consists of two semester, each of 15 weeks for teaching. The academic session in each semester will provide 90 teaching days. Each semester has 24 credit and the programme is comprised of total 96 credits.
2. There will be three categories of courses/papers in this programme:
  - A. Four Compulsory – **Core** theory **courses** with 4 credits each in every semester.
  - B. One choice based elective course (disciplinary/interdisciplinary) with 2 credits in each semester.
  - C. Two practical each of 3 credits in each semesters.
  - D. In the semester IV, courses similar to the above A, B, C and / or Dissertation work;
3. Detailed course pattern for each semester is given below.

**Note:**

1. For four credit course: each syllabus is of 4 units having equal weightage.
2. For two credit course: each syllabus is of 2 units having equal weightage.
3. For question paper of 70 marks: each question paper shall have 2 sections and having 3 questions each.

<b>Section I</b>	<b>Must be drawn from Unit 1 and 2</b>
Q. 1	One long question of 14 marks OR two short questions of 7 marks each from Unit 1.
Q. 2	One long question of 14 marks OR two short questions of 7 marks each from Unit 2.
Q. 3	Short questions of 7 marks from Unit 1 & 2
<b>Section II</b>	<b>Must be drawn from Unit 3 and 4</b>
Q. 4	One long question of 14 marks OR two short questions of 7 marks each from Unit 3.
Q. 5	One long question of 14 marks OR two short questions of 7 marks each from Unit 4.
Q. 6	Short questions of 7 marks from Unit 3 & 4

4. For question paper of 35 marks: Each question paper shall have 3 questions: Q-1 from unit-1 of 15 marks, Q-2 from unit-2 of 15 marks and Q-3 is of objective type having 05 marks from all the units of the paper.

	<b>Must be drawn from Unit 1</b>
Q. 1	Two long question of 15 marks OR three short questions of 5 marks each from Unit 1.
	<b>Must be drawn from Unit 2</b>
Q. 2	Two long question of 15 marks OR three short questions of 5 marks each from Unit 2.
Q. 3	Short questions of 5 marks from Unit 1& 2

### M. Sc. Semester I

Course	Course code	Paper title	Exam duration (Hours)	External marks	Internal marks	Total marks	Teaching hours per week	Credit points
Paper-I	BOTCC-101	Cell Biology	2.30	70	30	100	4	4
Paper-II	BOTCC -102	Molecular Biology and Genetics	2.30	70	30	100	4	4
Paper-III	BOTCC -103	Biodiversity and Ecology	2.30	70	30	100	4	4
Paper-IV	BOTCC -104	Plant Taxonomy and Resource Utilization	2.30	70	30	100	4	4
Practical Paper-I	BOTPR-101	Cell Biology, Molecular Biology and Genetics	More than 4 hours	75		75	6	3
Practical Paper-II	BOTPR-102	Biodiversity, Ecology and Plant Taxonomy and Resource Utilization	More than 4 hours	75		75	6	3
Elective Course	BOTEC-101 <b>OR</b> BOTEC-102 <b>OR</b> BOTEC-103	Environmental Science  Bio-fertilizer Technology  Herbal Medicine / Science	2.00	35	15	50	2	2
Total				465	135	600	30	24

## **BOT CC 101: CELL BIOLOGY**

### **UNIT I– Cell and cell organelles-1**

- Cell wall: Structure and functions; Plasmodesmata: Structure; role in movement of molecules and macromolecules; comparison with gap junctions.
- Plasma membrane: Structure, models, and functions; sites for ATPases, ion carriers, channels and pumps; receptors.
- Structural organization and function of intracellular organelles: Plastids, Mitochondria, Chloroplast, Golgibodies, Lysosomes, Peroxisomes, Endoplasmic reticulum, Ribosomes
- Cytoskeleton- microtubules, microfilamenets and intermediate filaments.

### **UNIT II– Cell and cell organelles-2**

- Nucleus: Structure and functions; nuclear pores; nucleosome organization, Nucleolus.
- Chromatin organization: Chromosome structure and packaging of DNA, molecular organization of centromere and telomere.
- Specialized types of chromosomes: Structure and functions of polytene and lampbrush, B-chromosomes and sex chromosomes.
- Experimental approaches for studying cells, Cell Fixation and Staining

### **UNIT III– Cell division and signaling**

- Cell division and cell cycle: Mitosis and meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle
- Cell Signaling: Cell signaling Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways
- Cellular communication: General principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, regulation of hematopoiesis, neurotransmission and its regulation,
- Apoptosis and Programmed Cell Death (PCD).

### **UNIT IV– Cytology of cancer**

- Introduction to cancer biology
- Cancer development: Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer.
- Cancer propagation: Metastasis, interaction of cancer cells with normal cells.
- Cancer treatment: Therapeutic interventions of uncontrolled cell growth.

### **References**

1. Lodish et. al., 2007 Molecular Cell Biology, W.H. Freeman and Company, New York, USA 2.
2. Albert et. al., 2008 Molecular Biology of the Cell, Garland Science, Taylor & Francis Group, New York, USA. 3.
3. Sperelakis 2001 Cell Physiology Source Book : A Molecular approach, Academic Press, New York, USA.
4. Powar C. B. 1983 Cell Biology, Himalaya Publishing House, Mumbai, India.

## **BOT CC -102 MOLECULAR BIOLOGY AND GENETICS**

### **UNIT I– Molecular Biology-1**

- Nucleic Acids: Composition of Nucleic Acids and Synthesis of Nucleotides; Molecular Organization and types of DNA and RNA.
- DNA Replication in Prokaryotes and Eukaryotes; Enzymes involved in Replication.
- Transcription in Prokaryotes and Eukaryotes; RNA Polymerases.
- Translation: Process of Protein synthesis.

### **UNIT II– Molecular Biology-2**

- Regulation of gene expression in Prokaryotes and Eukaryotes.
- Recombinant DNA technology: Classification of Restriction enzymes, Gene Cloning principles and technique
- Prokaryotic and Eukaryotic cloning Vectors. Construction of Genomic and cDNA libraries, DNA synthesis and sequencing.
- PCR (Polymerase Chain Reaction), DNA Finger printing and DNA Microarray

### **UNIT III– Genetics-1**

- Gene structure and expression: Gene vs allele, a new concept of Allelomorphism, fine structure of gene, cistron, recon and muton.
- Genetic code: Deciphering genetic code, properties of genetic code, initiation and termination codons, mutation
- Wobble hypothesis, new genetic codes, second genetic code, overlapping and split genes.
- Extra chromosomal inheritance: Male sterility-origin, induction and application, inheritance of chloroplast and mitochondrial gene

### **UNIT IV– Genetics-2**

- Spontaneous and induced mutation, Physical and chemical mutagens; Molecular basis of gene mutations
- Transposable elements in Prokaryotes and Eukaryotes; mutations induced by transposons; site-directed mutagenesis
- Principal of Mendelian Genetics and Hardy – Weinberg genetic equilibrium
- Factors affecting gene frequency – Natural selection and Genetic polymorphism and Genetic drift.

### **References**

1. Lodish et. al., 2007 Molecular Cell Biology, W.H. Freeman and Company, New York, USA 2.
2. Sambamurty A.V. S. S. 2008 Molecular Biology, Narosa Publishing House, New Delhi.
3. Sandhu G. S. 2002 Molecular Cell Biology, Campus books, New Delhi.
4. Verma P. S. and Agrawal V. K. 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S. Chand & Company Ltd.



## **BOTCC-103 BIODIVERSITY AND ECOLOGY**

### **UNIT I– Organization of biological diversity**

- Biogeography of the world and basis of biological diversity
- Levels of biodiversity: Species, Genetic and Ecosystem diversity
- Biodiversity hotspots of the world
- Conservation significance and threats to biodiversity

### **UNIT II– Strategies of Biodiversity conservation**

- Ecological services of Biodiversity
- IUCN threat categories, Red data book, and role in biodiversity conservation
- National Biodiversity Act (2002)
- Role of National Parks and Sanctuaries in biodiversity conservation in India

### **UNIT III– Principle and concept of Ecosystem**

- Classical ecological concepts and laws
- Concept of productivity, food chain, food web and trophic levels
- Habitat and niches, niche width and overlap; fundamental and realized niche; resource partitioning; character displacement
- Ecological succession

### **UNIT IV– Population and Community Ecology**

- Characteristics of a population; population growth curves and regulation;
- r and K selection; concept of Metapopulation.
- Population and Community dynamics and regulations
- Population genetics: genetic variation, speciation

### **References**

1. Magguran, A.E. (1996). Ecological diversity and its measurements. Princeton University.
2. Gadgil, M. (2002) A methodology manual for scientific inventorying, monitoring and conservation of Biodiversity.
3. Odum. E.P. 1996 Fundamentals of Ecology. Nataraj Publishers, Dehra Dun.
4. Smith, R.L.1986. Elements of Ecology. Harpet and Row Publishers, New York.
5. Berwer. A.1988 .The Science of ecology. Saunder's college publishing.

## BOTCC-104 PLANT TAXONOMY AND RESOURCE UTILIZATION

### UNIT 1– Taxonomy

- Salient features of the International Code of Botanical nomenclature (this topic should be modified as ICBN – Principles, Ranks, Typification, The principle of priority, Retention, choice of rejection of names & epithet).
- Taxonomic evidences: Morphology, anatomy, palynology, cytology and embryology
- Taxonomic tools: Herbarium; floras; phytochemical; biochemical and molecular techniques; serological, computers and GIS
- Classification and relative merits and demerits of major systems of classification Bentham & Hooker, Takhtajan, Bassey, Cladistic of taxonomy

### UNIT 2– Families

- Taxonomical study of the following families with reference to their geographical distribution, systematics position, floral variation and economics importance:
- Study of DICOTYLEDON families:
  1. Polypetalae: Menispermaceae, Capparaceae, Rutaceae, Meliaceae, Molluginaceae
  2. Gamopetalae: Oleaceae, Boraginaceae, Salvadoraceae, Lamiaceae, Asclepiadaceae.
  3. Apetalae: Casuarinaceae, Amaranthaceae, Chenopodiaceae, Euphorbiaceae, Polygonaceae.
  4. MONOCOTYLEDONS: Liliaceae, Pontaderiaceae, Cyperaceae, Poaceae.

### UNIT 3– Plant resources-1

- Adulteration in plant products: Introduction, detection of adulteration in the following: Oils-groundnut and sunflower, Species and condiments: pepper, carawax, cardemonas,saffron and clove, Cereals and pulses: Bajara, Rice, Tur and Gram.
- Origin, evolution, cultivation and uses of:
  - (i) Food – Wheat, chicken pea, potato, groundnut
  - (ii) Forage/fodder crops- bajara, guarbean.
- Plant fibers: Textile fibers- cotton, jute,linen, sun hemp, cannabis, Cordage (coir), Fibers for stuffing (silk cotton)
- Dye yielding Plants - Turmeric, Indigo, *Butea monosperma*, *Lowsonia alba*.

### UNIT 4– Plant resources-2

- Important fire wood and timber yielding plants: *Acacia nilotica*, *Tectona grandis*, *Dalbergia sissoo*, *Terminalia arjuna*, *Mangifera indica*.
- Rubber- Introduction, chemical composition, hevea rubber, plantation and production of rubber in the world and India, processing. Uses of rubber and synthetic rubber.
- Medicinal plants- *Atropa belladonna*, *Catheranthus roseus*, *Adhatoda vasica*, *Allium sativum*, *Rauvolfia serpentina*, *Papaver somniferum*, *Phyllanthus amaranthus*, *Aloe barbadense*.
- Studies on protected areas of India/Gujarat-sanctuaries, national parks, biosphere reserves, mangroves and coral reefs for conservation of plants. BSI, NBPGR, ICAR, CSIR, DBT and prepare the note.

## References

1. Singh V and Jain D K (1999) *Taxonomy of Angiosperms*, Rastogi Publications, Meerut (2<sup>nd</sup> Edition's Reprint).
2. Sambamurty A V S S (2005) *Taxonomy of Angiosperms*, I K International P Ltd, New Delhi (1<sup>st</sup> Edition)
3. Pandey B P (2004) *A Text Book of Botany: Angiosperms*, S Chand & Company Ltd., New Delhi (1<sup>st</sup> Edition's Reprint)
4. Stace, C.A. (1989). *Plant Taxonomy and Biosystematics* (2<sup>fd</sup> edition). Edward Arnold Ltd., London.
5. Takhtajan, A.L. (1997). *Diversity and Classification of Flowering Plants*. Columbia University Press, New York. Woodland, D.W. 1991. *Contemporary Plant Systematics*. Prentice Hall, New Jersey.
6. Lawrence G H M (1967) *Taxonomy of Vascular Plants*, Oxford & IBH Publishing Co.Pvt Ltd., New Delhi (1<sup>st</sup> Indian Edition).
7. Singh V Pande P C and Jain D K (1995) *A Text Book of Botany-Angiosperms*, Rastogi Publications, Meerut (1<sup>st</sup> Edition's Reprint).
8. Singh V and Jain D K (1999) *Taxonomy of Angiosperms*, Rastogi Publications, Meerut (2<sup>nd</sup> Edition's Reprint).
9. Kochhar S L , *Economic Botany in the Tropics* (2<sup>nd</sup> edition),
10. Verma V, *A Text Book of Economic Botany*
11. Bendre and Kumar , *Economic Botany* (4<sup>th</sup> edition),
12. Paroda, R.S. and Arora R.K.(1991) *Plant resources conservation and management*, IPGRIP USACampus, New Delhi.

# **BOTEC-101 ENVIRONMENTAL SCIENCE**

## **UNIT 1**

- Environmental Science: Introduction, Objectives and sub-divisions, Factors-Wind and Fire
- Population-Introduction, Influences (Growth and Density), Natality (Birth rate), Mortality (Death rate), Fluctuations, Dispersal.
- Community: Synecology-Phyto-sociological characters and methods of plant community.
- Genecology-Concept of species, Ecotype, Niche.
- Ecosystem-Types,structure and function, Energy flow, productivity, Biogeochemical cycles (Nitrogen and Phosphorus)

## **UNIT 2**

- Plant Indicators
- Pollution-Toxic, Acid rain, Green house gases, Ozone layer as a Earth protected umbrella.
- Phytogeography- Flora of India, Major biomes of the world.
- Conservation-Introduction, Endangered species (IUCN catagories), Forest research work in India, Wild life sanctuaries in India.
- Environmental Education-Introduction, Goals, Objectives and Guiding principles.

## **References:**

1. Odum, EP, Barret GW (2005) Fundamentals of Ecology, Thomson Ed. Brooks/Cole, Cengage Learning India Pvt Ltd, New Delhi.
2. Singh JS, Singh SP, Gupta SR (2014) Ecology, Environmental Science and Conservation, S Chand & Co, New Delhi.
3. Pungnaire FI, Valladares F (2007) 2nd Edition, Functional Plant Ecology CRC Press/Taylor & Francis Group, Boca Raton, Florida
4. Verma P S and Agarwal (2006) *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. S Chand & Company Ltd., New Delhi (1<sup>st</sup> Multicolour Edition-Reprint).

## **BOTEC-102 BIO-FERTILIZER TECHNOLOGY**

### **UNIT I**

- Biofertilizers: Definition, Introduction, Source of biofertilizers, its types and application.
- Characteristics of biofertilizers: Rhizobium, Azotobacter, Azospirillum, phosphate-solubilizing microorganisms (PSMs), cyanobacteria, Azolla, mycorrhizae.
- Biological nitrogen fixation: Nitrogenase, substrates for nitrogenase, mechanism of action of nitrogenase, strategies to exclude oxygen and need to control hydrogen evolution, regulation of nitrogen fixation.
- Symbiosis: Rhizobium-legume symbiosis including its physiology, biochemistry and molecular genetics of symbiosis.

### **UNIT II**

- Production technology: Strain selection, sterilization, growth and fermentation, mass production of various biofertilizers.
- Application technology: Standards and quality control, application for field and tree crops, nursery plants and seedlings, agronomical significance.
- Extension, promotion and marketing: Extension strategies, diagnosis for the effectiveness of inoculation, improvement in distribution system.

### **Reference**

1. Gallon JR, Chaplin AE (1987) An Introduction to Nitrogen Fixation, Cassel Educational Limited, London.
2. Smith RJ, Lea PJ, Chaplin JR (1999) Nitrogen Fixation. In : Plant Biochemistry & Molecular Biology, 2nd edition, eds: Lea PJ, Leegood RC, John Wiley & Sons, New York, pp. 137-162.
3. Rai AN (1990) A Handbook of Symbiotic Cyanobacteria, CRC Press, Boca Raton, USA.
4. Postgate JR (1987) Nitrogen Fixation, 2nd edition, Arnold, London.
5. Stacey G, Burris RH, Evans HJ (1992) Biological Nitrogen Fixation, Chapman & Hall, New York.
6. Sprent JI, Sprent P (1990) Nitrogen Fixing Organisms: Pure and Applied Aspects. Chapman & Hall, London.
7. Kannaiyan S, Kumar K, Govindrajana K (2007) Biofertilizers Technology, Saujanya Books, New Delhi.

## **BOTEC-103 HERBAL MEDICINE / SCIENCE**

### **Unit-1**

- Secondary metabolites: Introduction, its type and functions.
- Synthesis: Common pathway of biosynthesis of major secondary metabolites.
- Herbal plants: Diagnostic features and therapeutic values of some medicinal plants viz., Giloy, Brahmi, Safed musli, Kalmegh, Satavari, Sarpagandha, Ashwagandha, Aloe, Tulsi, Guggle
- Recent approaches towards the use of herbal plants in human welfare.

### **Unit-II**

- Multiplication and conservation of medicinal plants using biotechnological techniques.
- Biotechnological approaches for production of secondary metabolites.
- Analytical methods for evaluation of herbal products using modern techniques: HPTLC, HPLC LC-MS, LC-NMR, LC-IR, GC-MS, DNA finger printing and genetic marker. Bioprospecting, biopiracy and IPR for protection of medicinal plants and its products.

### **References:**

1. Buchanan, Gruissem, Jones (2004) Biochemistry and Molecular Biology of plants. American society of Plant Physiology, Rock ville, Maryland.
2. Cultivation of Selected Medicinal Plants, National Medicinal Plant Board, 36, Janpath, New Delhi.
3. Mandal SC, Mandal V, Das AK (2015) Essentials of Botanical Extraction: Principles and Applications, Academic Press, Elsevier, Amsterdam.
4. Prajati ND, Purohit SS (2006) A Hand Book of Medicinal Plants, Agrobios, Jodhpur, India.
5. Samant SS and Palini LMS (1998) Medicinal Plants of Himalaya: Diversity, Distribution and Potential Values, Gyonadra Prakashan, Nainital.
6. Singh MP (2011) Indigenous Medicinal Plants, Social, Foresting and Tribals, Daya Publishing House, New Delhi.

## **BOTPR-101 Cell Biology, Molecular Biology and Genetics**

### **Cell Biology**

1. Isolation of mitochondria from given sample
2. Isolation of chloroplast from given sample
3. Mitosis stages and the Cell Cycle in Onion Root-Tip Cells
4. Preparation of slide showing polyploidy induction in plants
5. Micrometry – Measurement of cell size
6. Study of various stages of meiosis in plants
7. Study of cytology using charts/models

### **Molecular Biology and Genetics**

8. Spectrometric analysis of DNA
9. Estimation of RNA by Orcinol method
10. UV survival and irradiation curve of E-coli
11. Simple problem solving task of Genetics
12. Isolation of DNA from plant samples
13. Study of lytic cycle of bacteriophages and estimation of phage titer
14. Study of molecular biology through charts/models

## **BOTPR-102 Biodiversity, Ecology and Plant Taxonomy and Resource Utilization**

### **Biodiversity and Ecology**

1. To estimate the canopy cover of plants species in the particular area
2. Determination of different population parameters using quadrat method:
  - a. Density
  - b. Abundance
  - c. Diversity
  - d. Dominance
3. Water and soil quality assessment (physical and chemical parameters)
4. Species-area curve method
5. Study of climate data: air temperature, air moisture
6. Study of biomass and productivity

### **Plant Taxonomy and Resource Utilization**

1. Studies of genera from listed families as per the theory syllabus.
2. Identify the families, genus and species of given plant specimen with the help of flora book.
3. Identification and preparation of at least 20 Herbarium sheets of families as per the theory syllabus.
4. Studies on plant adulteration in plant products as per listed in theory syllabus.
5. Scientific name, local name, family, useful organ, morphology and uses of food crops, forage/fodder crops, plant fibers, dyes and important fire wood, timber yielding plants and Rubber plant as per theory syllabus.
6. Describe the Medicinal uses of the medicinal plants as per listed in theory syllabus.
7. Visit to field or any protected areas of India/Gujarat-sanctuaries, national parks, biosphere reserves, mangroves and coral reefs for conservation of wild diversity. BSI, NBPGR, ICAR, CSIR, DBT and prepare the note.