



# હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC B (2.21) State University

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પરિપત્ર નં.- ૧૭ /૨૦૨૪

રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦

વિષય: વિજ્ઞાન વિદ્યાશાખા હેઠળના સ્નાતક કક્ષાના સેમેસ્ટર-૦૩ અને ૦૪ના શૈ.વર્ષ: ૨૦૨૪-૨૫થી ક્રમશઃ અમલમાં આવતા અભ્યાસક્રમ / પરિક્ષા સ્કીમ અંગે.

આ યુનિવર્સિટીની વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, વિજ્ઞાન વિદ્યાશાખાની તારીખ: ૩૦/૦૩/૨૦૨૪ના રોજ મળેલ સભાના નિર્દિષ્ટ ઠરાવોથી રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦ અંતર્ગત UGCની Guideline મુજબ વિજ્ઞાન વિદ્યાશાખા હેઠળના નીચેના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો મંજૂર કરવા કરેલ ભલામણ માન. કુલપતિશ્રીએ એકેડેમિક કાઉન્સિલવતી સ્વીકારી શૈક્ષણિક વર્ષ: ૨૦૨૪-૨૫થી ક્રમશઃ અમલમાં આવે તે રીતે મંજૂર કરેલ છે, જેનો અમલ કરવા સારૂ સંબંધિતોને આ સાથે મોકલવામાં આવે છે.

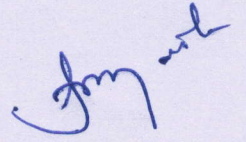
ક્રમ	અભ્યાસક્રમ	ઠરાવ ક્રમાંક	સેમેસ્ટર
૧	ભૌતિકશાસ્ત્ર	૩	સેમેસ્ટર ૩ અને ૪
૨	રસાયણશાસ્ત્ર	૪	સેમેસ્ટર ૩ અને ૪
૩	વનસ્પતિશાસ્ત્ર	૫	સેમેસ્ટર ૩ અને ૪
૪	ઝૂલોજી	૬	સેમેસ્ટર ૩ અને ૪
૫	માઇક્રોબાયોલોજી	૭	સેમેસ્ટર ૩ અને ૪
૬	બાયોટેકનોલોજી	૮	સેમેસ્ટર ૩ અને ૪
૭	ગણિતશાસ્ત્ર	૯	સેમેસ્ટર ૩ અને ૪

સદર બાબતની જાણ આપના સ્તરે થી અધ્યાપકશ્રીઓ તથા વિદ્યાર્થીઓને કરવા વિનંતી છે.

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

(૨) આ પરિપત્ર યુનિવર્સિટીની વેબસાઇટ [www.ngu.ac.in](http://www.ngu.ac.in) પર પણ ઉપલબ્ધ કરવામાં આવેલ છે. આથી સંબિધત કોલેજોને ડાઉનલોડ કરી ઉપયોગ કરવા સારૂ જણાવવામાં આવે છે.

બિડાણ:ઉપર મુજબ

  
કા. કુલસચિવ

નં-એકે/અ×સ/૨૦૨૪

તારીખ: ૧૪ / ૫ / ૨૦૨૪

પ્રતિ,

૧. ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા તરફ.
૨. વિજ્ઞાન વિદ્યાશાખા હેડળની કોલેજોના આચાર્યશ્રીઓ તરફ
૩. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૪. ગ્રંથપાલશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ. (વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઇલ અર્થે )
૫. માન.કુલપતિશ્રી/કુલસચિવશ્રીનું કાર્યાલય હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૬. સિસ્ટમ એનાલીસ્ટશ્રી, કોમ્પ્યુટર (રીઝલ્ટ સેન્ટર) હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ.(વેબસાઇટ પર મુકવા સારૂ )
૭. પ્રવેશ પ્ર-શાખા, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ
૮. મહેકમ શાખા, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ.( ૨ નકલ)

ક્રમ	વિષય	કોલેજ	પરીક્ષક	સંખ્યા
૧	ભૌતિકશાસ્ત્ર	કોલેજ ઓફ સાયન્સ	ડૉ. જી.કે. પટેલ	૧
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૭	વિજ્ઞાન	કોલેજ ઓફ સાયન્સ	ડૉ. જી.કે. પટેલ	૭
૮	વિજ્ઞાન	કોલેજ ઓફ સાયન્સ	ડૉ. જી.કે. પટેલ	૮

# HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

PATAN - 384 265

NAAC "A" (3.02) State University



वसुधैव कुटुम्बकम्

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## FACULTY OF SCIENCE

### B.Sc. (Honours) BOTANY

(With Research/without Research)

SCIUG103

### Semesters: III and IV

(with multiple entry & exit option)

## DIPLOMA SYLLABUS

Curriculum as per UGC Guideline

Framed according to National Education Policy (NEP) - 2020

With effect from June - 2024 (and thereafter)

*Handwritten signature*

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY**

**PATAN - 384 265**

**NAAC "A" (3.02) State University**



## **B.Sc. (Honours) Botany Programme**

**(With Research/without Research)**

**SCIUG103**

**NEP-2020**

**With effect from June - 2024 (and thereafter)**

**FACULTY OF SCIENCE**

**Subject: BOTANY**

**B. Sc. Semesters: III and IV**

**Total Pages: 01 to 65**

**Submitted on**

**Date: 14<sup>th</sup> March 2024(Thursday)**

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# HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC "A" (3.02) State University

PATAN - 384 265



## BOARD OF STUDIES (BOS) IN BOTANY

**References:** No. AK/AxS/2125/2020 Dt. 28/08/2020.  
No. AK/AxS/2315/2020 Dt. 04/09/2020.  
No. AK/AxS/3006/2020 Dt. 01/10/2020.  
No./KCG/NEP/2024-25/1368 Dt. 29/09/2023.

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*N. Patel*

**B.Sc. Semester III Courses :: BOTANY ::**

SEMESTER: THIRD	TYPES OF THE COURSES	PAPER NO.	PROGRAMME CODE	TITLE OF THE COURSE	CREDITS (T=TEACHING P=PRACTICAL)
	MAJOR THEORY	III	SCIUG103	MYCOLOGY AND PHYTOPATHOLOGY (SC23MJDSCBOT301)	4T
		IV		ARCHEGONIATE (SC23MJDSCBOT301A)	4T
	MAJOR PRACTICAL (GROUP A & B)	III		MYCOLOGY AND PHYTOPATHOLOGY (SC23PMJDSCBOT301)	2P
		IV		ARCHEGONIATE (SC23PMJDSCBOT301A)	2P
	MULTI/INTER DISCIPLINARY THEORY	III		MEDICINAL BOTANY (SC23MDCBOT303)	2T
	MULTI/INTER DISCIPLINARY PRACTICAL	III		MEDICINAL BOTANY (SC23PMDCBOT303)	2P
	ABILITY ENHANCEMENT THEORY	III		FROM POOL OF COURSE (Language) (SC23AECBOT304)	2T
	INDIAN KNOWLEDGE SYSTEM THEORY	II		INDIGENOUS MEDICINAL SYSTEM (SC23IKSBOT305)	2T
	SKILL ENHANCEMENT THEORY	III		MUSHROOM CULTIVATION (SC23SECBOT306)	2T

*Noted*

**B.Sc. Semester IV Courses :: BOTANY ::**

SEMESTER: FOURTH	TYPES OF THE COURSES	PAPER NO.	PROGRAMME CODE	TITLE (COURSE CODE)	CREDITS (T=TEACHING P=PRACTICA)
	MAJOR THEORY	V	SCIUG103	ANATOMY OF ANGIOSPERMS (SC23MJDSCBOT401)	4T
		VI		ECONOMIC BOTANY (SC23MJDSCBOT401A)	4T
	MAJOR PRACTICAL (GROUP A & B)	V		ANATOMY OF ANGIOSPERMS (SC23PMJDSCBOT401)	2P
		VI		ECONOMIC BOTANY (SC23PMJDSCBOT401A)	2P
	MINOR THEORY	III		APPLIED BOTANY (SC23MiDCBOT402)	2T
	MINOR PRACTICAL	III		APPLIED BOTANY (SC23PMiDCBOT402)	2P
	ABILITY ENHANCEMENT THEORY	IV		FROM POOL OF COURSE (Language) (SC23AECBOT404)	2T
	VALUE ADDED COURSE THEORY	II		FROM POOL OF COURSE (SC23VACBOT405)	2T FROM POOL OF COURSE
	SKILL ENHANCEMENT THEORY	IV		PLANT BREEDING (SC23SECBOT406)	2T

*Noted*

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*Botany*

**SEMESTER: III**  
**SUMMARY OF THE PROGRAMME**

<b>SYLLABUS DURATION</b>	<b>SEMESTER PATTERN I.E., SIX MONTHS (single major)</b>
<b>THEORY</b>	
<b>No. of Discipline Specific Major Core Courses (MJDSC)</b>	<b>02/Semester</b>
<i>Credits per Discipline Specific Major Core Course (MJDSC)</i>	<i>04</i>
<i>Total credits for Discipline Core Major Course (MJDSC)</i>	<b>08/Semester</b>
<i>Theory lectures per Discipline Major Core Course (MJDSC)</i>	<i>04/week</i>
<b>No. of Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC), Skill Enhancement Courses (SEC) &amp; Value Added Course (VAC)/Indian Knowledge System (IKS)</b>	<b>01/Semester</b>
<i>Credits per Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC), Skill Enhancement Courses (SEC) &amp; Value Added Course (VAC)/ Indian Knowledge System (IKS)</i>	<i>02</i>
<i>Total credits for Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC),Skill Enhancement Courses (SEC) &amp; Value Added Course (VAC)/ Indian Knowledge System (IKS)</i>	<b>02/Semester</b>
<i>Theory lectures per Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC) Skill Enhancement Courses (SEC) &amp; Value Added Course (VAC)/ Indian Knowledge System (IKS)</i>	<i>02 /week</i>
<b>PRACTICAL</b>	
<b>No. of Practical courses per Discipline Specific Major Core Courses (MJDSC)(GROUP A+GROUP B)</b>	<b>01 (in each semester)</b>
<i>Credits per Practical course</i>	<b>04(GROUP A:2+GROUP B:2)</b>
<i>Total Credits of Practical course</i>	<i>04/Semester</i>
<i>Total Practical lectures</i>	<i>08/week/ batch</i>
<i>No. of Practical course (in Uni. Exam.)</i>	<b>01/Semester</b>
<b>No. of Practical courses per Discipline Specific Multi /Inter Disciplinary Courses (MDC / IDC)</b>	<b>01 (in each semester)</b>
<i>Credits per Practical course</i>	<b>02</b>
<i>Total Credits of Practical course</i>	<i>02/Semester</i>
<i>Total Practical lectures</i>	<i>04/week/ batch</i>
<i>No. of Practical course (in Uni. Exam.)</i>	<b>01/Semester</b>
<b>EVALUATION</b>	
<b>Examination (including Preparation - week)</b>	<b>5</b>
<i>No. of Days per week</i>	<b>6</b>
<i>Week (days) available for Teaching</i>	<b>15 (90)</b>
<i>Duration of each lecture (minutes)</i>	<b>55</b>
<i>No. of students/batch</i>	<i>As per approval of AC and Exam. Unit</i>

*As per approval of AC and Exam. Unit*

**Framed according to National Education Policy (NEP) - 2020**  
**Under Choice Based Credit System-Semester-Grading System pattern**

**UG (B. Sc.) Programme in Botany**  
**Semester-III and IV**

**PREAMBLE:**

Over the past decades the higher education system of our country has undergone substantial structural and functional changes resulting in both quantitative and qualitative development of the beneficiaries. The upgradation of undergraduate programmes in the line of NEP, 2020 will play an extremely important role in promoting human as well as societal well-being and in developing India as envisioned in its Constitution - a democratic, just, socially conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all. A holistic and multidisciplinary education would aim to develop all capacities of human beings -intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner. Such an education will help develop well-rounded individuals that possess. Such changes will further result in learning outcome based curriculum in order to maximize the benefits of the newly designed curriculum. The learning outcome based curriculum in general and in Botany in particular will definitely help the teachers of the discipline to visualize the curriculum more specifically in terms of the learning outcomes expected from the students at the end of the instructional process. It is pertinent to mention here that the purpose of education is to develop an integrated personality of the individual and the educational system provides all knowledge and skills to the learner for this.

The template as developed has the provision of ensuring the integrated personality of the students in terms of providing opportunity for exposure to the students towards core courses, discipline specific courses, generic elective courses, ability enhancement courses and skill enhancement courses with special focus on technical, communication and subject specific skills through practical and other innovative transactional modes to develop their employability skills. The template of learning outcome based framework has categorically mentioned very well defined expected outcomes for the programme like core competency, communication skills, critical thinking, affective skills, problem-solving, analytical, reasoning, research-skills, teamwork, digital literacy, moral and ethical awareness, leadership readiness and so on along with very specific learning

course outcomes at the starting of each course. Therefore, this template on Learning Outcomes based Curriculum Framework (LOCF) for B.Sc. with Botany/ Botany Honours under the University will be in the line of NEP, 2020 – more flexible, multi-disciplinary, holistic and will definitely be a landmark in the field of outcome based curriculum construction.

Today plant science is a fusion of the traditional components with the modern aspects of biochemistry, molecular biology and biotechnology. Over the years, plant science (Botany) has shown enormous gain in information and applications owing to tremendous inputs from research in all its aspects. With global recognition of the need for conservation, field plant biologists have contributed significantly in assessing plant diversity. Taxonomists have explored newer dimensions for the classification of plants. New insights have been gained in functional and structural aspects of plant development by utilizing novel tools and techniques for botanical research. Challenging areas of teaching and research have emerged in ecology and reproductive biology. Concern for ever increasing pollution and climate change is at its highest than ever before. Keeping these advancements in view, a revision of the curriculum at the undergraduate level is perfectly timed. From the beginning of the session, the Botany students across Indian Universities shall have the benefit of a balanced, carefully-crafted course structure taking care of different aspects of plant science, namely plant diversity, physiology, biochemistry, molecular biology, reproduction, anatomy, taxonomy, ecology, economic botany and the impact of environment on the growth and development of plants. All these aspects have been given due weightage over the six semesters. It is essential for the undergraduate students to acquaint themselves with various tools and techniques for exploring the world of plants up to the sub- cellular level. A paper on this aspect is proposed to provide such an opportunity to the students before they engage themselves with the learning of modern tools and techniques in plant science. Keeping the employment entrepreneurship in mind, applied courses have also been introduced. These courses shall provide the botany students hands on experience and professional inputs. On the whole, the curriculum is a source of lot of information and is supported by rich resource materials. It is hoped that a student graduating in Botany with the new curriculum will be a complete botanist at Honours level.

### **NEP-2020:**

NEP, 2020 aims at a new and forward-looking Vision for India's Higher Education System. This curriculum framework for the bachelor-level program in Botany is developed keeping in view of the student centric learning pedagogy, which is entirely multidisciplinary outcome-oriented and curiosity-driven. To avoid rote -learning approach and foster imagination, the curriculum is more leaned towards self-discovery of concepts. The curriculum framework focuses on pragmatist approach whereby practical application of theoretical concepts is taught with substantial coverage of practical and field works. The platform aims at equipping the graduates with necessary skills for botany-related careers, careers with general graduate-level aptitude and for higher education in Botany and allied subjects. Augmented in this framework are graduate attributes including critical thinking, basic psychology, scientific reasoning, moral ethical reasoning and so on, qualification descriptors that are specific outcomes pertinent to the discipline of botany, learning outcomes for the two programmes these frameworks have been developed, learning outcomes for individual courses, pedagogical methods and assessment methods. Looking at all these new concepts and progress, the detailed syllabus of B.Sc. (H) – Botany sem. III & IV has been designed and decided to be implemented from the academic session from June 2024-25.

### **APPROACH TO CURRICULUM PLANNING:**

While designing these frameworks, emphasis is given on the objectively measurable teaching-learning outcomes to ensure employability of the graduates. In line with recent trends in education section, these frameworks foster implementation of modern pedagogical tools and concepts such as flip-class, hybrid learning, MOOCs and other e-learning platforms. In addition, the framework pragmatic to the core; it is designed such a way to enable the learners implementing the concepts to address the real world problems. A major emphasis of these frameworks is that the curriculum focuses on issues pertinent to India and also of the west; for example, biodiversity and conservation of endemic and threatened species that are found in India, Indian climatological variables, Indian biodiversity and so on. Above all, these frameworks are holistic and aim to mould responsible Indian citizen who have adequate skills in reflective thinking, rational skepticism, scientific temper, digital literacy and so on such that they are equipped to fight immediate social issues apropos to Indian milieu, including corruption and inequity.

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications such as a Bachelor's Degree (Hons) programmes are earned and awarded on the basis of (a) demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and (b) academic standards expected of graduates of a programme of study.

Learning outcomes-based frameworks in any subject must specify what graduates completing a particular programme of study are (a) expected to know, (b) understand and (c) be able to do at the end of their programme of study. To this extent, LOCF in Botany is committed to allowing for flexibility and innovation in (i) programme design and syllabi development by higher education institutions (HEIs), (ii) teaching-learning process, (iii) assessment of student learning levels, and (iv) periodic programme review within institutional parameters as well as LOCF guidelines, (v) generating framework(s) of agreed expected graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes. HEIs, on their turn, shall address to the situations of their students by identifying relevant and common outcomes and by developing such outcomes that not only match the specific needs of the students but also expands their outlook and values.

**NATURE AND EXTENT OF BACHELOR'S DEGREE PROGRAMME IN BOTANY (HONOURS):**

A bachelor's degree in Botany with Research or without Research is a 4 year degree course which is divided into 8 semesters.

Sl. No.	NCRF Credit Levels	Type of Award	Stage of Exit	Mandatory Credits to be secured for the Award
1	4.5	Certificate in the Discipline	After successful completion of 1st Year	44
2	5.0	Diploma in the Discipline	After successful completion of 1st and 2nd Years	88
3	5.5	B.Sc. Degree in Botany	After successful completion of 1st, 2nd and 3rd Years	132
4	6.0	B.Sc. (Honours with Research) / (without Research) in Botany	After successful completion of 1st, 2nd, 3rd and 4th Years	176

A student pursuing 4 years undergraduate programme with research in a specific discipline shall be awarded an appropriate Degree in that discipline on completion of 8th Semester if he/she secures 176 Credits. Similarly, for certificate, diploma and

degree, a student needs to fulfil the associated credits. An illustration of credits requirements in relation to the type of award is illustrated as above.

Bachelor's Degree (Honours) is a well-recognized, structured, and specialized graduate level qualification in tertiary, collegiate education. The contents of this degree are determined in terms of knowledge, understanding, qualification, skills, and values that a student intends to acquire to look for professional avenues or move to higher education at the postgraduate level.

Bachelor's Degree (Honours) programmes attract entrants from the secondary level or equivalent, often with subject knowledge that may or may not be directly relevant to the field of study/profession. Thus, B.Sc. (Honours) Course in Botany aims to equip students to qualify for joining a profession or to provide development opportunities in particular employment settings. Graduates are enabled to enter a variety of jobs or to continue academic study at a higher level.

#### **AIMS:**

1. To transform curriculum into outcome-oriented scenario.
2. To develop the curriculum for fostering discovery-learning.
3. To equip the students in solving the practical problems pertinent to India.
4. To adopt recent pedagogical trends in education including e-learning, flipped class, hybrid learning and MOOCs
5. To mold responsible citizen for nation-building and transforming the country towards the future.
6. To provide an environment that ensures cognitive development of students in a holistic manner. A dialogue about plants and its significance is fostered in this framework, rather than didactic monologues on mere theoretical aspects.
7. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A Botany graduate as envisioned in this framework would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.
8. To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.
9. To enable the graduate prepare for national as well as international competitive examinations, especially UGC-CSIR NET and UPSC Civil Services Examination.

## **PROGRAMME LEARNING OUTCOMES:**

Learning Outcome Curriculum Framework (LOCF) aims to equip students with knowledge, skills, values, attitudes, leadership readiness/qualities and lifelong learning. The fundamental premise of LOCF is to specify what graduates completing a particular programme of study are expected to know, understand and be able to do at the end of their programme of study. Besides this, students will attain various 21st century skills like critical thinking, problem solving, analytic reasoning, cognitive skills, self-directed learning etc.. A note on LOCF for undergraduate education is available on the UGC website [www.ugc.ac.in](http://www.ugc.ac.in). It can serve as guiding documents for all Universities undertaking the task of curriculum revision and adoption of outcome based approach. The student graduating with the Degree B.Sc. (Honours) Botany should be able to acquire:

**PO 1: Knowledge:** Students will acquire core competency in the subject Botany, and in allied subject areas. The student will be able to identify major groups of plants and compare the characteristics of lower (e.g. algae and fungi) and higher (angiosperms and gymnosperms) plants.

- Students will be able to use the evidence based comparative botany approach to explain the evolution of organism and understand the genetic diversity on the earth.
- The students will be able to explain various plant processes and functions, metabolism, concepts of gene, genome and how organism's function is influenced at the cell, tissue and organ level.
- Students will be able to understand adaptation, development and behavior of different forms of life.
- The understanding of networked life on earth and tracing the energy pyramids through nutrient flow is expected from the students.
- Students will be able to demonstrate the experimental techniques and methods of their area of specialization in Botany.

**PO 2: Critical Thinking and problem solving ability:** An increased understanding of fundamental concepts and their applications of scientific principles is expected at the end of this course. Students will become critical thinker and acquire problem solving capabilities.

**PO 3: Digitally equipped:** Students will acquire digital skills and integrate the fundamental concepts with modern tools.

**PO 4: Ethical and Psychological strengthening:** Students will also strengthen their ethical and moral values and shall be able to deal with psychological weaknesses.

**PO 5: Team Player:** Students will learn team workmanship in order to serve efficiently institutions, industry and society.

**PO 6: Independent Learner:** Apart from the subject specific skills, generic skills, especially in botany, the program outcome would lead to gain knowledge and skills for further higher studies, competitive examinations and employment. Learning outcomes based curriculum would ensure equal academic standards across the country and broader picture of their competencies. The Bachelor program in Botany and Botany honours may be mono-disciplinary or multidisciplinary.

**PO 7: Analytical ability:** The students will be able to demonstrate the knowledge in understanding research and addressing practical problems. Application of various scientific methods to address different questions by formulating the hypothesis, data collection and critically analyze the data to decipher the degree to which their scientific work supports their hypothesis.

### **SALIENT FEATURES:**

- B.Sc. (Honours) Botany in UG programme - **Semester III and IV** shall be offered from the Academic year, June **2024**.
- Botany subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2024-25.
- A student will have to get enrolled a **Discipline Specific Core Course (DSC)** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting a **Multi/ Inter disciplinary Course (MDC/ IDC), Ability Enhancement Course (AEC), Skill Enhancement Course (SEC)** as well as **Value Added Course (VAC)/Indian Knowledge System (IKS)** from a pool of courses.
- **Academic Bank of Credits (ABC)** is an academic service mechanism as a digital/virtual/online entity established and managed by MOE/UGC. This will facilitate students to become its academic account holders and paving the way for seamless student mobility between or within degree-granting Higher Education Institutions (HEIs) through a formal system of credit recognition, credit accumulation, credit transfers and credit redemption to promote distributed

teaching- learning from various recognized institutions, approved ODL and other sources to increase their knowledge, capacities and skills. ABC shall be established on the lines of "National Academic Depository" (NAD) as a Special Purpose Vehicle (SPV). It shall have a dynamic website providing all details of ABC, operational mechanism for the use of all stakeholders of higher education.

- Each course shall be assigned a specific number of **Credits**.
- Discipline Specific Core Course (**DSC**) is the course which should compulsorily be studied by a candidate as a Major and Minor requirement so as to get degree in a said discipline of study.
- There shall be two **Major (MJDC) Compulsory** course (Theory) with **4 credits/major** and their practical with **4 credits**.
- One **Minor (MiDSC) Compulsory (sem. IV)** course and **Multi-Disciplinary Course (MDC) (sem. III)** (Theory) each with **2 credits** in each semester and their practical's each with **2 credits**.
- In addition to the Major/Minor course, a student will have to choose **MDC/IDC, AEC, SEC** as well as **VAC/IKS** from a pool of courses.
- **AEC, SEC** and **VAC/IKS** courses shall have to be offered. The credit weight-age for **AEC 2 credit, SEC 2 credit, IKS (sem. III)** and **VAC (sem. IV) 2 credit** course shall be offered.
- Each course shall have a unique Course code. The Discipline Specific Core Course, Inter/Multi-Disciplinary Course, Ability Enhancement Course, Value Added Course and Skill Enhancement Course shall be abbreviated respectively as **DSC, IDC/MDC, AEC, VAC/IKS and SEC**.
  1. Discipline Specific Core Course DSC- Major (**MJDC**) & Minor (**MiDSC**)  
Practical Discipline Specific Core Course **PDSC- PMJDC & PMiDSC**.
  2. Multi/Inter Disciplinary Course **MDC/IDC**  
Practical Multi/Inter Disciplinary Course **PMDC/PIDC**
  3. Ability Enhancement Course **AEC**
  4. Skill Enhancement Course **SEC**
  5. Value Added Course **VAC**
  6. Indian Knowledge System **IKS**

- Each Academic year shall consist of **two** semesters, each of **15 weeks** of teaching equivalent to **90 working days**. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.
- The theory course with **4 credits** shall be of **60 hrs** (15 weeks x 4credits) duration and the course with **2 credits** shall be of **30 hrs** (15 weeks x 2 credits) duration.
- The **Practical** course **with 4 credits** shall be of **120 hrs** (15 weeks x 8 hours) duration and the **Practical** course **with 2 credits** shall be of **60 hrs** (15 weeks x 4 hours) duration.

### **GENERAL FRAMEWORK:**

- *A general framework for Bachelor of Science (B. Sc.) with Honours programme with Research/without Research shall be as follows:*

Semester wise credits								Total credits of the Programme
I	II	III	IV	V	VI	VII	VIII	
22	22	22	22	22	22	22	22	176

### **ATTENDANCE:**

The attendance rules as per the norms of Hemchandracharya North Gujarat University, Patan.

To be able to appear for the SEE, a student must comply with the following conditions:

1. Should have at least 75% of attendance in all the courses put together.
2. Should have at least 70% of attendance in each course/subject.
3. Should not have any disciplinary proceedings pending against him/her.
4. Should have no pending due.

### **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.

### **TEACHING LEARNING PROCESS:**

Teaching and learning in this programme involve classroom lectures as well tutorials. It allows-

- The tutorials allow a closer interaction between the students and the teacher as each student gets individual attention.
- Written assignments and projects submitted by students

- Project-based learning
- Group discussion
- Home assignments
- Quizzes and class tests
- PPT presentations, Seminars, interactive sessions
- Diversity survey
- Co-curricular activity etc.
- Industrial Tour or Field visit

### **LANGUAGE OF QUESTION PAPER:**

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

### **EVALUATION METHODS:**

Academic performance in various courses *i.e.* **MJDSC, MiDSC, MDC/IDC, AEC, SEC, VAC/IKS** and **RP/OJT** are to be considered as parameters for assessing the achievement of students in the Botany subject. A number of appropriate assessment methods of Botany will be used to determine the extent to which students demonstrate desired learning outcomes.

**Following assessment methodology should be adopted:**

1. A student shall be evaluated through **Continuous and Comprehensive Evaluation (CCE)**/ (**Internal Evaluation**) and as well as the **Semester End Evaluation (SEE)** (**External Evaluation**). The weightage of theory and practical is **25 marks per credit**. CCE shall be **50%**, whereas the weightage of the SEE shall be **50%**.

Sr. No.	Evaluation	4 credits subjects (Marks)	2 credits subjects (Marks)
1	CCE (50%) Classroom & Mid-Term Evaluation	50	25
2	SEE (50%)	50	25
	<b>Total</b>	<b>100</b>	<b>50</b>

2. In the **Continuous and Comprehensive Evaluation (CCE)**/ (**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 CCE. The assessment is to be done by various means including:

Written Mode	Oral Mode	Practical Mode	Integrated Mode
1. Semester Exam 2. Class Test 3. Open book exam/test 4. Open note exam/test 5. Self-test/ Online test 6. Essay/Article writing 7. Quizzes/Objective test 8. Class assignment 9. Home assignment 10. Reports Writing 11. Research/Dissertation 12. Case Studies	1. Viva/Oral exam 2. Group Discussion 3. Role Play 4. Authentic Problem Solving 5. Quiz 6. Open Book Reading 7. Interview	1. Lab work 2. Computer simulation/ Virtual labs 3. Craft work 4. Co-curricular work	1. Paper presentation/ Seminar 2. Field Assignment 3. Poster presentation

### ***NATURE AND OBJECTIVES OF VARIOUS TYPES OF EVALUATION::***

Written Mode		
Evaluation Type	Nature	Objectives
<b>Semester Exam</b>	Traditionally essay type	For depth and planned preparation
<b>Class test</b>	Traditionally essay type	Fixed date forces students to learn
<b>Open book test</b>	Allowed choice of reference book	Measures what students can do with resources, less stress on
<b>Open note test</b>	To get used to the system	Encourage good note taking
<b>Self-test</b>	For subjective and objective items	Mastery learning occurs with proper feedback
<b>Article/essay writing</b>	Individual long written assignment	Individual expression and creativity
<b>Quizzes/Objective test</b>	Short duration structured test	Excellent validity as greater syllabus coverage
<b>Class assignment</b>	With defined time	Student's performance to make decision
<b>Home assignment</b>	With undefined time	Reinforce learning and facilitate mastery of specific skills
<b>Reports Writing</b>	On activities performed or event observed	Develop a key transferable skill
<b>Research/Dissertatio</b>	Detailed research-based report	To judge creativity and research
<b>Case Studies</b>	<b>Analyse a given case (real or fictional)</b>	To assess thinking, value, and attitude

<b>Oral Mode</b>		
<b>Evaluation Type</b>	<b>Nature</b>	<b>Objectives</b>
<b>Viva/Oral exam</b>	Individually or in small group	Practical experience towards job interview situation
<b>Group discussion</b>	Small group of 2-5 members work on a joint task	Encourage teamwork
<b>Role Play</b>	Small group of 2-5 members work on a joint task	Develop personality
<b>Authenticate problem solving</b>	Small group of 2-5 members work on a joint task	Communication of ideas
<b>Quiz</b>	Small group of 2-5 members work on a joint task	Assess memory power
<b>Interview</b>	Individually	Judge the personal confidence level

<b>Practical Mode</b>		
<b>Evaluation Type</b>	<b>Nature</b>	<b>Objectives</b>
<b>Lab work</b>	Component of working with one's hand	Keep the students on the task
<b>Computer simulation/virtua</b>	Component of working with one's hand	To understand the practical exposure
<b>Craft work</b>	Component of working with one's hand	Encourage application of concepts learnt
<b>Co-curricular work</b>	Component of working with one's hand	For immediate feedback

<b>Integrated Mode</b>		
<b>Evaluation Type</b>	<b>Nature</b>	<b>Objectives</b>
<b>Paper presentation/Seminar</b>	Group or individual work	Learn from others presentation
<b>Field Assignment</b>	Field visit with report	Develop observation and recording skills
<b>Poster presentation</b>	Group or individual work	Develop research, creativity, and discussion skills

### **MODELS OF EVALUATION:**

Based on the types of evaluation, various models of evaluation implementation are suggested for theory, practical, self-study and work-based learning. The focus of these models is to encourage the students to improve on skills and performance.

Model for Theory Courses	
CCE- 50% (50)	SEE- 50% (50)
Exam Pattern	Marks
Class Test (Best 2 out of 3)	15
Quiz (Best 3 out of 4)	15
Active Learning	05
Home Assignment	05
Class Assignment	05
Attendance	05
<b>Continuous and Comprehensive Evaluation(CCE)</b>	<b>50</b>
<b>Semester-End Evaluation (SEE)</b>	<b>50</b>

Model for Practical Courses	
CCE- 50% (50)	SEE- 50% (50)
Exam Pattern	Marks
Lab work assessment (Best 4 out of 5)	20
Viva voce/Lab quiz (Best 4 out of 5)	20
Attendance	10
<b>Continuous and Comprehensive Evaluation(CCE)</b>	<b>50</b>
<b>Semester-End Evaluation(SEE)</b>	<b>50</b>

Model for Project/Self Model for Project/Self-study course-study/ Model for work experience course	
CCE- 50% (50)	SEE- 50% (50)
Exam Pattern	Marks
Project Evaluation (Best 3 out of 5)	30
Participation in discussion	10
Attendance	10
<b>Continuous and Comprehensive Evaluation(CCE)</b>	<b>50</b>
<b>Semester-End Evaluation(SEE)</b>	<b>50</b>

13. CCE and SEE shall be of 2 ½ hours for 4 credits course and 2 hours in case of 2 credits courses.

**14. CERTIFIED JOURNAL:**

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.

15. 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 **36%** as decided by concern Board of Studies (BoS) in Botany.

16. Promotion, Re-Admission and Time for Completion of course, Procedure for awarding grades, Provision for appeal, etc. as decided by the *Hemchandracharya North Gujarat University, Patan(Gujarat)*.

**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.

**COMPUTATION OF SGPA:**

SGPA is computed from the grades as a measure of the student's performance in each semester. It is the ratio of the sum of the product of the number of credits with the grade points and the sum of the number of credits. i.e.

$$SGPA (S_i) = \sum (C_i \times G_i) / \sum C_i$$

Where  $S_i$  is the SGPA for  $i$ th course,  $C_i$  is the number of credits of the  $i$ th course and  $G_i$  is the grade point scored by the student in the  $i$ th course.

**CUMULATIVE GRADE POINT AVERAGE (CGPA):**

The CGPA is based on the grades in all the courses taken after joining the programme of study. It is the ratio of the sum of the products of total credits scored in a particular semester with the SGPA scored by the student in that semester and the sum of the total number of credits of each semester. i.e.

$$CGPA = \sum (C_i \times S_i) / \sum C_i$$

Where  $S_i$  is the SGPA of the  $i$ th semester and  $C_i$  is the total number of credits in that semester.

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**  
**B.Sc. Honours Programme with 176 credits CBCS-Semester-Grading Pattern**  
**FRAMED ACCORDING TO NATIONAL EDUCATION POLICY (NEP- 2020)w.e.f. June-2024**  
**General Pattern/Scheme of study components along with credits for Science faculty.**

DIPLOMA COURSE								
Part/Class	Subject code	Study Components	Instruction Hrs/Week	Examination Marks			Credits	Exam Duration (Hours)
				CCE	SEE	Total		
<b>B.Sc. Semester -III</b>	<b>Semester-III</b>							
	<b>Discipline Specific Core Course(DSC)</b>							
	SC23MJDSCBOT301	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	02:30
	SC23MJDSCBOT301A	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	
	SC23MDCBOT303	Multi/Inter Disciplinary Courses (MDC/IDC)	2	25	25	50	2	02:00
	<b>Practical Course(PDSC)</b>							
	SC23PMJDSCBOT301&SC23PMJDSCBOT301A	Major Discipline Specific Core Courses (PMJDSC)(GROUP A & B)	8 (4+4)	50	50	100	4 (2+2)	05:00
	SC23PMDCBOT303	Multi/Inter Disciplinary Courses (PMDC/PIDC)	4	25	25	50	2	02:30
	<b>Ability Enhancement Course (AEC)</b>							
	SC23AECBOT304	Ability Enhancement Courses (AEC) (Language)	2	25	25	50	2	02:00
	<b>Value Added Course (VAC)/ Indian Knowledge System (IKS)</b>							
	SC23IKSBOT305	Indian Knowledge System (IKS)	2	25	25	50	2	02:00
	<b>Skill Enhancement Course (SEC)</b>							
	SC23SECBOT306	Skill Enhancement Course (SEC)	2	25	25	50	2	02:00
		<b>28</b>	<b>275</b>	<b>275</b>	<b>550</b>	<b>22</b>		
<b>B.Sc. Semester -IV</b>	<b>Semester-IV</b>							
	<b>Discipline Specific Core Course(DSC)</b>							
	SC23MJDSCBOT401	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	02:30
	SC23MJDSCBOT401A	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	
	SC23MiDCBOT402	Minor Discipline Specific Core Courses (MiDSC)	2	25	25	50	2	02:00
	<b>Practical Course(PDSC)</b>							
	SC23PMJDSCBOT401&SC23PMJDSCBOT401A	Major Discipline Specific Core Courses (PMJDSC)(GROUP A & B)	8 (4+4)	50	50	100	4 (2+2)	05:00
	SC23PMiDCBOT402	Minor Discipline Specific Core Courses (PMiDSC)	4	25	25	50	2	02:30
	<b>Ability Enhancement Course (AEC)</b>							
	SC23AECBOT404	Ability Enhancement Courses (AEC) (Language)	2	25	25	50	2	02:00
	<b>Value Added Course (VAC)/ Indian Knowledge System (IKS)</b>							
	SC23VACBOT405	Value Added Courses (VAC)	2	25	25	50	2	02:00
	<b>Skill Enhancement Course (SEC)</b>							
	SC23SECBOT406	Skill Enhancement Course (SEC)	2	25	25	50	2	02:00
		<b>28</b>	<b>275</b>	<b>275</b>	<b>550</b>	<b>22</b>		

**SEMESTER: III**

**MAJOR DISCIPLINE SPECIFIC CORE COURSES:**

**PROGRAMME CODE: SCIUG103**

**SEM-III: SC23MJDSCBOT301: MYCOLOGY AND PHYTOPATHOLOGY**

***Programme specific Learning Outcomes:***

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

- Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.
- Demonstrate skills in laboratory, field and glasshouse work related to mycology and plant pathology.
- Develop an understanding of microbes, fungi and lichens and appreciate their adaptive strategies.
- Identify the common plant diseases according to geographical locations and devise control measures.

**SEM-III: SC23MJDSCBOT301A: ARCHEGONIATE**

***Programme specific Learning Outcomes:***

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

- Demonstrate an understanding of archegoniatae, Bryophytes, Pteridophytes and Gymnosperms.
- Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.
- Understanding of plant evolution and their transition to land habitat.
- Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Bryophytes, Pteridophytes, and Gymnosperms.

**MULTI / INTER DISCIPLINARY COURSE:**

**PROGRAMME CODE: SCIUG103**

**SEM-III: SC23MDCBOT303: MEDICINAL BOTANY**

**Programme specific Learning Outcomes:**

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

- Recognize the basic medicinal plants.
- Apply techniques of conservation and propagation of medicinal plants.
- Setup process of harvesting, drying and storage of medicinal herbs.
- Propose new strategies to enhance growth of medicinal herbs considering the practical issues pertinent to India.

**INDIAN KNOWLEDGE SYSTEM:**

**PROGRAMME CODE: SCIUG103**

**SEM-III: SC23IKSBOT305: INDIGENOUS MEDICINAL SYSTEM**

**Programme specific Learning Outcomes:**

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

- Recognize the basic medicinal plants in the Indian Continent.
- Apply traditional techniques of conservation and propagation of medicinal plants.
- Setup traditional process of harvesting, drying and storage of medicinal herbs.
- Propose new strategies to enhance growth of medicinal herbs considering the practical issues pertinent to the India.

**SKILL ENHANCEMENT COURSE:**

**PROGRAMME CODE: SCIUG103**

**SEM-III: SC23SECBOT306: MUSHROOM CULTIVATION**

***Programme specific Learning Outcomes:***

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

- Recall various types and categories of mushrooms.
- Demonstrate various types of mushroom cultivating technologies.
- Examine various types of food technologies associated with mushroom industry.
- Value the economic factors associated with mushroom cultivation
- Devise new methods and strategies to contribute to mushroom production.

**DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BOTANY**

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

(Effective from June 2024-245 UNDER NEP-2020)

<b>MAJOR DISCIPLINE SPECIFIC CORE COURSE (MJDSC)</b>							
<b>Programme Code: SCIUG103</b>							
<b>COURSE</b>	<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>Credits</b>	<b>Lectures</b>	<b>THEORY</b>	
						<b>CCE</b>	<b>SEE</b>
<b>Diploma Course</b>	<b>B.Sc. III</b>	<b>SC23MJ DSCBOT 301</b>	<b>MYCOLOGY AND PHYTO PATHOLOGY</b>	<b>4</b>	<b>T=60hrs</b>	<b>50%</b>	<b>50%</b>
<b>Course outcomes:</b>	On completion of the course, the students will be able to: <ul style="list-style-type: none"><li>• Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.</li><li>• Demonstrate skills in laboratory, field and glasshouse work related to mycology and plant pathology.</li><li>• Develop an understanding of microbes, fungi and lichens and appreciate their adaptive strategies.</li><li>• Identify the common plant diseases according to geographical locations and device control measures.</li></ul> <b>Pedagogy:</b> Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.						
<b>THEORY UNIT</b>	<b>TOPIC</b>						<b>NO. OF LECTURES (60hrs)</b>
<b>Unit 1</b>	<b>Fungi-1</b> <ul style="list-style-type: none"><li>• General characteristics, Thallus organization; Cell wall composition; Nutrition; Classification (<b>Ainsworth</b>).</li><li>• <b>Allied Fungi:</b> General characteristics; Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.</li><li>• <b>Applied Mycology:</b> Application of fungi in food industry (Fermentation, Organic acids, Enzymes and Mycoproteins); Medicines (Pharmaceutical preparations); Agriculture (Bio fertilizers).</li></ul>						<b>15</b>

<b>Unit 2</b>	<b>Fungi-2</b> <ul style="list-style-type: none"> <li>• <b>Mycorrhiza:</b> Ectomycorrhiza, Endomycorrhiza and their significance.</li> <li>• <b>Zygomycetes:</b> Characteristic features, Reproduction. Life cycle and classification with reference to <b><i>Rhizopus</i></b>.</li> <li>• <b>Ascomycetes:</b> General characteristics (asexual and sexual fruiting bodies), Life cycle and classification with reference to <b><i>Claviceps</i></b>.</li> </ul>	<b>15</b>
<b>Unit 3</b>	<b>Fungi and Phytopathology</b> <ul style="list-style-type: none"> <li>• <b>Basidiomycetes:</b> General characteristics, Life cycle and Classification with reference to <b><i>Agaricus</i></b>.</li> <li>• <b>Lichens:</b> General characteristics; Classification; Study of thallus (morphological and anatomical), Reproduction; Economic importance.</li> <li>• Terms and concepts; General symptoms of phytopathology.</li> </ul>	<b>15</b>
<b>Unit 4</b>	<b>Phytopathology</b> <ul style="list-style-type: none"> <li>• Geographical distribution of diseases. Host-Pathogen relationships.</li> <li>• Pathogen, Symptoms, Dissemination, Disease cycle and control measures of following plant diseases: <ul style="list-style-type: none"> <li>➤ Bacterial diseases – <b>Citrus canker.</b></li> <li>➤ Fungal diseases – <b>White rust of crucifers. Black rust of wheat.</b></li> </ul> </li> </ul>	<b>15</b>
<p><b><i>Suggested Readings:</i></b></p> <ol style="list-style-type: none"> <li>1. Agrios, G.N. (1997) Plant Pathology, 4th edition, Academic Press, U.K.</li> <li>2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley &amp; Sons (Asia) Singapore. 4th edition.</li> <li>3. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.</li> <li>4. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.</li> <li>5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.</li> </ol>		

**DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BOTANY**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2024-245UNDER NEP-2020)

<b>MAJOR DISCIPLINE SPECIFIC CORE COURSE (MJDSC)</b>							
<b>Programme Code: SCIUG103</b>							
<b>COURSE</b>	<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>Credits</b>	<b>Lectures</b>	<b>THEORY</b>	
						<b>CCE</b>	<b>SEE</b>
<b>Diploma Course</b>	<b>B.Sc. III</b>	<b>SC23MJ DSCBOT 301A</b>	<b>ARCHEGONIATE</b>	<b>4</b>	<b>T=60hrs</b>	<b>50%</b>	<b>50%</b>
<b>Course outcomes:</b>	<p><b>Programme specific Learning Outcomes:</b></p> <p>On completion of this course, the students will be able to:</p> <ul style="list-style-type: none"> <li>• Demonstrate an understanding of archegoniatae, Bryophytes, Pteridophytes and Gymnosperms.</li> <li>• Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.</li> <li>• Understanding of plant evolution and their transition to land habitat.</li> <li>• Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Bryophytes, Pteridophytes, and Gymnosperms.</li> </ul> <p><b>Pedagogy:</b> Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</p>						
<b>THEORY UNIT</b>	<b>TOPIC</b>					<b>NO. OF LECTURES (60hrs)</b>	
<b>Unit 1</b>	<b>Bryophytes -I</b> <ul style="list-style-type: none"> <li>• General characteristics of Bryophytes, Vegetative reproduction of bryophytes.</li> <li>• Classification (<b>Rothmaler</b>); Alternation of generations.</li> <li>• Affinities of Bryophytes with Pteridophytes.</li> </ul>					<b>15</b>	

<b>Unit 2</b>	<b>Bryophytes -II</b> <ul style="list-style-type: none"> <li>• Classification only (up to family), morphology, anatomy and reproduction of <i>Marchantia</i>.</li> <li>• Classification only (up to family), morphology, anatomy and reproduction of <i>Funaria</i>.</li> <li>• Economic importance of bryophytes.</li> </ul>	
<b>Unit 3</b>	<b>Pteridophytes</b> <ul style="list-style-type: none"> <li>• General characteristics and economic importance of Pteridophytes; Classification (<b>Smith</b>).</li> <li>• Classification only (up to family), morphology, anatomy and reproduction of <i>Equisetum</i> (Developmental details not to be included).</li> <li>• Classification only (up to family), morphology, anatomy and reproduction of <i>Nephrolepis</i> (Developmental details not to be included).</li> </ul>	<b>15</b>
<b>Unit 4</b>	<b>Gymnosperms</b> <ul style="list-style-type: none"> <li>• General characteristics and economic importance of Gymnosperms. classification of Gymnosperms (<b>Sporne, 1965</b>).</li> <li>• Affinities with Pteridophytes and Angiosperms.</li> <li>• Morphology, anatomy (leaflets and coralloid root) and reproduction of <i>Cycas</i> (Developmental details not to be included).</li> </ul>	<b>15</b>
<p><b><u>Suggested Readings</u></b>  Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.  Bhatnagar, S.P. &amp; Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.  Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot. Allahabad.  Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.  Vanderpoorten, A. &amp; Goffinet, B. (2009) Introduction to Bryophytes. Cambridge University Press.</p>		

**DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BOTANY**

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

<b>MAJOR DISCIPLINE SPECIFIC CORE COURSE -PRACTICAL (PMJDSC)</b>						
<b>Programme Code: SCIUG103</b>						
<b>COURSE</b>	<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>PRACTICAL</b>		
				<b>Credits</b>	<b>CCE</b>	<b>SEE</b>
<b>Diploma Course</b>	<b>B.Sc. III</b>	<b>SC23PMJD SCBOT 301</b>	<b>MYCOLOGY AND PHYTOPATHOLOGY, ARCHEGONIATE</b>	<b>4 (120 hrs)</b>	<b>50%</b>	<b>50%</b>
<b>Course outcomes:</b>	<p>After the completion of the course the students will be able:</p> <ol style="list-style-type: none"> <li>1. Understand the instruments, techniques, lab etiquettes and good lab practices for working in a lower groups.</li> <li>2. Develop skills for identifying Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and using them for Industrial, Agriculture and Environment purposes.</li> <li>3. Practical skills in the field and laboratory experiments in Mycology, Archegoniate &amp; Pathology.</li> <li>4. Learn to identify lower group.</li> <li>5. Can initiate his own Plant &amp; Seed Diagnostic Clinic and</li> <li>6. Can start own enterprise on lower group products.</li> </ol> <p><b>Pedagogy:</b> Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</p>					
<b>PRACTICALS</b>						<b>NO. OF LECTURES (120 hrs)</b>
<b>GROUP A</b>						
<ol style="list-style-type: none"> <li>1. <b>Rhizopus:</b> study of asexual stage from temporary mounts and sexual structures through permanent slides/photographs/charts.</li> <li>2. <b>Claviceps:</b> study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs/charts.</li> <li>3. <b>Agaricus:</b> Specimen of fruiting body; sectioning of gills. Permanent slides/photographs/charts.</li> <li>4. <b>Lichens:</b> Study of thallus (crustose, foliose and fruticose) and reproductive structure (apothecium) through Permanent slides/ photographs/ charts/ specimen.</li> <li>5. <b>Mycorrhizae:</b> Ectomycorrhiza and Endomycorrhiza (Photographs).</li> <li>6. <b>Phytopathology:</b> Study of Plant diseases: Citrus Canker, <b>White rust of crucifers</b> and <b>Black rust of wheat</b>.</li> </ol>						<b>60</b>

**GROUP B**

1. **Marchantia**- Morphology of thallus with Gemma cup (whole mount), vertical section of thallus through Gemma cup (temporary slide), permanent slides of vertical section of Antheridiophore, Archegoniophore and Sporophyte.
2. **Funaria**- Whole mount of plant, longitudinal section of capsule (temporary slide), permanent slides of antheridial and archegonial heads.
3. **Equisetum**- Morphology, longitudinal section of strobilus (temporary slide and permanent slide).
4. **Nephrolepis**- Morphology, transverse section of sori (temporary slide and permanent slide), prothallus (permanent slide).
5. **Cycas**- Morphology, vertical section of leaflet (temporary slide), whole mount of spores and specimen of coralloid roots, microsporophyll and megasporophyll.

**60**

**Suggested Readings:**

1. Agrios, G.N. (1997) Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore. 4th edition.
3. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.
4. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.
6. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
7. Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
8. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.
9. Vanderpoorten, A. & Goffinet, B. (2009) Introduction to Bryophytes. Cambridge University Press.

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**CBCS - Semester - Grading Pattern**

(Effective from June 2024-25 UNDER NEP-2020)

**B. SC. :: BOTANY PRACTICAL(MAJOR) :: SEMESTER-III**

**Programme Code: SCIUG103**

**MYCOLOGY AND PHYTOPATHOLOGY, ARCHEGONIATE**

**SC23PMJDSCBOT 301**

**(GROUP A & GROUP B)**

**Date:**

**Place:**

**Time: 5 Hrs**

**Total Marks: 50**

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

**(GROUP A)**

1. Identify and classify giving reasons up to family of given specimen **A**. **06**
2. Make a temporary slide of the reproductive organ/Phytopathology from the given specimen **B**. **06**  
Draw the labelled diagram of it and show your slide to the examiner.
3. Identify and describe as per given instructions: **06**
  - I) Specimen – **C**: Electron micrographs/Models/charts/permanent slide  
**(Lichens/Mycorrhizae)**. (5 minutes)
  - II) Specimen – **D**: Electron micrographs/Models/charts/permanent slide  
**(Rhizopus/Claviceps/Agaricus)**. (5 minutes)
4. a. *Viva-voce* **03**  
b. Journal **04**

**(GROUP B)**

1. Identify and classify giving reasons up to family of given specimen **E**. **06**
2. Make a temporary slide of the reproductive organ from the given specimen **F**.  
Draw the labelled diagram of it and show your slide to the examiner. **06**
3. Identify and describe as per given instructions: **06**
  - I) Specimen – **G**: Permanent slide. (5 minutes)
  - II) Specimen – **H**: Permanent slide. (5 minutes)
4. a. *Viva-voce* **03**  
b. Journal **04**

**DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BOTANY**

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

(Effective from June 2024-245UNDER NEP-2020)

<b>MULTI/INTER DISCIPLINARY COURSE (MDC)</b>							
<b>Programme Code: SCIUG103</b>							
<b>COURSE</b>	<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>Credits</b>	<b>Lectures</b>	<b>THEORY</b>	
						<b>CCE</b>	<b>SEE</b>
<b>Diploma Course</b>	<b>B.Sc. III</b>	<b>SC23MDC BOT303</b>	<b>MEDICINAL BOTANY</b>	<b>2T</b>	<b>T=30hrs</b>	<b>50%</b>	<b>50%</b>
<b>Course outcomes:</b>	<p>On completion of the course, the students will be able to:</p> <ul style="list-style-type: none"> <li>Recognize the basic medicinal plants.</li> <li>This course gives a broader exposure to these very important economic plants in addition to their origin, general information, conservation and ethnobotany.</li> <li>The students who have opted for this course will be knowledgeable on several medicinally important plants.</li> <li>This will help them to pursue their career as economic botanist, conservation biologist, medicinal plants biologist, etc. will be able to deal with ethnobotanist, agricultural and horticultural scientist and social scientists.</li> </ul> <p><b>Pedagogy:</b> Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</p>						
<b>THEORY UNIT</b>	<b>TOPIC</b>						<b>NO. OF LECTURES (30hrs)</b>
<b>Unit 1</b>	<p><b>Popular medicinal plants and plant drugs:</b></p> <ul style="list-style-type: none"> <li>➤ A brief account of the chief chemical constituents and uses of the following plant drugs used in indigenous and allopathic systems of medicine:</li> <li>➤ <b>Root: <i>Asparagus racemosus</i></b></li> <li>➤ <b>Leaf: <i>Vitex negundo</i></b></li> <li>➤ <b>Stem: <i>Tinospora cordifolia</i></b></li> <li>➤ <b>Bark: <i>Cinnamon zeylanicum</i></b></li> </ul>						<b>15</b>

<p><b>Unit 2</b></p>	<p><b>Popular medicinal plants and plant drugs:</b></p> <ul style="list-style-type: none"> <li>➤ A brief account of the chief chemical constituents and uses of the following plant drugs used in indigenous and allopathic systems of medicine:</li> <li>➤ <b>Flower: <i>Syzygium aromaticum</i></b></li> <li>➤ <b>Fruit: <i>Moringa pterygosperma</i></b></li> <li>➤ <b>Seed: <i>Datura metel</i></b></li> </ul>	<p><b>15</b></p>
<p><b>Suggested Readings:</b></p> <ol style="list-style-type: none"> <li>1. Kochhar S.L. (2012) Economic Botany in the Tropics. MacMillan India Ltd., New Delhi.</li> <li>2. Wickens G.E. (2001) Economic Botany: Principles &amp; Practices. Kluwer Academic Publishers, The Netherlands.</li> <li>3. Chrispeels M.J. and Sadava D.E. (1994) Plants, Genes and Agriculture. Jones &amp; Bartlett Publishers.</li> <li>4. Sambamurthy A.V.S.S. and Subramanyam N.S. (1989) A Textbook of Economic Botany. Wiley Eastern Ltd., New Delhi.</li> <li>5. Trivedi P.C. (2006) Medicinal Plants: Ethnobotanical Approach, Agrobios, India.</li> <li>6. Purohit and Vyas (2008) Medicinal Plant Cultivation: A Scientific Approach. Agrobios, India.</li> <li>7. Fuller K.W. and Gallon J.A. (1985) Plant Products and New Technology. Clarendon Press, Oxford, New York.</li> <li>8. Hill A.F. (1952) Economic Botany: A Textbook of useful plants and plant products. McGraw Hill Publishing Company Ltd., New Delhi.</li> <li>9. Sen S. (2009) Economic Botany. NCBA Publishers, New Delhi.</li> </ol>		

**DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BOTANY**

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

(Effective from June 2024-25 UNDER NEP-2020)

<b>MULTI/INTER DISCIPLINARY COURSE-PRACTICAL (PMDSC)</b>						
<b>PROGRAMME CODE: SCIUG103</b>						
<b>COURSE</b>	<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>PRACTICAL</b>		
				<b>Credits</b>	<b>CCE</b>	<b>SEE</b>
<b>Diploma Course</b>	<b>B.Sc. III</b>	<b>SC23PMDC BOT303</b>	<b>MEDICINAL BOTANY</b>	<b>2 (60hrs)</b>	<b>50%</b>	<b>50%</b>
<b>Course outcomes:</b>	<p>After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"><li>1. Recognize the basic medicinal plants.</li><li>2. This course gives a broader exposure to these very important economic plants in addition to their origin, general information, conservation and ethnobotany.</li><li>3. The students who have opted for this course will be knowledgeable on several medicinally important plants.</li><li>4. This will help them to pursue their career as economic botanist, conservation biologist, medicinal plants biologist, etc. will be able to deal with ethnobotanist, agricultural and horticultural scientist and social scientists.</li></ol> <p>Apply theoretical knowledge in utilization, and report generation of economical and medicinal plants. Create awareness on conservation of medicinal plants and use of natural plant products as alternatives to synthetic products.</p> <p><b>Pedagogy:</b> Lectures, Tutorials, Assignments, Demonstrations, live specimens, Herbarium specimens, Videos, Team based learning, Field visit and report writing.</p>					
<b>PRACTICALS</b>						<b>NO. OF LECTURES (60 hrs)</b>
<ol style="list-style-type: none"><li>1. Identification (botanical name and family), description and utilization of plants and/or plant parts studied in theory under each group.</li><li>2. Chemical tests for sesame and groundnut oil and study of oil glands in T.S. of <i>Eucalyptus</i> leaf.</li><li>3. Study of properties and measurement of diameter of plant fibres: <b>cotton, jute</b> and <b>coir</b>.</li></ol>						<b>60</b>

	<p>4. Study of plants used as sources of drugs as in theory.</p> <p>5. Preparation of Holi colours using natural ingredients.</p> <p>6. Identification and medicinal value of locally available plants (field visit).</p>	
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***Suggested Readings:***

1. Kochhar S.L. (2012) Economic Botany in the Tropics. MacMillan India Ltd., New Delhi.
2. Wickens G.E. (2001) Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
3. Chrispeels M.J. and Sadava D.E. (1994) Plants, Genes and Agriculture. Jones & Bartlett Publishers.
4. Sambamurty A.V.S.S. and Subramanyam N.S. (1989) A Textbook of Economic Botany. Wiley Eastern Ltd., New Delhi.
5. Trivedi P.C. (2006) Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
6. Purohit and Vyas (2008) Medicinal Plant Cultivation: A Scientific Approach. Agrobios, India.
7. Fuller K.W. and Gallon J.A. (1985) Plant Products and New Technology. Clarendon Press, Oxford, New York.
8. Hill A.F. (1952) Economic Botany: A Textbook of useful plants and plant products. McGraw Hill Publishing Company Ltd., New Delhi.
9. Sen S. (2009) Economic Botany. NCBA Publishers, New Delhi.

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**CBCS - Semester - Grading Pattern**

(Effective from June 2024-25 UNDER NEP-2020)

***B. Sc. :: BOTANY PRACTICAL :: SEMESTER-III***

***(MULTI/INTER DISCIPLINARY COURSE)***

***Programme Code: SCIUG103***

***MEDICINAL BOTANY***

***SC23PMDCBOT303***

**Date:**

**Place:**

**Time: 02:30 Hrs**

**Total Marks: 25**

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

1. Identify and write local name, botanical name, family, useful part, economic important (from unit 1). 10
  - Specimen A & B
2. Identify and write local name, botanical name, family, useful part, economic important (from unit 2). 10
  - Specimen C & D
3. a. *Viva-voce* 02  
b. Journal 03

**DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BOTANY**

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

(Effective from June 2024-245UNDER NEP-2020)

<b>INDIAN KNOWLEDGE SYSTEM (IKS)</b>							
<b>Programme Code: SCIUG103</b>							
<b>COURSE</b>	<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CREDITS</b>	<b>LECTURES</b>	<b>THEORY</b>	
						<b>CCE</b>	<b>SEE</b>
<b>Diploma Course</b>	<b>B.Sc. III</b>	<b>SC23IKS BOT305</b>	<b>INDIGENOUS MEDICINAL SYSTEM</b>	<b>2T</b>	<b>T=30hrs</b>	<b>50%</b>	<b>50%</b>
<b>Course outcomes:</b>	On completion of the course, the students will be able to: <ul style="list-style-type: none"><li>To study how indigenous population used nature and natural products as medicine.</li></ul> <b>Pedagogy:</b> Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.						
<b>THEORY UNIT</b>	<b>TOPIC</b>						<b>NO. OF LECTURES (30hrs)</b>
<b>Unit 1</b>	<ul style="list-style-type: none"><li><b>Medicinal plants</b> in Atharvaveda, religious healing in Veda.</li><li><b>Traditional Treatment System:</b> Treatment of different diseases.</li></ul>						<b>15</b>
<b>Unit 2</b>	<ul style="list-style-type: none"><li><b>Herbal medicines:</b> History and Scope.</li><li><b>Herbal preparations:</b> preparations, formulations and benefits of herbal utilization.</li></ul>						<b>15</b>
<b>Suggested Readings:</b> <ol style="list-style-type: none"><li>1) Medicinal Plants: Ethnobotanical Approach, Trivedi P C, 2006. Agrobios, India.</li><li>2) The Yoga of Herbs: An Ayurvedic Guide to Herbal Medicine, Vasant Lad, David Frawley.</li><li>3) Medicine and athava veda: Dr. C. K. Ramachandran, Mathrubhumi books.</li><li>4) Hand Book of Ayurvedic medicinal plants Herbal (Kapoor).</li></ol>							

**DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BOTANY**

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

(Effective from June 2024-245UNDER NEP-2020)

<b>SKILL ENHANCEMENT COURSE (SEC)</b>							
<b>Programme Code: SCIUG103</b>							
<b>COURSE</b>	<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CREDITS</b>	<b>LECTURES</b>	<b>THEORY</b>	
						<b>CCE</b>	<b>SEE</b>
<b>Diploma Course</b>	<b>B.Sc. III</b>	<b>SC23SEC BOT306</b>	<b>MUSHROOM CULTIVATION</b>	<b>2T</b>	<b>T=30hrs</b>	<b>50%</b>	<b>50%</b>
<b>Course outcomes:</b>	<p>On completion of the course, the students will be able to:</p> <ul style="list-style-type: none"> <li>Recall various types and categories of mushrooms.</li> <li>Demonstrate various types of mushroom cultivating technologies.</li> <li>Examine various types of food technologies associated with mushroom industry.</li> <li>Value the economic factors associated with mushroom cultivation</li> <li>Device new methods and strategies to contribute to mushroom production.</li> </ul> <p><b>Pedagogy:</b> Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</p>						
<b>THEORY UNIT</b>	<b>TOPIC</b>						<b>NO. OF LECTURES (30hrs)</b>
<b>Unit 1</b>	<p><b>Mushrooms:</b></p> <ul style="list-style-type: none"> <li>History, Scope, Vegetative characters, Nutritional values of mushrooms.</li> </ul> <p><b>Types of Mushrooms:</b></p> <ul style="list-style-type: none"> <li><b>Edible Mushrooms:</b> Button mushroom (<i>Agaricus bisporus</i>), Oyster mushroom (<i>Pleurotus sajor-caju</i>) and paddy straw mushroom (<i>Volvariella volvcea</i>).</li> <li><b>Poisonous Mushrooms:</b> <i>Amanita phalloides</i>.</li> </ul>						<b>15</b>

<b>Unit 2</b>	<p><b><i>Mushroom cultivation:</i></b></p> <ul style="list-style-type: none"> <li>• Mushroom bed preparation- Preparation of mother culture, media preparation, inoculation, incubation and spawn production.</li> <li>• Spawning, spawn running, harvesting and Cultivation of oyster mushroom using paddystraw/agricultural wastes.</li> </ul>	<b>15</b>
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***Suggested Readings:***

1. Marimuthu, T. et al. (1991). Oster Mushroom. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.
2. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Pandey R.K, S. K Ghosh, 1996. A Hand Book on Mushroom Cultivation. Emkey Publications.
4. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
5. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.
6. Tripathi, D.P. (2005) Mushroom Cultivation, Oxford & IBH Publishing Co. PVT.LTD, New Delhi.