



हिमाचल प्रदेश केंद्रीय विश्वविद्यालय
Central University of Himachal Pradesh

(Established under Central Universities Act 2009)

अस्थायी शैक्षणिक खण्ड, शाहपुर, जिला काँगड़ा, हिमाचल प्रदेश - 176206

Temporary Academic Block, Shahpur, Distt. Kangra (HP) - 176206

Website: www.cuhimachal.ac.in

File No.: Botany/1-5/BOS/CUHP/18/39

Dated: 11.04.2018

MINUTES OF THE FIRST BOARD OF STUDIES MEETING HELD ON
11TH APRIL, 2018

The meeting of the First Board of Studies of the Department of Botany, School of Life Sciences was held on 11th April, 2018 in Committee Room of Central University of Himachal Pradesh, Temporary Academic Block, Shahpur. Prof. Ambrish Kumar Mahajan, Head, Department of Botany and Dean, School of Life Sciences welcomed all the Hon'ble members.

Following members attended the meeting:

1. Prof. Ambrish Kumar Mahajan – Head and Convener
Head, Department of Botany and Dean, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
2. Prof. G.A. Shantibala Devi – Subject Expert
Department of Life Sciences, Manipur University, Manipur.
3. Dr. Arvind Bhatt – Subject Expert
Department of Biotechnology at Himachal Pradesh University, Summer Hill, Shimla.
4. Prof. Mushtaq Ahmed – Vice Chancellor's Nominee
Department of Environmental Sciences, School of Earth and Environmental Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
5. Dr. Vikram Singh – Vice Chancellor's Nominee
Centre for Computational Biology and Bioinformatics, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
6. Ms. Nivedita Rana – Special Invitee
Department of Zoology, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Dehra.
7. Dr. Vivek Sharma – Special Invitee
Department of Zoology, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Dehra.

8. Dr. Shalini Chandel – Special Invitee

Department of Botany, School of Life Sciences, Central University of Himachal Pradesh,
Temporary Academic Block, Dehra.

9. Dr. Pawan Kumar Sharm – Special Invitee

Department of Botany, School of Life Sciences, Central University of Himachal Pradesh,
Temporary Academic Block, Dehra.

Following Decision were taken in BOS meeting as per the Agenda.

Item BOT-BOS-1/18-1: Approval of Rules of Business for the Board of Studies.

It was unanimously resolved that the draft rules of Business for the Board of Studies presented before the Board of Studies approval as “Rules of Business for the Board of Studies” which would come into effect from this day i.e. Wednesday the 11th April, 2018. (Annexure- I)

Item BOT-BOS-1/18-2: Approval of Courses for PG and RD Program (As per the Ordinance 4 clause 4 b (i).

The BOS approved the minutes of the CDC, Botany held on 16.08.2017 (**Placed as ANNEXURE-A**) with minor amendment (s) by adding the following three practical courses of 04 credits each, respectively, for 3rd and 4th Semester students of M.Sc. Botany who have already been admitted in the University.

1. **Practical Course in Botany – I (Course code BOT-426) = 04 credits (Core-open)**
2. **Practical Course in Botany – II (Course code BOT-524) = 04 credits (Core-open)**
3. **M.Sc Dissertation (Course code BOT-599) (Core-compulsory)**

The BOS also resolved that the course, namely, Genetics & Cytogenetics (BOT -505) which has been listed as a core-compulsory course in the CDC minutes be shifted and placed as a Core-open course.

The BOS further approved that the course curriculum for M.Sc. Botany, in future shall be as per UGC choice based credit system (CBCS). Accordingly, the BOS recommends for approval to the School Board the course curriculum as placed at **ANNEXURE-II (to be approved through email).**

Item BOT-BOS-1/18-3: Approval of Supervisors

BOS members recommend taking up this agenda once the Department will have research scholar.

Item BOT-BOS-1/18-4: List of Experts Approved. (Annexure- V)

Head Department of Botany in consultation with the concern faculty members may add any other name to this list depending upon the situation as per need.

Item BOT-BOS-1/18-5: Approval of Student's Industrial Training / Education Tours

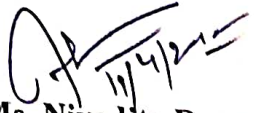
It was unanimously resolved that Students may go for Industrial Training in different Institutes and Educational Tours.

Item BOT-BOS-1/18-6: Invited Talks/Lectures


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Unanimously resolved that Scientists, Professors and Eminent Scholars in the field of Botany should be invited for delivering talks for the benefit of M.Sc. students.

The meeting ended with a vote of thanks to the Chair.

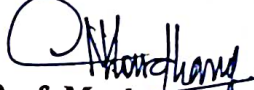

Ms. Nivedita Rana,
(Special Invitee)



Dr. Vivek Sharma,
(Special Invitee)

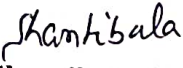

Dr. Shalini Chandel
(Special Invitee)

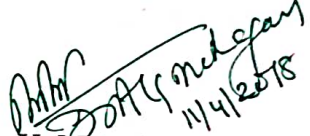

Dr. Pawan Kumar Sharma
(Special Invitee)

Dr. Vikram Singh
(VC's Nominee)


Prof. Mushtaq Ahmed
(VC's Nominee)


Dr. Arvind Bhatt
(Subject Expert)


Prof. G.A. Shantibala Devi
(Subject Expert)


Prof. A.K. Mahajan
Chairman & Convener

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Regulations for the conduct of the Business of Curriculum Development Committee (CDC)

Regulation No. 4

REGULATIONS FOR THE CONDUCT OF THE BUSINESS OF THE CURRICULUM DEVELOPMENT COMMITTEE

(Made under the Provisions of Section 29 of the Act and Statute 38 of 1st Statutes)

1. These regulations may be called, "Regulations for the conduct of the business of the Curriculum Development Committee" and shall come into force from the date of notification.
2. The Head of the Department (HOD)/Centre shall convene and preside over the meeting of Curriculum Development Committee.
3. In case Head of Department/Centre is not present at any meeting the senior-most member present shall act as the Chairman for the meeting in accordance with the clause 6 of University Ordinance 4.
4. The date, time and place for holding the meeting of the Curriculum Development Committee shall be as fixed by the Chairman.
5. A regular meeting of the Curriculum Development Committee shall be held at least two times, in a year as per the requirements of University Ordinance 4.
6. Notice for a meeting of Curriculum Development Committee, other than a special meeting, shall ordinary be issued at least 10 days before the day fixed for the meeting.
7. The quorum for the meetings of the Curriculum Development Committee shall be 50% of the members of the Curriculum Development Committee which shall include at least one outside expert.
8. Special meeting may be called by the chairman at his/her own initiative or on a written request by at least 50% of the members of Curriculum Development Committee.
9. In case of special meeting called at the request of the members, no item other than those notified in the Agenda shall be discussed and that the presence of all members, at whose request the special meeting was called, will be essential.
10. If in the opinion of the Vice-Chancellor, it is not necessary or expedient to convene a meeting of the Curriculum Development Committee to consider any item and if he consider that a matter could be disposed of by circulation among the members of Curriculum Development Committee he may issue necessary instructions to that effect.
11. An item proposed by any member(s) and included in the agenda may be withdrawn by the member with the permission of the chairman.
12. The conduct of business and order of speaking shall be controlled by the Chairman.

- (29)
13. The Chairman at his own instance or at the instance of any member may call or order any member to participate in the discussion.
 14. Ordinarily no business other than that is brought forward in the agenda or supplementary agenda shall be transacted in the meeting. The Chairman may, however, introduce or permit to introduce any other item for discussion provided that such an item could satisfactorily be dealt with in the meeting without any prior notice.
 15. All decisions in the meetings of Curriculum Development Committee shall be taken by consensus. However, if circumstances so warrant, the Chairman may resort to voting for taking a decision by majority of the votes of the members present. It shall be for the Chairman to decide the manner in which the votes are to be cast. The Chairman shall have a vote and a casting vote.
 16. A matter once decided by the Curriculum Development Committee shall not be reopened within next six months except with the consent of the Chairman.
 17. The Head of the Department/Centre, within seven days after the meeting of the Curriculum Development Committee, shall send a copy of the minutes to each member of the Curriculum Development Committee.
 18. The decisions recorded in the proceedings shall be submitted to the Dean of the School concerned for inclusion in the agenda of the School Board for its next meeting.
 19. Formal confirmation of the minutes will be the first item on the agenda of the following meeting of the Curriculum Development Committee.



Central University of Himachal Pradesh

(ESTABLISHED UNDER CENTRAL UNIVERSITIES ACT 2009)

PO Box: 21, Dharamshala, Himachal Pradesh-176215

No. Botany/1-1/CUHP/2017

Date: 16.08.2017

A meeting of Course Curriculum Development Committee was held on 16 August 2017 to propose the courses as per CBCS Guidelines for M.Sc. Botany Programme.

The following members were present in the meeting:-

1. Prof. H.R. Sharma, Dean, School of Social Science
2. Prof. Arvind Bhatt, Deptt. of Biotechnology, Himachal Pradesh University, Shimla
3. Dr. Adarsh Pal Vig, Department of Botanical & Environmental Sciences, Guru Nanak Dev University, Amritsar

The Committee suggested the following structure of the courses to be offered in the department of M.Sc. Botany as per new CBCS.

COURSE STRUCTURE (M.Sc. Botany)

Core Compulsory Courses (40 Credits)

Sr. No.	Course Code	Course Name	Credits	Pre-requisite/ Remarks
1	BOT 501	Plant Cell Biology	4	
2	BOT 502	Biodiversity of Viruses, Bacteria and Fungi	4	
3	BOT 503	Phycology	4	
4	BOT 504	Bryophytes and Pteridophytes	4	
5	BOT 505	Genetics and Cytogenetics	4	
6	BOT 506	Gymnosperms	4	
7	BOT 507	Angiosperms	4	
8	BOT 508	Plant Physiology and Metabolism	4	
9	BOT 509	Plant Ecology and Evolution	4	
10	BOT 510	Anatomy and development of Plants	4	

Adarsh Vig

✓

Core Open Courses (12 CREDITS)

Sr. No.	Course Code	Course Name	Credits	Pre-requisite/ Remarks
1.	BOT 521	Biomathematical and Computer Applications	4	
2.	BOT 522	Applied and Industrial Botany	4	
3.	BOT 523	Bioinstrumentation and analysis	4	

Elective Specialization

(CHOOSE 16 CREDITS FROM ANY ONE GROUP)

Note: A specialization shall only be offered if minimum 10 students have opted for it.

Specialization I: Plant Biotechnology				
S. No.	Course Code	Course Name	Credits	Pre-requisite/ Remarks
1	BOT 551	Plant Cell and Tissue Culture	4	
2	BOT 552	Plant Genetic Engineering	4	
3	BOT 553	Plant Breeding and Intellectual Property Rights	4	
4.	BOT 554	Industrial Biotechnology	4	

Specialization II: Computational Biology				
S. No.	Course Code	Course Name	Credits	Pre-requisite/ Remarks
1	BOT 555	Bioinformatics	4	
2	BOT 556	Statistical Techniques	4	
3	BOT 557	Computer Applications in Plant sciences	4	
4.	BOT 558	Biosystematics	4	

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Specialization III: Applied Ecology and Environment

S. No.	Course Code	Course Name	Credits	Pre-requisite/ Remarks
1	BOT 559	Plant resource utilization and conservation	4	
2	BOT 560	Plant Biodiversity	4	
3	BOT 561	Energy and Environment	4	
4.	BOT 562	Phytoremediation	4	

Specialization IV: Microbiology and Pathology

S. No.	Course Code	Course Name	Credits	Pre-requisite/ Remarks
1.	BOT 563	Plant Microbes interaction	4	
2.	BOT 564	Plant Protection and Quarantine	4	
3.	BOT 565	Applied and industrial Microbiology	4	
4.	BOT 566	Environmental Microbiology	4	

Specialization V: Proteomics and Genomics

S. No.	Course Code	Course Name	Credits	Pre-requisite/ Remarks
1.	BOT 567	Plant Molecular Biology	4	
2.	BOT 568	Proteins structure, function and Biology	4	
3.	BOT 569	Genome structure, function and dynamics	4	
4.	BOT 570	Applied Genetic Engineering	4	

Specialization VI: Field Botany and Herbarium

S. No.	Course Code	Course Name	Credits	Pre-requisite/ Remarks
1.	BOT 571	Plant Taxonomy	4	
2.	BOT 572	Methods in Field Biology	4	
3.	BOT 573	Seed Biology	4	
4.	BOT 574	Field study tour and plant material preservation	4	

Adm. Div.

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Elective Open (04 CREDITS)

S. No.	Course Code	Course Name	Credits	Pre-requisite/Remarks
1	BOT 401	Paleobotany	4	
2	BOT 402	Ethanobotany	4	
3	BOT 403	Phytochemistry	4	
4	BOT 404	Horticulture and Forestry	4	
5	BOT 405	Seminar	4	
6	BOT 406	Project Report/Advance practical /Assignment	4	
7	BOT 407	Ecological Modelling	4	

Courses Offered to Other Departments

S. No.	Course Code	Course Name	Credits	Pre-requisite/Remarks
1	BOT 421	Plants and Society	2	
2	BOT 422	Bioethics and Bio safety	2	
3	BOT 423	Botanical and Ecological Principles	2	
4	BOT 424	Herbal and Medicinal Plants	2	
5	BOT 425	Plant Products in Human Healthcare	2	


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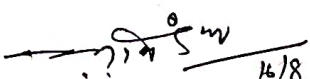
Courses Offered for PhD

S. No.	Course Code	Course Name	Credits	Pre-requisite/ Remarks
1	BOT 601	Research Methodology	6	
2	BOT 602	Applied Instrumentation and Analysis	6	
3	BOT 603	Statistical analysis and computer application in research	6	
4	BOT 604	Issues in Manuscript writing and publication	6	
5.	BOT 605	Bioprospecting of Plant Secondary Metabolites	6	

Note:

1. Field study tour to explore plant diversity of India must be a compulsory part of the course.
2. Practical courses related to theory papers must be added in different semesters of the course accordingly.


 1. Prof. H.R. Sharma,
 Dean, School of Social Science


 2. Prof. Arvind Bhatt,
 Deptt. of Biotechnology, Himachal Pradesh University, Shimla


 3. Dr. Adarsh Pal Vig,
 Department of Botanical & Environmental Sciences, Guru Nanak Dev University,
 Amritsar



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Central University of Himachal Pradesh

4

पाठ्यक्रम निर्माण समिति, "वनस्पति विज्ञान विभाग" की बैठक,
दिनांक 16.08.2017 स्थान : टैब, शाहपुर, समय:पूर्वाह्न 10:00 बजे

उपस्थिति पत्रक

क्र.सं.	नाम	पदनाम	हस्ताक्षर
1.	प्रोफेसर हंसराज शर्मा, अधिष्ठाता समाज विज्ञान स्कूल	अध्यक्ष	
2.	प्रोफेसर अरविन्द भट्ट जैव प्रोद्योगिकी विभाग, हिमचल प्रदेश विश्वविद्यालय शिमला	कुलपति	
3.	डॉ. आदर्श विन्हा वानस्पति और पर्यावरण विज्ञान विभाग, गुरु नानक देव विश्वविद्यालय, अमृतसर, पंजाब	सदस्य	



हिमाचल प्रदेश केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF HIMACHAL PRADSEH
(Established under Central Unverslties Act 2009)

Department of Plant Sciences

School of Life Sciences

COURSE CURRICULUM

The "Curricular Framework" is given in Table-I below for M.Sc Botany, Department of Plant Sciences, School of Life Sciences, prepared based on the Choice Based Credit System (CBCS) adopted by the University in its 13th Academic Council Meeting held on 15th June, 2015 vide ITEM NO: 13.10 (T).

Dr. Anurag
21/6/18

TABLE-I: Curricular Framework" for M.Sc Botany based on Choice Based Credit System (CBCS) (Year 2018)

Syllabus Framework for M.Sc Botany based on Choice Based Credit System (CBCS) (Year 2018)									
Semester	Credits	Core- Compulsory	Credits	Faculty	Credits	Core- Open/Elective open	Credits	Faculty	
I	16	BOT 503 – Phycology	2						
		BOT 504 – Bryophytes and Pteridophytes	2						
		BOT 506 –Gymnosperms — changed to BOT 506A as 2 Introduction to Gymnosperms							
		BOT 410- Mycology and Plant Pathology	4						
		BOT 514 – Cytogenetics and Molecular Biology	2						
		BOT 412 – Practical Course on Bryophytes, Pteridophytes and Gymnosperms	2						
		BOT 413 - Practical Course on Phycology, Mycology, Plant Pathology and Biology	2						
II	12	BOT 416 – Embryology of Angiosperms	2		4	BOT 524 – Biostatistics	2		
		BOT 415 – Plant Physiology and Biochemistry	4			BOT 574 – Basics of Bioinformatics	2		
		BOT 411 – Ecology and Environment	2			BOT 403 -Phytochemistry	2		
		BOT 417 – Practical Course on Embryology of Angiosperms, Ecology	2			BOT 575 – Cell Biology	2		
		BOT 418 – Practical Course on Plant Physiology and Biochemistry	2			BOT 401- Paleobotany	2		
						BOT 572 - Methods in Field Biology and Analytical Techniques	2		
III	4	BOT 419 – Anatomy and Development of Plants	2		4	BOT 565 -Applied and Industrial Microbiology	2		
		BOT 420 – Practical Course on Anatomy of Plants	2			BOT 519 - Plant Biodiversity and Bioresource Utilization	2		
IV	8	BOT 414 – Taxonomy of Angiosperms	2		4	BOT 520 - Bio-resources and Biotechnology	2		
		BOT 514 – Practical Course on Cytogenetics Molecular Biology, Microbiology	2			BOT 578- Genomics, Proteomics and Metabolomics	2		
		BOT 515 – M.Sc dissertation	4			BOT 577 -Economic Botany and Medicinal Plants	2		
						BOT 576- Genetics	2		
						BOT 407 - Ecological Modelling	2		
						BOT 404- Horticulture and Forestry	2		
						BOT 576 –Biosafety, IPR and Patenting	2		
						BOT 402 -Ethanobotany	2		
						BOT 573 - Seed Biology	2		
Semester	Credits	Elective (Specialization)	Credits		Semester	Credits	Elective (Specialization)	Credits	Faculty
III	8	BOT 516 – Genetics and Molecular Biology	4		IV	8	BOT 525 -Plant Biotechnology and Genetic Engineering	4	
		BOT 515 – Microbiology and Plant Pathology	4				BOT 564- Plant Protection and Quarantine	4	
		BOT 518 – Plant Ecology and Evolution	4				BOT 527- Plant Biodiversity and Biosystematics	4	
		BOT 121 - Plant Physiology	4						
Approved by Circulation									
Approved by 2/1/18									

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Annexure - V

**List of Examiners/Experts for the Department of Botany, School of Life Sciences,
Central University of Himachal Pradesh**

- 1. Prof. RK Chahota** - Department of Agricultural Biotechnology, CSK HPKV Palampur, HP 9418369800 rkchahota@yahoo.com
- 2. Dr. Vikas Sharma** - Department of Botany DAV University Jalandhar (Pb). 8699391984 vikasm@gmail.com
- 3. Dr. Rajnish Sharma** - Department of Biotechnology, UHF Nauni, Solan. HP. 9418193900 rajnish.sharma@yahoo.com
- 4. Prof. Anand Sagar** - Professor Department of Biosciences HP University Shimla 09816807646 email: asbio@rediffmail.com
- 5. Prof. Duni Chand**- Department of Biotechnology, HPU Shimla 9418276448 dunichand_2000@yahoo.co.in
- 6. Dr. Sikander Pal** - Assistant Professor, Department of Botany, Jammu University Jammu
- 7. Prof. Anita singh** - Department of Botany, CSKHPKV Palampur, HP 9418485620 anitasinghhhpkv@gmail.com
- 8. Prof. Anand Sagar** - Professor Department of Biosciences HP University Shimla 09816807646 email: asbio@rediffmail.com
- 9. Dr. Vikas Sharma** - Department of Botany DAV University Jalandhar (Pb). 8699391984 vikasm@gmail.com
- 10. Dr. N.S.ATRI** - Professor, Department of Botany, Pujabi University Patiala Email: narinderatri04@gmail.com Mobile: +91- 9417810754
- 11. Dr. Harish Chander** - Assistant Professor, Department of Botany Jammu University Jammu
E-mail: harishchander@jammuuniveristy.in , hcdutt@rediffmail.com



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Temporary Academic Block, Shahpur, Distt. Kangra (HP) - 176206

Website: www.cuhimachal.ac.in

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फाइल संख्या: पादप विज्ञान/1-5/पाठ्य समिति/हि.प्र.के.वि./18/5/4

दिनांक: 01.09.2020

MINUTES OF THE 2ND BOARD OF STUDIES MEETING HELD ON 01ST SEPTEMBER, 2020

The meeting of the 2nd Board of Studies of the Department of Plant Sciences, School of Life Sciences, Central University of Himachal Pradesh, Dharamshala, HP was held through online mode on Cisco Webex (<https://meetingsapac15.webex.com/meetingsapac15/j.php?MTID=maed57fd2b69c09d20752ec5e8808d46e>, Meeting number (access code): 170 315 3709, Meeting password: wZGMSkNE 734(99467563 from video systems)) on 1st September, 2020 at 11:00 AM. During the meeting, the Subject Experts were available on Cisco Webex and all other members were present in the Seminar Hall, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur. Prof. Pardeep Kumar, Head, Department of Plant Sciences and Dean, School of Life Sciences Chaired the meeting.

Following members attended the meeting:

1. Prof. Pardeep Kumar – Head and Convener
Head, Department of Plant Sciences and Dean, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
2. Prof. G.A. Shantibala Devi – Subject Expert
Department of Life Sciences, Manipur University, Manipur.
3. Prof. Arvind Kumar Bhatt – Subject Expert
Department of Biotechnology, Himachal Pradesh University, Summer Hill, Shimla.
4. Dr. Sunil Kumar – Vice Chancellor's Nominee
Associate Professor & Head, Department of Animal Sciences, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
5. Dr. Vikram Singh – Vice Chancellor's Nominee
Assistant Professor, Centre for Computational Biology and Bioinformatics, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
6. Dr. Divya V. Nair – Member
Assistant Professor, Department of Plant Sciences, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
7. Dr. Rishi Thakur – Special Invitee
Assistant Professor, Department of Plant Sciences, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
8. Dr. Munish Sharma – Special Invitee
Assistant Professor, Department of Plant Sciences, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
9. Dr. Ashun Chaudhary – Special Invitee
Assistant Professor, Department of Plant Sciences, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.

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11/09/2020

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11/09/2020

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The Chairman welcomed all the Hon'ble members and briefed about the past activities and also about various agenda items to be discussed in the meeting which were sent in advance to all members through e-mail including out-side experts. Various Agenda Items were placed before the committee and after detailed discussion and deliberations on each, the following decisions were taken :

AGENDA ITEM NO. - PLS-BOS-2/20-1

Proposal for Change the name of Degree from M.Sc. Botany to M.Sc. Plant Sciences (Botany).

Suggestions':

The proposal for change of nomenclature of the Master's Degree from "M.Sc.-Botany" to "M.Sc.-Plant Sciences" was placed before the committee by the Head and Convener as per the recommendation of the Departmental Council of CUHP. However, while agreeing to change the name for betterment, it was suggested that the future possible repercussions of the decision should also be considered so that the students are not affected by this decision in future w.r.t. the job opportunities in the field of Botany. There was suggestion from Prof. Arvind Kumar Bhatt, Subject Expert, that if the name of the M.Sc. Degree is to be changed which seems better, it should have equivalence to M.Sc. Botany as per requirement of Himachal Pradesh Public Service Commission or any other commission in the State or other educational Institutions in the country so that the pass-outs can continue to get benefit of Botany subject like the past practice.

Dr. Vikram Singh, VC's Nominee suggested that the M.Sc. students should be provided with a Certificate mentioning that M.Sc. Plant Sciences will be equivalent to M.Sc. Botany degree of any other UGC recognised University/ Institutes.

Decision:

It was unanimously recommended that the name of Master's Degree should be M.Sc.-Plant Sciences (Botany) alongwith a Certificate that "Degree will be equivalent to M.Sc. Botany".

AGENDA ITEM NO. - PLS-BOS-2/20-2

Approval of the Minutes of the 1st Board of Studies meeting held on 11.04.2018 attached as Annexure I.

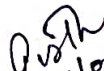
Decision:

The Minutes of the first meeting of the BoS were Approved


Agenda Item No. - PLS-BOS-2/20-3

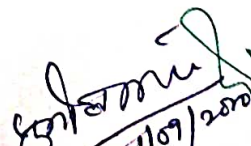
Proposal for restructure of the course curriculum and addition of new courses for the M.Sc. Plant Sciences (Botany) as per detail given below and in the CBCS format (for 2020 Batch onwards) as given in Annexure -II.


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Suggestions':

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The proposal for restructuring of the current course curriculum was placed before the BoS in view of the requirement for imparting better knowledge and practical skills to the students with justification. The members deliberated upon the tabled new structure as recommended by the Departmental Council of Department of Plant Sciences, CUHP and suggested several changes for betterment. It was suggested that in the beginning foundation courses be preferred and thereafter as the students gain basic knowledge, gradually advanced and application-oriented courses be provided. In addition, the course curriculum must contain the components of skill, more hands-on training during practicals and also exposure to advanced fields so that they can help to contribute in various related fields/disciplines in future. Finally, after detailed deliberations, the new course curriculum with addition of few new courses and modification of others and re-shifting of the courses was recommended for Masters Degree of M.Sc. Plant Sciences (Botany) in the CBCS format (for 2020 Batch onwards) as per the detail given below and in Annexure - II.

SEMESTER-I

S. No.	Courses Name	Courses Code	Credits
Core Compulsory Courses (Total Credits = 12)			
1	Fundamentals of Phycology and Mycology	PLS 401	2
2	Bryophytes, Pteridophytes and Gymnosperms	PLS 402	2
3	Principles of Microbiology and Plant Pathology	PLS 403	2
4	Fundamentals of Phycology and Mycology-Lab	PLS 401 (L)	2
5	Bryophytes, Pteridophytes and Gymnosperms - Lab	PLS 402 (L)	2
6	Principles of Microbiology and Plant Pathology -Lab	PLS 403 (L)	2
*Core Open / Elective open Courses (Total Credits =04)			
1	Organic and Natural Farming	PLS 404	2
2	Histology and Micro techniques	PLS 405	2
3	Protected cultivation of High Value Crops	PLS 406	2

Human Making and Skill Development Courses to be offered by the Department of Plant Sciences

Human Making Courses (Total Credits =02)			
1	Commercial Horticultural Crops	PLS 407	2
Skill Development Courses (Total Credits = 02)			
1	Mushroom Production	PLS 408	2

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SEMESTER-II

No.	Courses Name	Courses Code	Credits
Core Compulsory Courses (Total Credits = 12)			
1.	Fundamentals of Plant Physiology and Biochemistry	PLS 451	2
2.	Taxonomy of Angiosperms	PLS 452	4
3.	Plant Biotechnology & Genetic Engineering	PLS 453	2
4.	Fundamentals of Plant Physiology and Biochemistry - LAB	PLS 451 (L)	2
5.	Plant Biotechnology & Genetic Engineering - LAB	PLS 453 (L)	2
*Core Open / Elective open Courses (Total Credits =04)			
1.	Advances in Cell Biology	PLS 454	2
2.	Pharmacognosy and Phytochemistry	PLS 455	2
3.	Basic and Advanced Bioinformatics	PLS 456	2

Human Making and Skill Development Courses to be offered by the Department of Plant Sciences

Human Making Course (Total Credits = 02)			
1.	Plant and Society	PLS 457	2
Skill Development Course (Total Credits = 02)			
1.	Plant Products and Human Health care	PLS 458	2

SEMESTER- III

S. No.	Courses Name	Courses Code	Credits
Core Compulsory Courses (Total Credits = 10)			
1	Advances in Molecular Biology	PLS 501	2
2	Modern Bio-analytical Techniques	PLS 502	2
3	Principles of Ecology and Environment	PLS 503	2
4	Advances in Molecular Biology - LAB	PLS 501 (L)	2
5	Principles of Ecology and Environment - Lab	PLS 503 (L)	2
Core Elective (Specialization) (Total Credits = 08)			
1	Biotic and Abiotic Stress Management in Plants	PLS 504	4
2	Fundamentals of Plant Breeding and Genetics	PLS 505	4
3	Artificial Intelligence and Plant Sciences	PLS 506	4
4	Historical Perspectives of Economic Plants of India	PLS 507	4
Core Open / Elective open Courses (Total Credits = 02)			
1	Community Development	PLS 508	2
2	Seed Technology	PLS 509	2
3	Field Methods for Vegetation Mapping	PLS 510	2

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SEMESTER- IV

S. No.	Courses Name	Courses Code	Credits
Core Compulsory Courses (Total Credits = 08)			
1.	Research Methodology and Biostatistics	PLS 551	4
2.	M.Sc. Dissertation	PLS 599	4
Core Open / Elective open Courses (Total Credits =04)			
1.	Biosafety, IPR and Patenting Issues in Plant Sciences	PLS 552	2
2.	Commercially Important Medicinal & Aromatics Plants	PLS 553	2
3.	Modern Trends in Systematics	PLS 554	2
Core Elective (Specialization) (Total Credits =08)			
1.	Advanced Biochemistry	PLS 555	4
2.	Plant diseases & Protection	PLS 556	4
3.	Genomics & Proteomics	PLS 557	4
4.	Herbal Healthcare & Nutraceuticals	PLS 558	4

The Subject Experts suggested the following major amendments/ rectifications which after discussion were agreed by all members of BoS:

1. Research Methodology be shifted from 1st to 4th Semester and renamed as "Research Methodology and Biostatistics".
2. Industrial Microbiology be replaced with Plant Biotechnology in 2nd Semester
3. Plant Biotechnology & Genetic Engineering, Core Elective from 4th Semester be shifted to 2nd Semester as Core Compulsory Course.
4. Community Development be added as Core Open / Elective open Course replacing "Fundamentals of Enzymology" in 3rd Semester
5. Principles of Ecology and Environment be shifted from 4th to 3rd Semester
6. Artificial Intelligence and Plant Sciences be added in 3rd Semester
7. Biostatistics and Bioinformatics be renamed as Basic and Applied Bioinformatics as Core Open course in 2nd semester
8. Herbal Healthcare and Nutraceuticals was added as one of the Core Open/ Elective Courses in 4th Semester.

Decision:

All members agreed and approved the list of above new courses with above minor modifications and need based reshuffling.

AGENDA ITEM NO. – PLS-BOS-2/20-4

Proposal for framing New Courses for Ph.D. programme in the Department of Plant Sciences in the CBCS format (for 2020 Batch onwards) as given in Annexure III.

Decision:

Approved

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AGENDA ITEM NO. – PLS-BOS-2/20-5

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Proposal of the Faculty Members of the Department of Plant Sciences to become M.Phil./Ph.D. Supervisor/Guide.

Decision:

The members unanimously resolved that since all Faculty members possess requisite qualifications and desired experience to guide research students for M.Phil. and Ph.D. Degrees, hence they are approved as Supervisor(s)/Guide(s) for M.Phil./Ph.D scholars as per UGC guidelines.

1. Prof. Pardeep Kumar, Professor, Department of Plant Sciences, School of Life Sciences.
2. Dr. Divya V. Nair, Assistant Professor, Department of Plant Sciences, School of Life Sciences.
3. Dr. Rishi Thakur, Assistant Professor, Department of Plant Sciences, School of Life Sciences.
4. Dr. Munish Sharma, Assistant Professor, Department of Plant Sciences, School of Life Sciences.
5. Dr. Ashun Chaudhary, Assistant Professor, Department of Plant Sciences, School of Life Sciences.

AGENDA ITEM NO. – PLS-BOS-2/20-6

Proposal of the allotment of Supervisor/Guide for the newly admitted Ph.D. Scholars (2020 batch).

Decision:

All members unanimously resolved to approve the following faculty members as Supervisor(s)/Guide(s) for the newly admitted Ph.D. Scholars (2020 batch).

Sr. No.	University Roll No.	Name	Father Name	Name of the Ph.D. Research Supervisor
1	CUHP20RDPLS01	Kirti	Vishawa Bandhu Raina	Dr. Ashun Chaudhary
2	CUHP20RDPLS02	Leena Thakur	Hira Lal	Prof. Pardeep Kumar
3	CUHP20RDPLS03	Maneesha Jaswal	Onkar Singh	Dr. Rishi Thakur
4	CUHP20RDPLS04	Neha Guleri	Satish Kumar	Prof. Pardeep Kumar
5	CUHP20RDPLS05	Purnima Sharma	Ramesh Kumar Sharma	Prof. Pardeep Kumar
6	CUHP20RDPLS06	Pushpa Guleria	Bhim Singh	Dr. Rishi Thakur
7	CUHP20RDPLS07	Shilpa	Tilak Raj	Dr. Munish Sharma

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Proposal of List of Experts as Examiners for the Practical and Viva Voce Examinations of M.Sc. Plant Sciences (Botany) as given in Annexure IV.

In accordance with the draft ordinance 4(i), Section 23 and Statute 16(2) of the Central Universities Act 2009, section 4(b) i and ii, the Head, Department of Plant Sciences placed before the members of the Board of Studies (BoS) the list of examiners for M.Sc. Practicals and Viva Voce Examination for their approval, as per list attached at Annexure IV.


Decision:

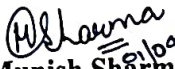
All members agreed and approved the list of examiners as proposed at Annexure IV. It was also suggested that the list will be updated regularly by the faculty members of the Department of Plant Sciences (DoPS) with the consent of the HoD, Plant Sciences and the same be reported in the next meeting of BoS. It was also suggested that preferably the subject/ course experts be invited for specific courses. The BoS also recommended that, if needed, HoD, Plant Sciences may invite a Subject Expert (External Examiner) not included in the list on the recommendations of the concerned faculty member(s) and after approval of competent university authority.

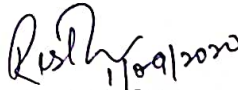
AGENDA ITEM NO. – CBB-BOS-5/18-8


Any item with the permission of the Chair: No item was taken


The meeting ended with a vote of thanks to the chair.

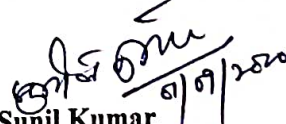

Dr. Ashut Chaudhary,
(Special Invitee)

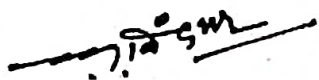

Dr. Munish Sharma,
(Special Invitee)



Dr. Rishi Thakur
(Special Invitee)


Dr. Divya V. Nair
(Member)


Dr. Vikram Singh
(VC's Nominee)


Dr. Sunil Kumar
(VC's Nominee)


Prof. Arvind Kumar Bhatt
(Subject Expert)


Prof. G.A. Shantibala Devi
(Subject Expert)


Prof. Pardeep Kumar
Chairman & Convener



हिमाचल प्रदेश केंद्रीय विश्वविद्यालय
Central University of Himachal Pradesh

(Established under Central Universities Act 2009)

अस्थायी शैक्षणिक खण्ड, शाहपुर, जिला कांगड़ा, हिमाचल प्रदेश - 176206

Temporary Academic Block, Shahpur, Distt. Kangra (HP) - 176206

Website: www.cuhimachal.ac.in

File No.: Botany/1-5/BOS/CUHP/18/39

Dated: 11.04.2018

MINUTES OF THE FIRST BOARD OF STUDIES MEETING HELD ON
11TH APRIL, 2018

The meeting of the First Board of Studies of the Department of Botany, School of Life Sciences was held on 11th April, 2018 in Committee Room of Central University of Himachal Pradesh, Temporary Academic Block, Shahpur. Prof. Ambrish Kumar Mahajan, Head, Department of Botany and Dean, School of Life Sciences welcomed all the Hon'ble members.

Following members attended the meeting:

1. Prof. Ambrish Kumar Mahajan – Head and Convener
Head, Department of Botany and Dean, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
2. Prof. G.A. Shantibala Devi – Subject Expert
Department of Life Sciences, Manipur University, Manipur.
3. Dr. Arvind Bhatt – Subject Expert
Department of Biotechnology at Himachal Pradesh University, Summer Hill, Shimla.
4. Prof. Mushtaq Ahmed – Vice Chancellor's Nominee
Department of Environmental Sciences, School of Earth and Environmental Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
5. Dr. Vikram Singh – Vice Chancellor's Nominee
Centre for Computational Biology and Bioinformatics, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
6. Ms. Nivedita Rana – Special Invitee
Department of Zoology, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Dehra.
7. Dr. Vivek Sharma – Special Invitee
Department of Zoology, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Dehra.

8. Dr. Shalini Chandel – Special Invitee

Department of Botany, School of Life Sciences, Central University of Himachal Pradesh,
Temporary Academic Block, Dehra.

9. Dr. Pawan Kumar Sharm – Special Invitee

Department of Botany, School of Life Sciences, Central University of Himachal Pradesh,
Temporary Academic Block, Dehra.

Following Decision were taken in BOS meeting as per the Agenda.

Item BOT-BOS-1/18-1: Approval of Rules of Business for the Board of Studies.

It was unanimously resolved that the draft rules of Business for the Board of Studies presented before the Board of Studies approval as “Rules of Business for the Board of Studies” which would come into effect from this day i.e. Wednesday the 11th April, 2018. (Annexure- I)

Item BOT-BOS-1/18-2: Approval of Courses for PG and RD Program (As per the Ordinance 4 clause 4 b (i).

The BOS approved the minutes of the CDC, Botany held on 16.08.2017 (**Placed as ANNEXURE-A**) with minor amendment (s) by adding the following three practical courses of 04 credits each, respectively, for 3rd and 4th Semester students of M.Sc. Botany who have already been admitted in the University.

1. Practical Course in Botany – I (Course code BOT-426) = 04 credits (Core-open)
2. Practical Course in Botany – II (Course code BOT-524) = 04 credits (Core-open)
3. M.Sc Dissertation (Course code BOT-599) (Core-compulsory)

The BOS also resolved that the course, namely, Genetics & Cytogenetics (BOT -505) which has been listed as a core-compulsory course in the CDC minutes be shifted and placed as a Core-open course.

The BOS further approved that the course curriculum for M.Sc. Botany, in future shall be as per UGC choice based credit system (CBCS). Accordingly, the BOS recommends for approval to the School Board the course curriculum as placed at **ANNEXURE-II (to be approved through email)**.

Item BOT-BOS-1/18-3: Approval of Supervisors

BOS members recommend taking up this agenda once the Department will have research scholar.

Item BOT-BOS-1/18-4: List of Experts Approved. (Annexure- V)

Head Department of Botany in consultation with the concern faculty members may add any other name to this list depending upon the situation as per need.

Item BOT-BOS-1/18-5: Approval of Student's Industrial Training / Education Tours

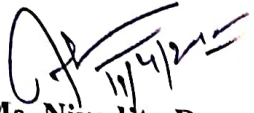
It was unanimously resolved that Students may go for Industrial Training in different Institutes and Educational Tours.

Item BOT-BOS-1/18-6: Invited Talks/Lectures


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Unanimously resolved that Scientists, Professors and Eminent Scholars in the field of Botany should be invited for delivering talks for the benefit of M.Sc. students.

The meeting ended with a vote of thanks to the Chair.

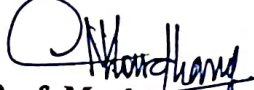

Ms. Nivedita Rana,
(Special Invitee)



Dr. Vivek Sharma,
(Special Invitee)

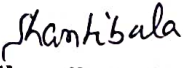

Dr. Shalini Chandel
(Special Invitee)



Dr. Pawan Kumar Sharma
(Special Invitee)

Dr. Vikram Singh
(VC's Nominee)


Prof. Mushtaq Ahmed
(VC's Nominee)


Dr. Arvind Bhatt
(Subject Expert)


Prof. G.A. Shantibala Devi
(Subject Expert)


Prof. A.K. Mahajan
Chairman & Convener

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TABLE-I: Curricular Framework for M.Sc. Plant Sciences (Botany) based on Choice Based Credit System (CBCS) (Batch: 2020-21 onwards)

B.Sc. Plant Sciences (Botany) based on Choice Based Credit System (CBCS) (Batch: 2020-21)							
Semester	Credits	Core - Compulsory	Credits	Credits	Core Open	Credits	
I	12	PLS 401 - Fundamentals of Phycology and Mycology	2	4	PLS 404 - Organic and Natural Farming	2	
		PLS 402 - Bryophytes, Pteridophytes and Gymnosperms	2		PLS 405 - Histology and Micro techniques	2	
		PLS 403 - Principles of Microbiology and Plant Pathology	2		PLS 406 - Protected cultivation of High Value Crops	2	
		PLS 401 (L) - Fundamentals of Phycology and Mycology-Lab	2				
		PLS 402 (L) Bryophytes, Pteridophytes and Gymnosperms - Lab	2				
		PLS 403 (L) - Principles of Microbiology and Plant Pathology -Lab	2				
II	12	PLS 451 - Fundamentals of Plant Physiology and Biochemistry	2	4	PLS 454 - Advances in Cell Biology	2	
		PLS 452 - Taxonomy of Angiosperms	4		PLS 455 - Pharmacognosy and Phytochemistry	2	
		PLS 453 - Plant Biotechnology and Genetic Engineering	2		PLS 456 -Basic and Advanced Bioinformatics	2	
		PLS 451 (L) - Fundamentals of Plant Physiology and Biochemistry-LAB	2				
		PLS 453 (L) - Plant Biotechnology and Genetic Engineering- LAB	2				
Semester	Credits	Core - Compulsory	Credits	Credits	Elective Open	Credits	
III	10	PLS 501 - Advances in Molecular Biology	2	2	PLS 508 - Community Development	2	
		PLS 502 - Modern Bio-analytical Techniques	2		PLS 509- Seed Technology	2	
		PLS 503 - Principles of Ecology & Environment	2		PLS 510 - Field Methods for Vegetation Mapping	2	
		PLS 501 (L) - Advances in Molecular Biology -Lab	2				
		PLS 503 (L) - Principles of Ecology & Environment - LAB	2				
IV	8	PLS 551 - Research Methodology and Biostatistics	4	4	PLS 552 - Biosafety, IPR and Patenting Issues in Plant Sciences	2	
		PLS 599 - M.Sc. Dissertation	4		PLS 553 - Commercially Important Medicinal & Aromatics Plants	2	
					PLS 554 - Modern Trends in Systematics	2	
Semester	Credits	Elective (Specialization)	Credits	Semester	Credits	Elective (Specialization)	Credits
III	8	PLS 504 - Biotic and Abiotic Stress Management in Plants	4	IV	8	PLS 555 - Advanced Biochemistry	4
		PLS 505 - Fundamentals of Plant Breeding and Genetics	4			PLS 556 - Plant diseases & Protection	4
		PLS 506 - Artificial Intelligence and Plant Sciences	4			PLS 557 - Genomics & Proteomics	4
		PLS 507- Historical Perspectives of Economic Plants of India	4			PLS 558 - Herbal Healthcare and Nutraceuticals	4

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Human Making and Skill Development Courses to be offered by the Department of Plant Sciences:-

SEMESTER-I

Human Making Courses (Total Credits =02)			
1	Commercial Horticultural Crops	PLS 407	2
Skill Development Courses (Total Credits = 02)			
1	Mushroom Production	PLS 408	2

SEMESTER-II

Human Making Course (Total Credits = 02)			
1.	Plant and Society	PLS 457	2
Skill Development Course (Total Credits = 02)			
1.	Plant Products in Human Health care	PLS 458	2

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Pre Ph.D. Course in Plant Sciences (Botany)

Scheme of Courses for Pre Ph.D. Course in Plant Sciences (Botany)

Course Code	C/E*	Course Name	Credits
CPE-RPE	C	Research and Publication Ethics	2
PLS-600	C	Advances in Research Methodology	4
PLS-601	E	Abiotic Stress Management in Plants	4
PLS-602	E	Greenhouse Technology for High Value Plants	4
PLS-603	E	Advanced Plant Biochemistry	4
PLS-604	E	Recent Techniques in Plant Sciences	4
PLS 605	E	Advanced Plant Biotechnology	4
PLS 606	E	"Omics" Approaches - Technologies and Applications	4

*Students can select any two elective papers from above scheme.

C- Compulsory

E-Elective

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Detailed List of External Examiners

1. Dr. (Mrs.) Usha Rana, Professor (Plant Physiology), Department of Biology and Environmental Sciences, College of Basic Sciences, CSK HPKV, Palampur, Himachal Pradesh (176062), Mobile: 9418414393, Email: rana.usha@rediffmail.com
2. Dr. Rakesh Kumar Chahota, Professor (Plant Biotechnology), Department of Biotechnology, CSK HPKV, Palampur, Himachal Pradesh (176062), Mobile: 9418369800, Email: rkchahota@gmail.com
3. Dr. Gopal Katna, Associate Professor (Plant Breeding and Genetics), Department of Organic Agriculture and Natural Farming, College of Basic Sciences, CSK HPKV, Palampur, Himachal Pradesh (176062), Mobile: 9418155748, Email: gkatna@gmail.com
4. Dr. Raj Saini, Associate Professor (Microbiology), Department of Social Sciences and Basic Sciences, College of Horticulture and Forestry, NERI, Hamirpur, Himachal Pradesh (177001), Mobile: 9418244246, Email: sainiraj78@yahoo.com
5. Dr. Neelam Bhardwaj, Associate Professor (Plant Breeding and Genetics), Rice and Wheat Research Station, Malan, CSK HPKV, Palampur, Himachal Pradesh (176062), Mobile: 9816743729
6. Dr. Akhilesh K. Tyagi, Professor, Department of Plant Molecular Biology, Delhi University, akhilesh@genomeindia.org
7. Dr. Ashwani Pareek Ph.D., FNASc., FNAAS, Professor of Plant Molecular Biology and Biotechnology, Adjunct Professor at University of Western Australia, Stress Physiology and Molecular Biology Laboratory, School of Life Sciences, Jawaharlal Nehru University, New Delhi 110067, INDIA, ashwanip@mail.jnu.ac.in
8. Dr. Felix Bast, PhD, Associate Professor, Department of Botany, Central University of Punjab, City Campus, Mansa Road, Bathinda, Punjab, 151 001, India, felix.bast@gmail.com
9. Dr. Shyam Kumar Masakapalli, Associate Professor, BioX Center, School of Basic Sciences, Indian Institute of Technology Mandi -175001, Himachal Pradesh, Email: shyam@iitmandi.ac.in
10. Dr. Vinay Kumar Yadav, Assistant Professor, Department of Plant Sciences, School of Basic and Applied Sciences Central University of Punjab (CUP) City Campus, Mansa Road, Bathinda-151001, Email: vinayihbt@gmail.com
11. Dr. Saroj Arora, Professor, Area of Specialization- Plant Biochemistry, Ecology, Economic Botany, Deptt. of Botanical and Environmental Sciences, Guru Nanak Dev University, Amritsar, Punjab-143005, Contact No: 09417285485, Email: dr.sarojarora@gmail.com; sarojarora.gndu@gmail.com
12. Dr. Adarsh Pal Vig, Professor, Area of Specialization- Bioresource technology, Organic Farming, Environmental Biology, Department of Botanical and Env. Sciences, Guru Nanak Dev University, Amritsar, Punjab-143005, Contact No: +919417062796, E.mail: adarshpalvig@yahoo.co.in
13. Dr. Rohit Sharma, Assistant Professor, Area of Specialization-Phtyochemistry and Medicinal & Aromatics Plants, Department of Forest Products, College of Forestry, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan (HP)-173230, rohitchemistiiim@gmail.com, Mob. 959668977
14. Dr. Saurabh Sharma, Deputy Director, Area of Specialization-Medicinal and Aromatics Plants, Regional Cum Facilitation Centre (RCFC) Northern Region-1, RIISM Herbal Garden and Herbarium, Joginder Nagar, Distt. Mandi, Himachal Pradesh, India 100rabh.nmpb@gmail.com, Mob. 9418355621, 9736049621

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15. Dr. Neera Rashmi, Associate Professor, Area of Specialization-Microbiology and Plant Pathology, Government College Narpur, Himachal Pradesh University, neerarashmi@gmail.com, Phone-9418355400
16. Dr. Vivek Dogra, Senior Scientist, Biotechnology Division, CSIR-Institute of Himalayan Bioresource Technology, Palampur, Area of the Specialization-Plant Molecular Biology, Mobile no. 9816349450, vivekdogra@ihbt.res.in
17. Dr. Jai Dev Sharma, Prof (Plant Breeding and Genetics) and Head, Department of Tea Husbandry & Technology, CSK Himachal Pradesh Agriculture University, Palampur -176 062 (H.P), Mobile: 9418054450 / 9816012020, E-mail: jaidevsharma@gmail.com
18. Dr. Sachin Upmanyu, Senior Scientist (Mycology and Plant Pathology)- Rice and Wheat Research Centre- Malan, Distt.- Kangra (HP), [Email-sachinupmanyu_mpp@rediffmail.com](mailto:sachinupmanyu_mpp@rediffmail.com), Mob. No.-70180-58606
19. Dr. Shelly Sehgal, Assistant Professor, Centre for Molecular Biology, Central University of Jammu, Rahya Suchani (Bagla), Dist. Samba-181143, Jammu (JKUT), Phone (M): 09797673255, E-mail: shelleysehgal@gmail.com
20. Dr. Rahul Sharma, Assistant Professor, Department of Biotechnology, Govt. P.G College of Women, Gandhi Nagar, Distt. Jammu (JKUT), Phone (M): 07006293151, E-mail: rahul.aries21@gmail.com
21. Dr. Salej Sood, Senior Scientist (Crop Improvement), Central Potato Research Institute, Shimla, Mob. No.-99176-14660, [Email-salej1plp@gmail.com](mailto:salej1plp@gmail.com)
22. Dr. M.R. Dhiman, Principal Scientist (Floriculture), Indian Agricultural Research institute-Katrain- Kullu (HP)-Mob. No. 94185-06133, Email-mrjarjun01@gmail.com.
23. Dr. Chaman Lal Thakur, Professor, Department of Silviculture and Agroforestry, College of Forestry, Dr. Y.S. Parmar University of Horticulture and Forestry-Nauni-Solan.
24. Dr. Rakesh Banyal, Principal Scientist (Silviculture and Agroforestry), Central Institute of Soil Salinity, Karnal, Haryana, Mob. 9467883865, Email-drbanal08@gmail.com.
25. Dr. Parveen Sharma, Professor (Protected Cultivation) - Department of Vegetable Science and Floriculture, CSKHPKV-Palampur. Mob. No. 9219589366, Email-parveens012@gmail.com
26. Dr. Namita Banyal, Senior Scientist (Floriculture and Landscaping), division of Floriculture, Indian Agricultural Research Institute, New Delhi. Mob. 98914-81136, Email-namitabanyal@gmail.com
27. Dr. Rajesh Uppal, Professor (Agroforestry), Department of Horticulture and Agroforestry, CSKHPKV-Palampur, Mob. 8988230718, Email-uppalr1964@gmail.com
28. Dr. Hitesh Thakur, Assistant Professor (Botany), Government Degree College Palampur, Mob. 98172-99188, Email-hitesh_biotech@hotmail.com
29. Dr. Arun Kumar, Senior Scientist (Biotechnology), CSIR-IHBT-Palampur, Mob. 9418830880, Email-arunkumar@ihbt.res.in
30. Dr. Bhavya Bhargwa, Senior Scientist (Agro technology), CSIR-IHBT-Palampur, Mob. 9418373301, Email-bhavya@ihbt.res.in

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Central University of Himachal Pradesh

Department of Plant Sciences

School of Life Sciences

AGENDA



3rd BOARD OF STUDIES MEETING
TO BE HELD ON 27th SEPTEMBER, 2021 at SHAHPUR CAMPUS

Mode: Online/Offline

Venue: Seminar Hall,

Time: 11:00 AM

Central University of Himachal Pradesh
Temporary Academic Block, Shahpur



हिमाचल प्रदेश केन्द्रीय विश्वविद्यालय
Central University of Himachal Pradesh
(Established under Central Universities Act 2009)

शाहपुर परिसर, जिला कांगड़ा, हिमाचल प्रदेश - 176206
Shahpur Campus, Distt. Kangra (HP) - 176206
Website: www.cuhimachal.ac.in

7/11/21
अध्यक्ष महोदय

27 सितम्बर 2021 को आयोजित होने वाली पादप विज्ञान विभाग की तृतीय बोर्ड ऑफ स्टडीज (BOS) बैठक

बैठक के कार्यवृत्त (MINUTES OF MEETING)

स्थान: ऑनलाइन परिसंचरण

समय: 11:00 Am

27 सितम्बर 2021 को प्रातः 11:00 बजे, शाहपुर परिसर के सेमिनार हॉल में पादप विज्ञान विभाग की 3rd बोर्ड ऑफ स्टडीज (BOS) की बैठक ऑनलाइन परिसंचरण माध्यम से हुई। जिसमें निम्नलिखित सदस्यों ने बैठक में भाग लिया:

1. प्रो. प्रदीप कुमार
(अध्यक्ष/संयोजक)
विभागाध्यक्ष, पादप विज्ञान विभाग
2. प्रो. आदर्श पाल विज,
प्रोफेसर (यूजीसी-एचआरडी),
वानस्पतिक एवं पर्यावणीय विज्ञान विभाग,
गुरु नानक देव विश्वविद्यालय, अमृतसर, पंजाब
3. डॉ. चमन लाल ठाकुर,
वानिकी विभाग,
डॉ. वई.एस.परमार विश्वविद्यालय, नौनी, हि.प्र.
4. डॉ. सुनील कुमार
एसोसिएट प्रोफेसर
जंतु विज्ञान विभाग
5. डॉ. महेश कुल्हारिया,
एसोसिएट प्रोफेसर
संगणकीय जीव विज्ञान एवं जैव सूचना केन्द्र
6. डॉ. मुनीश शर्मा
सहायक प्रोफेसर, पादप विज्ञान विभाग
7. डॉ. अशुन चौधरी
सहायक प्रोफेसर, पादप विज्ञान विभाग
8. डॉ. हिमाद्री
Resource Person, पादप विज्ञान विभाग

@Sharma

Signature

मद PLS-BOS-3/21-1: पादप विज्ञान विभाग की 2nd पाठ्य समिति (BOS) के कार्यवृत्त (Minutes of Meeting) को अनुमोदित किया गया (अनुलग्नक-I)।

मद PLS-BOS-3/21-2: पादप विज्ञान विभाग के M.Sc. Botany में पढ़ाये गए एक की कोर्स कार्ड से दो अलग अलग पाठ्यक्रमों के नामों के कोर्स कोड को प्रतिशोधित करने के प्रस्ताव को अनुमोदित किया गया।

जिसका विवरण इस प्रकार से है

क्र सं	शैक्षणिक सत्र	सेमेस्टर	कोर्स कोड	कोर्स नाम	क्रेडिट
1.	2018	3 rd	BOT 515 A	Microbiology and Plant Pathology	4
	2019	4 th	BOT 515	M.Sc. Dissertation	4
क्र सं	शैक्षणिक सत्र	सेमेस्टर	कोर्स कोड	कोर्स नाम	क्रेडिट
2.	2018	1 st	BOT 514	Cytogenetics and Molecular Biology	2
	2019	4 th	BOT 514 L	Practical Course on Cytogenetics Molecular Biology, Microbiology	2

मद PLS-BOS-3/21-3: पादप विज्ञान विभाग के PG Plant Sciences (Botany) के लिए National Education Policy-2020 (NEP-2020) के आधार पर नए पाठ्यक्रमों को जोड़ने और पाठ्यक्रमों को पुनर्गठन/संशोधित (restructure/Implementation) करने हेतु प्रस्ताव को अनुमोदित किया गया (अनुलग्नक-II)।

मद PLS-BOS-3/21-4: National Education Policy-2020 के आधार पर पादप विज्ञान विभाग के PG Plant Sciences (Botany) में विद्यार्थियों के प्रवेश और प्रस्थान (Entry and Exit) विकल्प अनुमोदन हेतु प्रस्ताव को अनुमोदित किया गया।

जिसका विवरण इस प्रकार से है

S.No.	Entry Semester	Exit Semester	Conditions	Certificate/Diploma/Degree/Advance Diploma/Others
1	1 st	2 nd	Candidate has to successfully complete the all courses offered in 1 st to 2 nd semesters	PG Diploma in Plant Science
2	1 st	4 th	Candidate has to successfully complete the all courses offered in 1 st to 4 th semesters.	M.Sc. in Plant Science (Botany)
3	3 rd	4 th	Candidate has to successfully complete the all courses offered in 1 st to 4 th semesters.	M.Sc. in Plant Science (Botany)

मद PLS-BOS-3/21-5: पादप विज्ञान विभाग के शोध छात्रों के लिए Ph.D Course Work के लिए दो Core-Compulsary कोर्स आरम्भ करने हेतु प्रस्ताव को अनुमोदित किया गया (अनुलग्नक-III)।

@Shaame 

मद PLS-BOS-3/21-6: पादप विज्ञान विभाग के शोध छात्र पुष्पा गुलेरिया और मनीषा देवी के लिए पर्यवेक्षक बदलने हेतु अनुलग्नक प्रस्ताव को अनुमोदित किया गया ।

जिसका विवरण इस प्रकार से है

क्र सं.	शोध छात्र का नाम	क्रमांक सं.	पूर्व पर्यवेक्षक का नाम	नव पर्यवेक्षक का नाम
1.	मनीषा देवी	CUHP20RDPLS03	डॉ. ऋषि ठाकुर	प्रो. प्रदीप कुमार
2.	पुष्पा गुलेरिया	CUHP20RDPLS06	डॉ. ऋषि ठाकुर	प्रो. प्रदीप कुमार

मद PLS-BOS-3/21-7: पादप विज्ञान विभाग के सहायक प्रोफेसर डॉ. अशुन चौधरी के MMDU Mullana (Ambala) के छात्र आशुतोष दीक्षित के सह-पर्यवेक्षक/सह-मार्गदर्शक बनने हेतु प्रस्ताव को अनुमोदित किया गया ।

मद PLS-BOS-3/21-8: पादप विज्ञान विभाग के वर्ष 2020-21 सत्र के लिए प्रवेश हुए शोध छात्रों के लिए अनुसंधान सलाहकार समिति (RAC) अनुमोदन हेतु प्रस्ताव को अनुमोदित किया गया ।

जिसका विवरण इस प्रकार से है

क्र.सं.	नाम	क्रमांक सं.	अनुसंधान सलाहकार समिति (RAC)
1	कीर्ति	CUHP20RDPLS01	Subject Expert (s) Head Nominee(s) -Dr.Ranjit Kumar Supervisor of the concerned students – Dr. Ashun Chaudhary
2	लीना ठाकुर	CUHP20RDPLS02	Subject Expert (s) Head Nominee(s)-Dr. Rakesh Kumar Supervisor of the concerned students – Dr. Pardeep Kumar
3	मनीषा देवी	CUHP20RDPLS03	Subject Expert (s) Head Nominee(s) -Dr. Sunil Kumar Supervisor of the concerned students – Dr. Pardeep Kumar
4	नेहा गुलेरी	CUHP20RDPLS04	Subject Expert (s) Head Nominee(s)- Dr. Divya V. Nair Supervisor of the concerned students – Dr. Pardeep Kumar
5	पूर्णमा शर्मा	CUHP20RDPLS05	Subject Expert (s) Head Nominee(s)-Dr. Munish Sharma Supervisor of the concerned students – Dr. Pardeep Kumar
6	पुष्पा गुलेरिया	CUHP20RDPLS06	Subject Expert (s) Head Nominee(s)-Dr. Mahesh Kulharia Supervisor of the concerned students – Dr. Pardeep Kumar
7	शिल्पा	CUHP20RDPLS07	Subject Expert (s) Head Nominee(s)- Dr. Pardeep Kumar Supervisor of the concerned students – Dr. Munish Sharma

मद PLS-BOS-3/21-9: पादप विज्ञान विभाग के PG के प्रैक्टिकल और प्रोजेक्ट / मौखिक परीक्षाओं के लिए विषय विशेषज्ञों की अद्यतन सूची अनुमोदन हेतु प्रस्ताव को अनुमोदित किया गया (अनुलग्नक-IV) ।

* पाठ्य समिति (BOS) के विषय विशेषज्ञों द्वारा यह सुझाव दिया गया कि विषय विशेषज्ञों की दी गई अद्यतन सूची में से अगर कोई एक विषय विशेषज्ञ अनुपस्थित होता है तो विभागाध्यक्ष द्वारा उसके स्थान पर किसी भी विषय विशेषज्ञ को प्रैक्टिकल और प्रोजेक्ट / मौखिक परीक्षाओं को सुचारु रूप से चलाने के लिए बुलाया जा सके ।

मद PLS-BOS-3/21-10: पादप विज्ञान विभाग के PG छात्रों के लिए एक Certificate Course (SD) अनुमोदित करने हेतु प्रस्ताव को अनुमोदित किया गया (अनुलग्नक-V) ।

मद PLS-BOS-3/21-11: Himalayan Life Science Society द्वारा Journal of Himalayan Life Sciences के अनुमोदन हेतु प्रस्ताव को अनुमोदित किया गया ।

Sharma *Sharma*

मद PLS-BOS-3/21-12: पाठ्य समिति (BOS) के विषय विशेषज्ञों द्वारा यह सुझाव दिया गया कि विश्वविद्यालय द्वारा किसी निजी कम्पनी से MOU करना चाहिए ताकि मौखिक कार्य को संचालित करने में कोई समस्या उत्पन्न ना हो ।

The meeting ended with the thanks to the Chair.

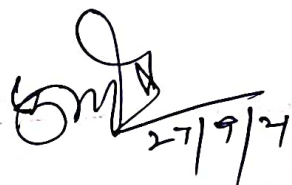
Signatures:

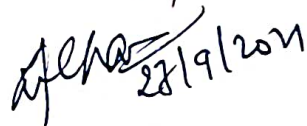
1. प्रो. प्रदीप कुमार
(अध्यक्ष/संयोजक)
विभागाध्यक्ष, पादप विज्ञान विभाग
2. प्रो. आदर्श पाल विज, (विषय विशेषज्ञ)
प्रोफेसर (यूजीसी-एचआरडी),
वानस्पतिक एवं पर्यावणीय विज्ञान विभाग,
गुरु नानक देव विश्वविद्यालय, अमृतसर, पंजाब
3. डॉ. चमन लाल ठाकुर, (विषय विशेषज्ञ),
वानिकी विभाग,
डॉ. वर्ड.एस.परमार विश्वविद्यालय,
नौनी, हि.प्र.
4. डॉ. सुनील कुमार (VC Nominee)
एसोसिएट प्रोफेसर
जंतु विज्ञान विभाग
5. डॉ. महेश कुल्हारिया, (VC Nominee)
एसोसिएट प्रोफेसर
संगणकीय जीव विज्ञान एवं जैव सूचना केन्द्र
6. डॉ. मुनीश शर्मा, (Special Invite)
सहायक प्रोफेसर, पादप विज्ञान विभाग
7. डॉ. अशुन चौधरी, (Special Invite)
सहायक प्रोफेसर, पादप विज्ञान विभाग
8. डॉ. हिमाद्री, (Special Invite)
Resource Person, पादप विज्ञान विभाग

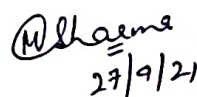

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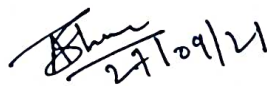
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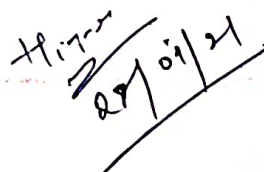
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27/9/21


28/9/2021


27/9/21


27/09/21


27/09/21

The link of the BOS meeting :

meet.google.com/gob-awzi-fgu



हिमाचल प्रदेश केन्द्रीय विश्वविद्यालय

Central University of Himachal Pradesh

(Established under Central Universities Act 2009)

अस्थायी शैक्षणिक खण्ड, शाहपुर, जिला कांगड़ा, हिमाचल प्रदेश - 176206
Temporary Academic Block, Shahpur, Distt. Kangra (HP) - 176206

Website: www.cuhimachal.ac.in

(129)

फाइल संख्या: पादप विज्ञान/1-5/पाठ्य समिति/हि.प्र.के.वि./18/5/4

दिनांक: 01.09.2020

MINUTES OF THE 2ND BOARD OF STUDIES MEETING HELD ON 01ST SEPTEMBER, 2020

The meeting of the 2nd Board of Studies of the Department of Plant Sciences, School of Life Sciences, Central University of Himachal Pradesh, Dharamshala, HP was held through online mode on Cisco Webex (<https://meetingsapac15.webex.com/meetingsapac15/j.php?MTID=maed57fd2b69c09d20752ec5e8808d46e>, Meeting number (access code): 170 315 3709, Meeting password: wZGMSkNE 734(99467563 from video systems)) on 1st September, 2020 at 11:00 AM. During the meeting, the Subject Experts were available on Cisco Webex and all other members were present in the Seminar Hall, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur. Prof. Pardeep Kumar, Head, Department of Plant Sciences and Dean, School of Life Sciences Chaired the meeting.

Following members attended the meeting:

1. Prof. Pardeep Kumar – Head and Convener
Head, Department of Plant Sciences and Dean, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
2. Prof. G.A. Shantibala Devi – Subject Expert
Department of Life Sciences, Manipur University, Manipur.
3. Prof. Arvind Kumar Bhatt – Subject Expert
Department of Biotechnology, Himachal Pradesh University, Summer Hill, Shimla.
4. Dr. Sunil Kumar – Vice Chancellor's Nominee
Associate Professor & Head, Department of Animal Sciences, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
5. Dr. Vikram Singh – Vice Chancellor's Nominee
Assistant Professor, Centre for Computational Biology and Bioinformatics, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
6. Dr. Divya V. Nair – Member
Assistant Professor, Department of Plant Sciences, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
7. Dr. Rishi Thakur – Special Invitee
Assistant Professor, Department of Plant Sciences, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
8. Dr. Munish Sharma – Special Invitee
Assistant Professor, Department of Plant Sciences, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
9. Dr. Ashun Chaudhary – Special Invitee
Assistant Professor, Department of Plant Sciences, School of Life Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.

11/09/2020

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The Chairman welcomed all the Hon'ble members and briefed about the past activities and also about various agenda items to be discussed in the meeting which were sent in advance to all members through e-mail including out-side experts. Various Agenda Items were placed before the committee and after detailed discussion and deliberations on each, the following decisions were taken :

AGENDA ITEM NO. - PLS-BOS-2/20-1

Proposal for Change the name of Degree from M.Sc. Botany to M.Sc. Plant Sciences (Botany).

Suggestions':

The proposal for change of nomenclature of the Master's Degree from "M.Sc.-Botany" to "M.Sc.-Plant Sciences" was placed before the committee by the Head and Convener as per the recommendation of the Departmental Council of CUHP. However, while agreeing to change the name for betterment, it was suggested that the future possible repercussions of the decision should also be considered so that the students are not affected by this decision in future w.r.t. the job opportunities in the field of Botany. There was suggestion from Prof. Arvind Kumar Bhatt, Subject Expert, that if the name of the M.Sc. Degree is to be changed which seems better, it should have equivalence to M.Sc. Botany as per requirement of Himachal Pradesh Public Service Commission or any other commission in the State or other educational Institutions in the country so that the pass-outs can continue to get benefit of Botany subject like the past practice.

Dr. Vikram Singh, VC's Nominee suggested that the M.Sc. students should be provided with a Certificate mentioning that M.Sc. Plant Sciences will be equivalent to M.Sc. Botany degree of any other UGC recognised University/ Institutes.

Decision:

It was unanimously recommended that the name of Master's Degree should be M.Sc.-Plant Sciences (Botany) alongwith a Certificate that "Degree will be equivalent to M.Sc. Botany".

AGENDA ITEM NO. - PLS-BOS-2/20-2

Approval of the Minutes of the 1st Board of Studies meeting held on 11.04.2018 attached as Annexure I.

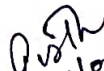
Decision:

The Minutes of the first meeting of the BoS were Approved

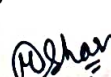
Agenda Item No. - PLS-BOS-2/20-3

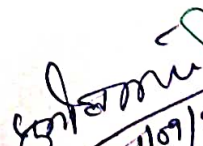
Proposal for restructure of the course curriculum and addition of new courses for the M.Sc. Plant Sciences (Botany) as per detail given below and in the CBCS format (for 2020 Batch onwards) as given in Annexure -II.


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Suggestions':

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The proposal for restructuring of the current course curriculum was placed before the BoS in view of the requirement for imparting better knowledge and practical skills to the students with justification. The members deliberated upon the tabled new structure as recommended by the Departmental Council of Department of Plant Sciences, CUHP and suggested several changes for betterment. It was suggested that in the beginning foundation courses be preferred and thereafter as the students gain basic knowledge, gradually advanced and application-oriented courses be provided. In addition, the course curriculum must contain the components of skill, more hands-on training during practicals and also exposure to advanced fields so that they can help to contribute in various related fields/disciplines in future. Finally, after detailed deliberations, the new course curriculum with addition of few new courses and modification of others and re-shifting of the courses was recommended for Masters Degree of M.Sc. Plant Sciences (Botany) in the CBCS format (for 2020 Batch onwards) as per the detail given below and in Annexure - II.

SEMESTER-I

S. No.	Courses Name	Courses Code	Credits
Core Compulsory Courses (Total Credits = 12)			
1	Fundamentals of Phycology and Mycology	PLS 401	2
2	Bryophytes, Pteridophytes and Gymnosperms	PLS 402	2
3	Principles of Microbiology and Plant Pathology	PLS 403	2
4	Fundamentals of Phycology and Mycology-Lab	PLS 401 (L)	2
5	Bryophytes, Pteridophytes and Gymnosperms - Lab	PLS 402 (L)	2
6	Principles of Microbiology and Plant Pathology -Lab	PLS 403 (L)	2
*Core Open / Elective open Courses (Total Credits =04)			
1	Organic and Natural Farming	PLS 404	2
2	Histology and Micro techniques	PLS 405	2
3	Protected cultivation of High Value Crops	PLS 406	2

Human Making and Skill Development Courses to be offered by the Department of Plant Sciences

Human Making Courses (Total Credits =02)			
1	Commercial Horticultural Crops	PLS 407	2
Skill Development Courses (Total Credits = 02)			
1	Mushroom Production	PLS 408	2

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SEMESTER-II

No.	Courses Name	Courses Code	Credits
Core Compulsory Courses (Total Credits = 12)			
1.	Fundamentals of Plant Physiology and Biochemistry	PLS 451	2
2.	Taxonomy of Angiosperms	PLS 452	4
3.	Plant Biotechnology & Genetic Engineering	PLS 453	2
4.	Fundamentals of Plant Physiology and Biochemistry - LAB	PLS 451 (L)	2
5.	Plant Biotechnology & Genetic Engineering - LAB	PLS 453 (L)	2
*Core Open / Elective open Courses (Total Credits =04)			
1.	Advances in Cell Biology	PLS 454	2
2.	Pharmacognosy and Phytochemistry	PLS 455	2
3.	Basic and Advanced Bioinformatics	PLS 456	2

Human Making and Skill Development Courses to be offered by the Department of Plant Sciences

Human Making Course (Total Credits = 02)			
1.	Plant and Society	PLS 457	2
Skill Development Course (Total Credits = 02)			
1.	Plant Products and Human Health care	PLS 458	2

SEMESTER- III

S. No.	Courses Name	Courses Code	Credits
Core Compulsory Courses (Total Credits = 10)			
1	Advances in Molecular Biology	PLS 501	2
2	Modern Bio-analytical Techniques	PLS 502	2
3	Principles of Ecology and Environment	PLS 503	2
4	Advances in Molecular Biology - LAB	PLS 501 (L)	2
5	Principles of Ecology and Environment - Lab	PLS 503 (L)	2
Core Elective (Specialization) (Total Credits = 08)			
1	Biotic and Abiotic Stress Management in Plants	PLS 504	4
2	Fundamentals of Plant Breeding and Genetics	PLS 505	4
3	Artificial Intelligence and Plant Sciences	PLS 506	4
4	Historical Perspectives of Economic Plants of India	PLS 507	4
Core Open / Elective open Courses (Total Credits = 02)			
1	Community Development	PLS 508	2
2	Seed Technology	PLS 509	2
3	Field Methods for Vegetation Mapping	PLS 510	2

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SEMESTER- IV

S. No.	Courses Name	Courses Code	Credits
Core Compulsory Courses (Total Credits = 08)			
1.	Research Methodology and Biostatistics	PLS 551	4
2.	M.Sc. Dissertation	PLS 599	4
Core Open / Elective open Courses (Total Credits =04)			
1.	Biosafety, IPR and Patenting Issues in Plant Sciences	PLS 552	2
2.	Commercially Important Medicinal & Aromatics Plants	PLS 553	2
3.	Modern Trends in Systematics	PLS 554	2
Core Elective (Specialization) (Total Credits =08)			
1.	Advanced Biochemistry	PLS 555	4
2.	Plant diseases & Protection	PLS 556	4
3.	Genomics & Proteomics	PLS 557	4
4.	Herbal Healthcare & Nutraceuticals	PLS 558	4

The Subject Experts suggested the following major amendments/ rectifications which after discussion were agreed by all members of BoS:

1. Research Methodology be shifted from 1st to 4th Semester and renamed as "Research Methodology and Biostatistics".
2. Industrial Microbiology be replaced with Plant Biotechnology in 2nd Semester
3. Plant Biotechnology & Genetic Engineering, Core Elective from 4th Semester be shifted to 2nd Semester as Core Compulsory Course.
4. Community Development be added as Core Open / Elective open Course replacing "Fundamentals of Enzymology" in 3rd Semester
5. Principles of Ecology and Environment be shifted from 4th to 3rd Semester
6. Artificial Intelligence and Plant Sciences be added in 3rd Semester
7. Biostatistics and Bioinformatics be renamed as Basic and Applied Bioinformatics as Core Open course in 2nd semester
8. Herbal Healthcare and Nutraceuticals was added as one of the Core Open/ Elective Courses in 4th Semester.

Decision:

All members agreed and approved the list of above new courses with above minor modifications and need based reshuffling.

AGENDA ITEM NO. – PLS-BOS-2/20-4

Proposal for framing New Courses for Ph.D. programme in the Department of Plant Sciences in the CBCS format (for 2020 Batch onwards) as given in Annexure III.

Decision:

Approved

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AGENDA ITEM NO. – PLS-BOS-2/20-5

24

Proposal of the Faculty Members of the Department of Plant Sciences to become M.Phil./Ph.D. Supervisor/Guide.

Decision:

The members unanimously resolved that since all Faculty members possess requisite qualifications and desired experience to guide research students for M.Phil. and Ph.D. Degrees, hence they are approved as Supervisor(s)/Guide(s) for M.Phil./Ph.D scholars as per UGC guidelines.

1. Prof. Pardeep Kumar, Professor, Department of Plant Sciences, School of Life Sciences.
2. Dr. Divya V. Nair, Assistant Professor, Department of Plant Sciences, School of Life Sciences.
3. Dr. Rishi Thakur, Assistant Professor, Department of Plant Sciences, School of Life Sciences.
4. Dr. Munish Sharma, Assistant Professor, Department of Plant Sciences, School of Life Sciences.
5. Dr. Ashun Chaudhary, Assistant Professor, Department of Plant Sciences, School of Life Sciences.

AGENDA ITEM NO. – PLS-BOS-2/20-6

Proposal of the allotment of Supervisor/Guide for the newly admitted Ph.D. Scholars (2020 batch).

Decision:

All members unanimously resolved to approve the following faculty members as Supervisor(s)/Guide(s) for the newly admitted Ph.D. Scholars (2020 batch).

Sr. No.	University Roll No.	Name	Father Name	Name of the Ph.D. Research Supervisor
1	CUHP20RDPLS01	Kirti	Vishawa Bandhu Raina	Dr. Ashun Chaudhary
2	CUHP20RDPLS02	Leena Thakur	Hira Lal	Prof. Pardeep Kumar
3	CUHP20RDPLS03	Maneesha Jaswal	Onkar Singh	Dr. Rishi Thakur
4	CUHP20RDPLS04	Neha Guleri	Satish Kumar	Prof. Pardeep Kumar
5	CUHP20RDPLS05	Purnima Sharma	Ramesh Kumar Sharma	Prof. Pardeep Kumar
6	CUHP20RDPLS06	Pushpa Guleria	Bhim Singh	Dr. Rishi Thakur
7	CUHP20RDPLS07	Shilpa	Tilak Raj	Dr. Munish Sharma

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Proposal of List of Experts as Examiners for the Practical and Viva Voce Examinations of M.Sc. Plant Sciences (Botany) as given in Annexure IV.

In accordance with the draft ordinance 4(i), Section 23 and Statute 16(2) of the Central Universities Act 2009, section 4(b) i and ii, the Head, Department of Plant Sciences placed before the members of the Board of Studies (BoS) the list of examiners for M.Sc. Practicals and Viva Voce Examination for their approval, as per list attached at Annexure IV.


Decision:

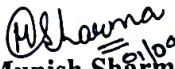
All members agreed and approved the list of examiners as proposed at Annexure IV. It was also suggested that the list will be updated regularly by the faculty members of the Department of Plant Sciences (DoPS) with the consent of the HoD, Plant Sciences and the same be reported in the next meeting of BoS. It was also suggested that preferably the subject/ course experts be invited for specific courses. The BoS also recommended that, if needed, HoD, Plant Sciences may invite a Subject Expert (External Examiner) not included in the list on the recommendations of the concerned faculty member(s) and after approval of competent university authority.

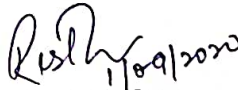
AGENDA ITEM NO. – CBB-BOS-5/18-8


Any item with the permission of the Chair: No item was taken


The meeting ended with a vote of thanks to the chair.

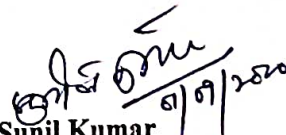

Dr. Ashut Chaudhary,
(Special Invitee)

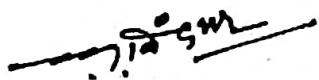

Dr. Munish Sharma,
(Special Invitee)



Dr. Rishi Thakur
(Special Invitee)


Dr. Divya V. Nair
(Member)


Dr. Vikram Singh
(VC's Nominee)


Dr. Sunil Kumar
(VC's Nominee)


Prof. Arvind Kumar Bhatt
(Subject Expert)


Prof. G.A. Shantibala Devi
(Subject Expert)


Prof. Pardeep Kumar
Chairman & Convener


LIST OF COURSES TO BE OFFERED FOR M.SC. PLANT SCIENCES (BOTANY)
(2021 BATCH ONWARDS) NEP-2020

SEMESTER-I

S. No.	Courses Name	Courses Code	Credits
Major Courses (Total Credits = 10)			
1	Fundamentals of Phycology and Mycology	PLS 415	2
2	Bryophytes, Pteridophytes and Gymnosperms	PLS 416	2
3	Fundamentals of Phycology and Mycology - LAB	PLS 415 (L)	2
4	Bryophytes, Pteridophytes and Gymnosperms - LAB	PLS 416 (L)	2
5	Fundamentals of Plant Anatomy and Micro Techniques	PLS 417	2
*Minor Courses (Total Credits =04)			
1	Advances in Cell Biology	PLS 418	2
2	Principles of Organic and Natural farming	PLS 419	2
3	Fundamentals of Enzymology	PLS 420	2
4	Elements of Plant Breeding	PLS 421	2
*Vocational / Skill Courses (Total Credits =04)			
1	Protected cultivation of High Value Crops	PLS 422	2
2	Biosafety, IPR and Patenting Issues in Plant Sciences	PLS 423	2
3	Gardening and Landscaping	PLS 424	2
4	Commercial Horticulture Crops	PLS 425	2
# Indian Knowledge system (Total Credits=02)			
1	# IKS	#	2

Course will be developed by University Level Committee

*Students have to opt two courses (4 credits)


Dr. Sharmila 

SEMESTER-II

S. No.	Courses Name	Courses Code	Credits
Major Courses (Total Credits = 12)			
1.	Plant Physiology and Advanced Biochemistry	PLS 465	2
2.	Microbiology and PhytoPathology	PLS 466	2
3	Advances in Molecular biology	PLS 467	2
4	Plant Physiology and Advanced Biochemistry – LAB	PLS 465 (L)	2
5	Microbiology and PhytoPathology - LAB	PLS 466 (L)	2
6	Advances in Molecular biology - LAB	PLS 467 (L)	2
*Minor Courses (Total Credits =04)			
1	Bio-analytical Techniques in Plant Science	PLS 468	2
2	Plant Systematics	PLS 469	2
3	Principles of Ecology and Environment	PLS 470	2
**Vocational / Skill Courses (Total Credits =02)			
1	Community Development	PLS 471	2
2	Methods for Vegetation Mapping	PLS 472	2
3	Fundamentals of Seed Technology	PLS 473	2
Indian Knowledge system (Total Credits=02)			
1	Historical Perspectives of Economic Plants of India	PLS 474	2

*Students have to opt two courses (4 credits)

**Students have to opt one course (2 credits)

R. Sharma 

SEMESTER-III

S. No.	Courses Name	Courses Code	Credits
Elective Specialization (Total Credits = 04)			
1	Fundamentals of "Omics" Technologies	PLS 515	4
2	Ethnobotany and Ethnopharmacology	PLS 516	4
3	Plant Biotechnology and Genetic Engineering	PLS 517	4
4	Underutilized Economic plants	PLS 518	4
Research Methodology (Total Credits =04)			
1	Fundamentals of Research Methodology	PLS 519	4
(Software based Data Analysis) (Total Credits = 04)			
1	Biostatistics	PLS 520	2
2	Fundamentals of Computer Applications in data analysis	PLS 521	2
(Review of Literature, Research proposal) (Total Credits = 08)			
1	Data mining for Review of Literature	PLS 522	4
2	Research Proposal/Project writing	PLS 523	4

P. Sharma *Sharma*

SEMESTER- IV

S. No.	Courses Name	Courses Code	Credits
Elective Specialization (Total Credits = 04)			
1	Herbal medicines in Human Health Care	PLS 565	4
2	<i>In Vitro</i> Plant Biology	PLS 566	4
3	Plant Stress Biology	PLS 567	4
4	Grafting techniques in Plants	PLS 568	4
(Total Credits = 04)			
1	Academic Writings	PLS 569	2
2	Paper Publications/Seminar, Conferences Presentation at National Level	PLS 570	2
(Software based Data Analysis) (Total Credits = 04)			
1	Application of Artificial intelligence in Plant Science	PLS 571	2
2	Advanced softwares used in Plant Sciences for Data Analysis (GPS, GIS, Image analysis, Biorender, Mendley, Turnitin, Statistical softwares)	PLS 572	2
Dissertation and Viva –Voce (Total Credits = 08)			
1	M.Sc Dissertation (50% Dissertation, 50% Presentation & Viva-Voce)	PLS 595	8

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हिमाचल प्रदेश केन्द्रीय विश्वविद्यालय Central University of Himachal Pradesh

(Established under Central Universities Act 2009)

शाहपुर परिसर , ज़िला काँगड़ा, हिमाचल प्रदेश -176206

Shahpur Campus , Distt. Kangra (HP) - 176206

Website: www.cuhimachal.ac.in



SEMESTER - I

Course Name: Fundamentals of Phycology and Mycology

Course Code: PLS 415

Credits = 02

Learning outcomes:

On the successful completion of the course, student will be able:

- To understand and collect the diversified habitats of algae and fungi.
- To identify different types of algae and fungi
- To undertake project work about most of the aspects covered concerning algal and cyanobacterial taxonomy, ecology and areas of economic importance of these organisms.

UNIT-1

Principles and systems of classification of Algae (Fritsch F. E. 1935), Contributions of Indian Algologists, Comparative account of algal pigments, food reserves, flagellation, chloroplasts and eye spots; their taxonomic importance and molecular phylogeny

UNIT-2

Salient Features of Cyanophyta, Chlorophyta, Xanthophyta, Bacillariophyta; Phaeophyta, Dinophyta, Cryptophyta and Rhodophyta

UNIT-3

Characteristics of fungi and fungal systematic, Recent trends in classification of fungi, contribution of Indian Mycologists

UNIT-4

General features of Phylum Chitridiomycota, Zygomycota, Ascomycota and Basidiomycota

UNIT-5

Algae and human affairs : Ecological role of algae, algae as food and feed, uses in industries etc algal biofertilizers, phycocolloids, algal blooms and phycotoxins, Economic importance of fungi, Role of fungi in industry and food, Fungi as biocontrol agent

Reference Books:

1. Lee, R. E. 2018. Phycology 5th Edition. Cambridge University Press, New Delhi.

2. Vashishta, B. R., Sinha, A.K., and Singh, V.P. 2016. Algae. S. Chand & Company, New Delhi.
3. Sharma, O. P. 2017. Fungi and Allied Microbes. McGraw Hill Education
4. Dube, H. C. 2013. An Introduction to Fungi. 4th Edition. Scientific Publishers, India.
5. Kirk, P., Cannon P.F., Minter D.W. & Stalpers J. A. 2008. Ainsworth & Bisby's Dictionary of Fungi. 10th Edition. CAB International, Oxon UK.
6. Alexopoulou, C. J., Mims, C.W. & Blackwell, M. 2007. Introductory Mycology. 4th Edn. John Wiley & Sons, New York.
7. Ainsworth, G.C., Sparrow, K.E. & Sussman, A.S. 1973. The Fungi. Academic Press, New York.
8. Vashishta, B. R., Sinha, A.K., and Kumar, A. 2020. Fungi. S. Chand & Company, New Delhi.

Course Name: Bryophytes, Pteridophytes and Gymnosperms

Course Code: PLS 416

Credits = 02

Learning outcomes:

On the successful completion of the course, student will be able:

- To develop understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms
- To understand the plant evolution and their transition to land habitat
- To familiarize the fossil members of these groups.

UNIT-1

General characteristics of Bryophytes, Classification system ((Shofield, 1985), Study of Life cycle of following types: *Lunularia*, *Pallavicinia*, *Porella*, , *Polytrichum*, Origin and evolution of Bryophytes, Brief account on Fossil Bryophytes, Economic importance of Bryophytes, Bryophytes as indicators of water and air pollution

UNIT-2

General characteristics and classification of Pteridophytes (Bierhost, 1971), Structure, reproduction and life cycle of the following types: *Ceratopteris*, *Lygodium*, *Trichomanes*, *Azolla*, Telome theory-basis, elementary proves- origin of sporophylls in Lycopsidea, Sphenopsida and Pteropsida- origin of root- merits and demerits of telome theory;

UNIT-3

Evolutionary trends in the gametophytes of Pteridophytes, Conservation of Pteridophytes, Pteridophytes as ecological indicators, Principles of Paleobotany, Fossil pteridophytes: *Rhynia*, *Lepidocarpon*, Economic importance of Pteridophytes

UNIT-4

General characteristics, affinities and distribution of Gymnosperms, Classification of Gymnosperms (Sporne, 1965), Phylogeny of Gymnosperms

UNIT-5

Structure, reproduction and life cycle of the following types: *Zamia*, *Araucaria*, *Cupressus*, *Ephedra*, Fossil Gymnosperms (Brief account), Economic importance of Gymnosperms

Reference Books:

1. Botanical Survey of India. 2016. Liverworts and Hornworts of India – An annotated check list.
2. Vanderpoorten A. & Goffinet B. 2009. Introduction to Bryophytes. Cambridge Publishers.
3. Shaw, J. & Goffinet, B. 2000. Bryophyte Biology, Cambridge University Press.
4. Rashid, A. 1998. An introduction to bryophyte. Vikas Publishing House, New Delhi
5. Sharma, O. P. 2017. Text book of Pteridophyta. McGraw Hill Education.
6. Sundara Rajan, S. 1999. Introduction to Pteridophyta. New Age Publications, New Delhi.
7. Rashid, A. 1999. Pteridophyta. Vikas Publishing House, New Delhi.
8. Sporne, K. R. 1986. Morphology of Pteridophytes. Hutchinson University Library, London.
9. Stewart, W. N. 1983. Paleobotany and Evolution of Plants. Cambridge University Press, London.
10. Bierhost, D.W. 1971. Morphology of vascular plants. Macmillan, London
11. James W.B. 2015 The Gymnosperms Handbook: A practical guide to extant families and genera of the world. Plant Gateway Ltd.
12. Christenhurz M. J. M. Reveal, J. L. Farjon, A. Gardner, M. F & Mill, R. R. M. and Chase M. W. (2011) A new classification and linear sequence of extant gymnosperms. Phytotaxa 19: 55-70. Magnolia Press
13. Vashishta, P.C. 2010. Gymnosperms, S. Chand & Company, New Delhi.
14. Chamberlain, C. J. 2000. Gymnosperms. CBS Publishers, New Delhi.
15. Sporne, K. R. 1986. Morphology of Gymnosperms, Hutchinson University Library, London

Course Name: Fundamentals of Phycology and Mycology-LAB

Course Code: PLS 415(L)

Credits = 02

Practicals

1. Field trips to be conducted for students to get familiarized with the algae and fungi present nearby to university
2. Collections and culture (media preparation, sterilization, inoculation and incubation).
3. Culturing techniques of different fungi
4. A record of algal and fungus types mentioned above – A study of their morphology and structures including vegetative and reproductive stage of lifecycle.
5. Range of thallus and sex organs in major algal groups.
6. Study of anatomical structure wherever relevance
7. Heterocysts and their frequency in some cyanophycean genera.

Course Name: Bryophytes, Pteridophytes and Gymnosperms-LAB

Course Code: PLS 416 (L)

Credits = 02

Practicals

1. Structural details of the vegetative and reproductive parts of the types mentioned in the syllabus.
2. Identification of fossil types mentioned in the syllabus

Course Name: Fundamentals of Plant Anatomy and Microtechniques

Course Code: PLS 417

Credits: 02

Learning outcomes:

After the end of the course, the students will be able:

- To understand the various tissue systems, anatomical features of plant parts and to identify the anomalous growth
- To familiarize with various stains and staining techniques
- To familiarize the techniques for the preparation of different types of glass slides
- To get practical experience in various methods of Microtechnique and histochemistry

UNIT-1

Introduction to Plant tissue systems (Structure and Function), Meristems and meristematic growth, Anatomy of roots, stems and leaves, Nodal Anatomy, Cambium: Structure and Function, Anomalous secondary structure and growth

UNIT-2

Tissue processing steps: Fixation (Chemical and Freezing), Dehydration, Infiltration and embedding, Sectioning and mounting

UNIT-3

Biological stains: Classification and chemistry of biological stains; general and specific; vital stains and flurochromes

UNIT-4

Tissue processing methods: Squash, Smear and Maceration; Microtomy: Rotary, Freezing, Cryostat and Ultratomes, Micrometry-camera lucida, photomicrography

UNIT-5

Histochemistry: Detection and localization of primary metabolites: Carbohydrates (PARS reaction), Proteins (Coomassie brilliant blue staining), Lipids (Sudan Black method); Detection of secondary metabolites: alkaloids, terpenoids, phenolics

Reference Books:

1. Cutler D.F., Ted Botha T. and Stevenson D.W. 2016. Plant Anatomy: An Applied Approach. John Wiley & Sons.
2. Clive K. 2016. Plant Anatomy, Morphology and Physiology. Syrawood Publishing House
3. Yeung E.C.T., Stasolla C., Sumner M. J. & Huang B. Q. 2015. Plant Microtechniques and Protocols. Springer Nature
4. Prasad M. K. & Prasad M. K. 2000. Emkay Publications
5. Arumugam N & Ragland A. Fundamentals of Plant Anatomy and Microtechniques, Saras Publication, India
6. Johanson, W. A. 1984. Plant Microtechnique. McGraw Hill, New York.
7. Johanson, W. A. 1982. Botanical Histochemistry-Principles and Practice. Freeman Co.

Course Name: Advances in Cell Biology

Course Code: PLS 418

Credits = 02

Learning outcomes:

After the end of the course, the student will be able:

- To understand how these cellular components are used to generate and utilize energy in cells.
- To understand the structural organization of cell and intracellular organelles.
- To understand the general principles of cellular communication and roles of different molecules
- To acquire knowledge of replication, transcription and translation

UNIT-1

General structure and constituents of cell, difference between prokaryotic and eukaryotic cell, cell wall, cell membrane, structure and composition of bio membrane, similarities and distinction between plant and animal cell, Cell division and regulation of cell cycle.

UNIT-2

Structure and function of major cell organelles: nucleus, chloroplast, mitochondria, ribosomes, lysosomes, peroxisomes, endoplasmic reticulum, microbodies, Golgi apparatus, vacuole etc.

UNIT-3

Nucleic acids as a genetic material, structure and properties of DNA and RNA, genome organization of eukaryotes and prokaryotes, chromatin structure and function.

UNIT-4

DNA replication in prokaryotes and eukaryotes, transcription and translation in prokaryotes and eukaryotes.

UNIT-5

Post transcriptional and post translational modifications.

Reference Books:

1. Gupta P.K. 2003. Cell and Molecular Biology. 2nd Ed. Rastogi publication.
2. Lodish H. 2003. Molecular Cell Biology. 5th Ed. W.H. Freeman & co.
3. Primrose S.B. 2001. Molecular Biotechnology. Panima
4. Nelson DL & Cox MM. 2007. Lehninger Principles of Biochemistry. 5th Ed. MacMillan.

Course Name: Principles of Organic and Natural farming

Course Code: PLS 419

Credits: 02

Learning outcomes:

By successfully completing the course, the student will be able:

- To gain the theoretical knowledge in Organic Farming Practices
- To Learn a means of self-employment and income generation

UNIT-1

Introduction to Organic Farming: Why Organic Farming? Concept and Principles of organic farming; Historical development of Organic Farming / Agriculture, Advantages and Disadvantages,

UNIT-2

Natural Farming, Integrated and Mixed Farming system, Ecological Farming; Organic Farming Models: Fukuoka (Japan), Permaculture (Australian Organic Farming),

UNIT-3

Role of Bio-fertilizers in Organic Farming: Bioformulations and Bio-Pesticides, Effective Microbial Technology in Organic Farming

UNIT-4

Harvest and Post-harvest Management under Organic Farming: Soil Health and Nutrient Management, Integrated Pest and Disease Management; Weed control

UNIT-5

Quality Assurance and Certification in Organic Farming, Marketing of Organic Farming Products:

Reference Books:

1. Sarath Chandran, Unni M.R and Sabu Thomas. 2018. Organic farming. Woodhead Publishing, UK.
2. Reddy, S.R. 2017. Principles of organic farming. Kalyani publishers, India
3. Ranjan Kumar Biswas. 2014. Organic farming in India. New Delhi Publishers, India.
4. Peter Fossel. 2014. Organic Farming: How to Raise, Certify, and Market Organic Crops and Livestock. Reprint edition, Voyageur Press, USA.
5. Organic farming-Theory and Practice by S.P. Palaniappan and K. Annadurai
6. Organic crop production (Principles and practices Vol-I: Principles and General Aspects) by J. P. Sharma

Course Name: Fundamentals of Enzymology
Course Code: PLS 420
Credits = 02

Learning outcomes:

After the end of the course, the student will be able:

- To describe structure, functions and mechanism of action of enzymes
- To classify enzymes based on the reactions catalyzed.
- To understand the kinetics, inhibition and regulation of enzyme catalyzed reactions.

UNIT-1

Basic concept, Classification and Nomenclature of Enzymes, Chemical nature of enzymes. Protein nature of enzymes and Non protein enzymes - Ribozymes and DNAzymes. Coenzymes and Cofactors, Classification of coenzymes: Isozymes, Abzymes, Synzyme

UNIT-2

Lock and key, Induced fit and Transition state Hypotheses. Mechanism of enzyme catalysis- Acid-base catalysis, covalent catalysis, Metal ion catalysis

UNIT-3

Enzyme inhibition: Reversible Inhibition- Competitive, Non Competitive, Uncompetitive, Mixed, Substrate, Allosteric and Product Inhibition. Irreversible Inhibition

UNIT-4

Factors affecting the enzyme activity- Concentration, pH and temperature. Kinetics of a single-substrate enzyme catalysed reaction, Michealis-Menten Equation, Kinetics of Enzyme Inhibition.

UNIT-5

Feedback and Allosteric Regulation, Organization of enzymes in the cell. Mechanisms of enzyme degradation

Reference Books:

1. Fundamentals of Enzymology : Nicholas Price & Lewis Stevens
2. Enzymes : Biochemistry, Biotechnology and Clinical Chemistry- Trevor Palmer
3. Biochemistry by Donald Voet, Judith G. Voet, Publisher: John Wiley & Sons (2011), Fourth Edition, ISBN-10: 0071737073, ISBN-13: 978-0071737074.
4. Fundamentals of Biochemistry by J. L. Jain, Sunjay Jain, Nithin Jain (2008), Publishers: S. Chand & Co Ltd ISBN: 81-219-2453-7.
5. Lehninger, Principles of Biochemistry by Nelson, D. L., Lehninger, A. L., & Cox, M. M.(2008), 5th Edition, ISBN: 978-0-230-22699-9, Publisher: W. H. Freeman and Company, New York, p: 677-878.

Course Name: Elements of Plant Breeding

Course Code: PLS 421

Credits = 02

Learning outcomes:

After the end of the course, the students will be able:

- To develop conceptual understanding of plant genetic resources, plant breeding, gene bank and gene pool.
- To familiarize with genetic basis of heterosis.
- To understand the different methods of plant breeding for the improvement of crop

UNIT-1

Introduction and objectives of Plant Breeding, History of Plant Breeding (Pre and post-Mendelian era), Important characteristics improved by plant breeding, Self- and cross - pollinated crops including mating systems and response to selection

UNIT-2

Breeding methods in asexually/clonally propagated crops, Line breeding, pedigree, bulk, backcross, single seed descent and multi-line method; Population breeding in self pollinated crops

UNIT-3

Male sterility and self-incompatibility in crop plants and their commercial exploitation, Pure line theory, pure line selection and mass selection methods

UNIT-4

Breeding methods in cross pollinated crops; S1 and S2 progeny testing, progeny selection schemes; Genetical and physiological basis of heterosis and inbreeding, Inbreds production, seed production of hybrid and their parent varieties/inbreds

UNIT-5

Mutation breeding; Breeding for abiotic and biotic stresses. Cultivar development- testing, release and notification, maintenance breeding, Plant breeders' rights and regulations for plant variety protection and farmers rights

Reference Books:

1. Roy D. 2003. Plant Breeding, Analysis and Exploitation of Variation. NarosaPubl.House.
2. Sharma JR. 2001. Principles and Practice of Plant Breeding. Tata McGraw-Hill.
3. Singh P. 2006. Essentials of Plant Breeding. Kalyani.
4. Singh S & Pawar IS. 2006. Genetic Bases and Methods of Plant Breeding. CBS.
5. Das, L.D. Vijendra (2006) Plant Breeding. New Age International Publishers, New Delhi.
6. Singh, B.D. (2012). Plant Breeding: Principles and Methods. Kalyani Publishers. 9th edition.

Course Name: Protected cultivation of High Value Crops

Course Code: PLS 422

Credits = 02

Learning outcomes:

After the end of the course, the student will be able:

- To gain theoretical knowledge on protected cultivation and its implications
- To understand the latest knowledge for growing of high value crops under protected environmental condition.

UNIT-1

Importance and scope of protected cultivation of vegetable crops; principles used in protected cultivation, energy management, low cost structures; training methods; engineering aspects.

UNIT-2

Protected Cultivation – Greenhouse –Polyhouses- Plastic Tunnel – Shadenet House – Walk in Tunnels – Plant Protection Nets – Surface Cover Cultivation – Plastic Mulching – Soil Solarisation, Manipulation of CO₂, light and temperature for vegetable production, fertigation.

UNIT-3

Water Resource Management in protected cultivation – Farm Pond & Reservoir lined with Plastic Films

UNIT-4

Problem of growing vegetables in protected structures and their remedies, insect and disease management in protected structures; soil-less culture, use of protected structures for seed production.

UNIT-5

Crops covered under Greenhouse- Cabbage, Cucumber, Tomato, Capsicum; Crops under shadenet house - Ridge gourd, Bottle gourd, Cucumber, Capsicum, Broccoli, Okra, Chilli Vermi Bed – Organic Farming

BIS Standards - Protected Cultivation; MIDH – Path Forward

Reference Books:

1. Anonymous 2003. Proc. All India Seminar on Potential and Prospects for Protective Cultivation. Organised by Institute of Engineers, Ahmednagar. Dec.12-13, 2003.
2. Chandra S & Som V. 2000. Cultivating Vegetables in Green House. Indian Horticulture 45: 17-18.
3. Prasad S & Kumar U. 2005. Greenhouse Management for Horticultural Crops. 2nd Ed. Agrobios.
4. Tiwari GN. 2003. Green House Technology for Controlled Environment. Narosa Publ. House.

Course Name: Biosafety, IPR and Patenting Issues in Plant Sciences

Course Code: PLS 423

Credits = 02

Learning outcomes:

After the end of the course, the student will be able:

- To understand the various forms of intellectual property rights and its different forms, like Trade secrets, Trademarks, Copyrights, IPR and plant genetic recourses.
- To understand the biohazards, biosafety levels and what are ethics issues in genetic engineering.
- To understand a specialized knowledge and how to file patent, which material is subjected to patent and its infringements.

UNIT-1

Introduction to Biological Safety Cabinets, Primary Containment for Biohazards, Biosafety Levels, Convention on biological diversity, Cartagena Protocol and Nagoya Protocol, Roles of Institutional Biosafety Committee, RCGM, GEAC etc. Definition of GMOs & LMOs, Environmental release of GMOs

UNIT-2

General Introduction to Intellectual Property Rights, Types of IP, Patents, Trademarks, Copyright, Related Rights, Industrial Design, Geographical Indications, Importance of IPR – patentable and non patentables, Patenting of biological materials, patenting life,

UNIT-3

Legal protection of Biotechnological inventions, Indian scenario of patents for higher animal and higher plants, Patenting of transgenic organisms and isolated genes, GURT, GATT, TRIPS, WTO agreement, Special issues in Biotechnology Patents, Patent Litigation.

UNIT-4

Recent Development in Patent System and Patentability of Biotechnology invention, Budapest treaty Development of patent system in India, Basic requirements of patentability, patentable subject matter, novelty and the Public Domain, Non obviousness compulsory licensing

UNIT-5

Patent infringements and revocation, Implications of intellectual property rights on the commercialization of biotechnology products, Indian Patent Act 1970 & recent amendments.

Reference Books:

1. Elements of Biotechnology, Gupta PK, Rastogi Publications, Meerut.
2. Intellectual Property rights in the WTO and Developing countries, Watal J, Oxford Univ Press.
3. Intellectual Property Bulletin, New Delhi
4. Biosafety and Bioethics: Joshi

Course Name: Gardening and Landscaping

Course Code: PLS 424

Credits = 02

Learning outcomes:

After the completion of this course the learner will be able:

- To apply the basic principles and components of gardening
- To design various types of gardens according to the culture and art of bonsai
- To establish and maintain special types of gardens for outdoor and indoor landscaping
- To start Gardening and landscaping activity as an agri- business enterprise by liaising with different stake holders

UNIT-1

Scope and introduction to gardening, Gardening components and features, Special types of Gardens: Home garden, roof garden, sunken garden, vertical garden, terrace garden, water garden, rock garden, bottle garden, window garden, Suitable plants for different types of garden, Advantages and limitations in establishing different types of gardens,

UNIT-2

Detailed description of potted plants such as outdoor, foliage, flowers, creepers, climbers etc, Culture of Bonsai and its maintenance (pruning and wiring), Establishment and maintenance of lawn, Types of lawn, Machineries required for mowing a lawn, Establishment of topiaries and its maintenance

UNIT-3

Importance, features and maintenance of commercial gardening , Components such as statues, garden benches, paths, floral clock etc, Annuals, perennials and flowering trees for commercial / ornamental gardening, Designing of hedges

UNIT-4

Landscape designs (Components and Features), Urban landscaping, Landscaping in various places and its value addition. Landscaping for specific situations, institutions, industries, residents, hospitals, roadsides, traffic islands, dam sites, river banks, IT parks, corporate.

UNIT-5

Bioaesthetic planning, ecotourism, theme parks, indoor gardening, therapeutic gardening, Non-plant components (water scaping, xeriscaping, hardscaping); Computer Aided Designing (CAD) for outdoor and indoor scaping

Reference Books:

1. Berry, F. and Kress, J. (1991). Heliconia: An Identification Guide . Smithsonian Books.
2. Russell, T. (2012). Nature Guide: Trees: The world in your hands (Nature Guides).
3. Sabina, GT and Peter KV. 2008. Ornamental Plants for Gardens. New India Publ. Agency
4. Bose, T. K and Mukherjee, D. 1977. Gardening in India. Oxford & IBH Publishing Co. Pvt. Ltd., Calcutta

5. Bose, T. K. Maiti, R. G. Dhua, R. S and Das, P. 2004. Floriculture and Landscaping. Nayaprakash, Calcutta
6. Nambisan, K. M. P. 1992. Design Elements of Land Scape Gardening Oxford & IBH Publishing Co. Pvt. Ltd., New Delh

Course Name: Commercial Horticulture Crops

Course Code: PLS 425

Credits = 02

Learning outcomes:

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

- To understand the different classifications of horticultural crops, nursery management and use of technology in horticulture.
- To develop their competency on pre and post-harvest technology in horticultural crops
- To evaluate the importance of floriculture and contribution spices and condiments on economy

UNIT-1

National and International scenario in fruit production and floriculture, Recent advances in propagation – root stock influence, planting systems, High density planting, crop modeling, Precision farming, decision support systems - aspects of crop regulation- physical and chemical regulation effects on physiology and development, influence of stress factors, strategies to overcome stress effects, integrated and modern approaches in water and nutrient management. Total quality management (TQM) - Current topics.

UNIT-2

Fruit Crops: Mango, Papaya, Citrus, Guava, Apple, Plums, Peach

UNIT-3

Specific objectives of breeding in flower crops, Methods of breeding suited to seed and vegetatively propagated flower crops, Introduction, selection, polyploidy and mutation breeding in the evolution of new varieties, Exploitation of heterosis, utilization of male sterility incompatibility problems, *In Vitro* breeding.

UNIT-4

Floral oil industry, floral concrete production, extraction methods, recent advances. Flower forcing and year-round flowering through physiological interventions; Chemical regulation; Environmental manipulation; Harvest indices; Harvesting techniques; Post-harvest handling; Precooling, pulsing, packing, marketing; Export potential; Agri Export Zones.

UNIT-5

Crop specific practices – rose, anthurium, orchids, carnation, Jasminum sp., marigold, tuberose, crossandra

Reference Books:

1. Bose TK, Maiti RG, Dhua RS & Das P. 1999. Floriculture and Landscaping. Naya Prokash.
2. Chadha KL & Choudhury B. 1992. Ornamental Horticulture in India. ICAR.
3. George S & Peter KV. 2008. Plants in a Garden. New India Publ. Agency.
4. Lauria A & Victor HR. 2001. Floriculture – Fundamentals and Practices. Agrobios.
5. Randhawa GS & Mukhopadhyay A. 1986. Floriculture in India. Allied Publ.
6. Reddy S, Janakiram B, Balaji T, Kulkarni. S & Misra RL. 2007. Hightech Floriculture. Indian Society of Ornamental Horticulture, New Delhi.

Course Name: Indian Knowledge system #

Course Code:

Credits = 02

Course will be developed by University Level Committee and uniform for all programmes



हिमाचल प्रदेश केन्द्रीय विश्वविद्यालय

Central University of Himachal Pradesh

(Established under Central Universities Act 2009)

शाहपुर परिसर , ज़िला काँगड़ा, हिमाचल प्रदेश -176206
Shahpur Campus , Distt. Kangra (HP) - 176206
Website: www.cuhimachal.ac.in



SEMESTER - II

Course Name: Plant Physiology and Advanced Biochemistry

Course Code: PLS 465

Credits = 02

Learning outcomes:

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

- To learn about the ways plants use light to assimilate atmospheric carbon dioxide to support life on this planet
- To understand the advance function micromolecules and macromolecules.
- To understand the core principles and topics of biochemistry and their experimental basis, and enable students to acquire specialized knowledge in plant signalling, the effect of elicitor, and their response in defense.
- To understand the defense mechanisms of plants and their communication.

UNIT-1

Structure of chloroplast and mitochondria, photorespiration, photo morphogenesis, phytochrome, cryptochrome, photoperiodism and verbalization, Gibberellin and Auxin signal transduction in plants

UNIT-2

Scope and importance of biochemistry, structure of water, pH, buffer, Classification, structure and function of Carbohydrates, lipids, amino acids, proteins, and nucleic acid.

UNIT-3

Second messengers and G-proteins, Physiological roles of cyclic nucleotide gated channels in plants, Role of cyclic nucleotides, Calcium-Calmodulin cascade, Protein kinases and phosphatases, Two component sensor-regulator system in bacteria and plants

UNIT-4

Signaling in bacteria and leguminous plants during nitrogen fixation, Signaling to the actin Cytoskeleton during cell morphogenesis and patterning, Signaling via plant peroxidases, Signaling and cell walls, Signaling in plant gravitropism

UNIT-5

Role of elicitors, Pathogen associated molecular patterns, Nitric oxide and salicylic acid in plant defense, and plant defence activator, Pathogen or Pattern-Triggered Immunity, Role of PR proteins in plants

Reference Books:

1. Nelson DL & Cox MM. 2007. Lehninger Principles of Biochemistry. 5th Ed. MacMillan.
2. Voet D, Voet J G & Pratt CW. 2007. Fundamentals of Biochemistry. John Wiley.
3. Hopkins WG & Huner NPA. 2004. Introduction to plant physiology. John Wiley & sons
4. Pandey SN & Sinha Bk. 1972 plants physiology H.S. Srivastava N. Shankar Plant physiology and Biochemistry.
5. Alberts, B., Bray, D., Lewis, J. Raff, M., Roberts, K. and Watson, J.D. 1989. Molecular Biology of the cell, Garland Publishing Inc., New York.
6. Brown TA. (2008) Gene cloning and DNA analysis (5th Edition), Blackwell Publishing, Oxford, UK.
7. Lodish H, Berk A, Kaiser CA and Krieger M. (2008) Molecular Cell Biology, 6th Edition, W.H. Freeman and Company, New York, USA.

Course Name: Microbiology and PhytoPathology

Course Code: PLS 466

Credits = 02

Learning outcomes:

On the completion of the course, the student will be able:

- To gain knowledge in the area of Microbiology like classification, structure, metabolism, Bacterial culture and microbial diseases.
- To understand the various plant diseases caused by different types of pathogens its disease symptoms and control measures

UNIT-1

Introduction to Microbiology: Different System of Classifications, Methods of Microbial identification, Major groups of microorganisms and their characteristics – prions, viroids, viruses, bacteria, archaeobacteria, actinomycetes, cyanobacteria, viable but nonculturable (VBNC) bacteria, Simple and Differential staining, Gram staining

UNIT-2

Nutritional classes of microorganisms, Types of nutrient media for culturing microbes, Methods of isolation and enumeration of microbial populations, Preservation of microbial cultures, Microbial growth Kinetics: Batch and continuous growth, Factors affecting growth of bacteria, Bacterial Reproduction: Transformation, Transduction and Conjugation, Physical and chemical agents for control of microbial growth, antibiotic susceptibility test

UNIT-3

Basic Concept of pathogenicity and plant disease: Koch's postulates, Plant pathogens and types of plant pathogens, Growth, reproduction, survival and dispersal of plant pathogens, biotic and abiotic causes of plant diseases, Methods for control of plant diseases

UNIT-4

Host-Pathogen Interaction: recognition and infection, Pre-penetration activities of pathogens on host surface, Penetration through intact plant surfaces (Direct and Indirect), post-penetration development, Defence mechanisms in plants, Phytoalexins; Pathogenesis-related (PR) proteins Disease control by physical, chemical and biological methods

UNIT-5

Study of the following plant diseases with reference to symptoms, causal organism, disease cycle and control measures:

- i. Wheat - Rust disease, Smut disease
- ii. Sugarcane - Red rot
- iii. Ladies finger - Yellow vein mosaic
- iv. Potato - Early blight

Reference Books:

1. Pelczar Jr., M.J., Chan, E.C.S. and Krieg, Noel R., Microbiology, McGraw Hill (2003) 5th ed.
2. Stanier, R.Y., Ingraham, J.L. and Wheelis, M.L., General Microbiology, MacMillan (2007) 5th ed.
3. Tortora, G.J., Funke, B.R., and Case, C.L., Microbiology- An Introduction, Pearson Education (2007) 8th ed.
4. Burns, R. (2010). Plant Pathology: Techniques and Protocols. Humana Press Inc., USA.
5. Singh, R. S. (2014). Introduction to principles of plant pathology. Oxford & Ibh Publishing Co Pvt Ltd
6. 1 Singh R.S. 2017. Introduction to Principles of Plant Pathology. 5th Edition. Medtech Publisher.
7. Singh RS. 2002. Introduction to Principles of Plant Pathology. Oxford & IBH, New Delhi.
8. Singh DP & Singh A. 2007. Disease and Insect Resistance in Plants. Oxford & IBH, New Delhi

Course Name: Advances in Molecular biology

Course Code: PLS 467

Credits = 02

Objectives:

- To provide advance level knowledge on molecular biology
- To familiarize molecular level details of central dogma

UNIT-1

Genome Organization: Central Dogma of molecular Biology and reversal of central dogma. Organization of genes as operons in prokaryotes and as multigene family in eukaryotes. Monogenic vs polygenic traits and Quantitative trait loci (QTLs).

UNIT-2

Prokaryotic Transcription: Transcription unit-start site, upstream promoter regions, terminator, RNA polymerases, sigma factors, mechanism of transcription –initiation, elongation and termination Rho- dependant and independent termination; inducible (lactose) and repressible (tryptophan) operons; RNA polymerase interactions; anti-termination by bacteriophage proteins, inhibitors of prokaryotic transcription.

UNIT-3

Eukaryotic Transcription: Transcription, Transcription factors – general features, motifs – zinc fingers, leucine zippers, helix-turn helix, homeodomains, regulatory elements –enhancers, silencers, response elements. RNA Polymerase I,II, III. Inhibitors of eukaryotic transcription.

UNIT-4

Post transcriptional modifications: Introns, exons, mechanism of gene splicing, 5' cap formation, 3' polyadenylation, RNA editing, RNA interference (RNAi), catalytic role of RNA (Ribozyme); Translation: Translation, Post –translational modification of proteins, transport of proteins and molecular chaperons; Protein stability, Protein turnover and degradation inhibitors of translation

UNIT-5

Techniques in Molecular Biology: Polymerase chain reaction (PCR) Procedure and Components. Types of PCR i) inverse PCR ii) Rapid amplification of cDNA ends (RACE) iii) Real-Time quantitative PCR. PCR applications; Blotting techniques Southern, Western, Northern and Dot Blot. Labelling of Nucleic acids; New Trends in Gene modification –CRISPER/CAS System

Suggested Readings:

1. Krebs, J. E., Goldstein, E. S. & Kilpatrick, S. T. 2018. LEWIN'S GENES XII. Jones & Bartlett Learning.
2. Iwasa, J. & Marshall, W. 2017. KARP'S Cell And Molecular Biology John Wiley & Sons, Inc.
3. Lodish, H., Berk, A., Kaiser, C. A. & Krieger, M. 2012 Molecular Cell Biology. 7 th Edition, W. H. Freeman, NY, USA.
4. Benjamin A. Pierce. 2012. Genetics. A Conceptual Approach 4th Edition. W. H. Freeman and Company. 6. Klug, W. S., Cummings, M. R., Spencer, C. A. & Palladino. M. A. 2012. Concepts of genetics. Pearson Education, Inc.
5. Lodish, H., Berk, A., Kaiser, C. A. & Krieger, M. 2012 Molecular Cell Biology. 7th Edition, W. H. Freeman, NY, USA.
6. Hartwell, L. H., Hood, L., Goldberg, M. L., Reynolds, A. E. & Silver, L. M. 2011. The McGraw Hill Companies, Inc.
7. Russell, P. J. 2010. Genetics: A molecular approach. 3rd Edition. Pearson Education, Inc.
8. Alberts, B., Bray, D., Hopkin, K. & Johnson, A. D. 2009. Essential Cell Biology. 3rd Edition, Garland Science, NY, USA. 39
9. Strickberger, M. W. 2008. Genetics 3rd Edition. Pearson Education India.
10. Weaver, R. F. 2008. Molecular Biology. 5th Edition. McGraw-Hill, New York.
11. Brown, T.A. 2006. Genomes. 3 Garland Science.
12. Tamarin, R. 2001. Principles of Genetics 7th Edition. McGraw Hill Education.
13. Goodenough, U. Genetics. 1984. Holt Saunders, New York. 16. Sinnott, E. W. Dunn, L. C. & Dobzhansky, T. 1958. Principles of Genetics. McGraw Hill, New Delhi.

Course Name: Plant Physiology and Advanced Biochemistry-LAB

Course Code: PLS 465 (L)

Credits-02

Practicals:

1. Preparation of standard and buffer solutions.
2. Qualitative test for carbohydrates, proteins, amino acids
3. Separation of biomolecules by TLC and paper chromatography.
4. Estimation of DNA (DPA Method)
5. Estimation of total proteins [Bradford's / Lowry's]
6. Effect of pH on enzyme activity.
7. Estimation of Ascorbic acid [Calorimetric / volumetric]
8. Separation of proteins by SDS-PAGE
9. Estimation of moisture content, separation of plant pigments.
10. Measurement of water potential by different methods.
11. Osmosis, plasmolysis, root pressure, transpiration rate.
12. Opening and closing of stomata, separation of xanthophylls and chlorophylls.

Reference Books:

1. Keith Wilson and John Walker, 2000. Principle and Techniques of practical Biochemistry.
2. S.R Thimmaiah, 2009. Standard Methods of Biochemical Analysis.
3. H.S. Srivastava N. Shankar Plant physiology and Biochemistry

Course Name: Microbiology and PhytoPathology-LAB

Course Code: PLS 466 (L)

Credits-02

Practicals:

1. Preparation of media and sterilization methods
2. Methods of Isolation of bacteria from different sources (soil/water/air)
3. Differential staining – Gram staining of pure culture of Lactobacillus/Rhizobium
4. To perform standard growth curve of purified bacterial strain
5. Isolation of Rhizobium from root nodule of legumes.
6. A record of all diseases mentioned in the syllabus

Course Name: Advances in Molecular biology-LAB

Course Code: PLS 467 (L)

Credits-02

Objectives:

- To bestow practical skill in isolation of DNA
 - To get familiarize the isolation and separation of DNA, RNA and Protein
1. Isolation and purification of genomic DNA
 2. Estimation of DNA using diphenylamine reagent/UV Spectrophotometry

3. PCR amplification study using thermal cycler (Demonstration only)
4. Electrophoresis – Horizontal and Vertical (Demonstration only)
5. Isolation of total RNA (Demonstration only)
6. Isolation and Partial purification of Proteins

References:

1. Lodish, H., Berk, A., Kaiser, C. A. & Krieger, M. 2012 Molecular Cell Biology. 7th Edition, W. H. Freeman, NY, USA.
2. Alberts, B., Bray, D., Hopkin, K. & Johnson, A. D. 2009. Essential Cell Biology. 3rd Edition, Garland Science, NY, USA.
3. Watson, J.D., Baker T.A., Bell S.P., Gann A., Levine M. & Losick R. 2014. Molecular biology of the gene. 7th Edition. Cold Spring Harbor Laboratory, Tania, MIT
4. Cooper, G. M. & Hausman R. E. 2013. The Cell – A Molecular Approach. Sinauer Associates
5. Jones, R. L. 2012. The Molecular Life of Plants. Wiley-Blackwell.
6. Clark, D. P. 2010. Molecular Biology Elsevier Inc. 7. Cold Spring Harbor Laboratory Course manuals

Course Name: Bio-analytical Techniques in Plant Science

Course Code: PLS 468

Credits = 02

Learning outcomes:

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

- To apply the concepts of bioanalytical techniques in plant research
- To operate and optimize the experimental conditions of different analytic
- Techniques
- To implement knowledge for the separation of bioentities

UNIT-1

Centrifugation: Principles of centrifugation, concepts of RCF, different types of instruments and rotors, preparative, differential and density gradient centrifugation, analytical ultra-centrifugation, determination of molecular weights and other applications

UNIT-2

Microscopy: Light microscopy, phase contrast microscopy, fluorescent microscopy, Flow-cytometer, scanning electron microscopy (SEM/FESEM), transmission electron microscopy (TEM)

UNIT-3

Chromatography: Principle, procedure and applications of Paper, Column, Thin layer chromatography and Gas chromatography, Ion exchange chromatography, High Performance Liquid Chromatography (HPLC) and Fast Protein Liquid Chromatography (FPLC)

UNIT-4

Electrophoresis: Principle of gel electrophoresis, polyacrylamide gel electrophoresis (PAGE and SDS-PAGE), agarose gel electrophoresis, pulse field gel electrophoresis (PFGE) and 2-Dimensional gel electrophoresis.

UNIT-5

Spectroscopy: Concepts of spectroscopy, Laws of photometry, Beer-Lamberts law, Visible and UV spectroscopy, Nuclear Magnetic Resonance, atomic absorption and MS spectrophotometry,

Reference Books:

1. Spectrometric identification of Organic Compounds, Robert. M. Silverstein, Basseler, Morrill (John Wiley and Sons. N.Y).
2. Principles of Instrumental Analysis by Douglas A. Skoog, James, J. Leary, 4th Edition.
3. Chromatographic Analysis of Pharmaceuticals, John A. Adamovics, 2nd Edition.
4. Instrumental Methods of Chemical Analysis – B. K. Sharma - 9th Edition.
5. Techniques and Practice of Chromatography – Raymond P. W. Scott, Vol. 70.
6. Instrumental Methods of Chemical Analysis – B. K. Sharma - 9th Edition.

Course Name: Plant Systematics

Course Code: PLS 469

Credits = 02

Objectives:

- To understand the concepts and principles related to plant systematics
- To acquire the skill in plant identification and herbaria preparation
- To create an attitude in conserving plants for sustainable development
- To get the skill in phylogenetic tree construction

UNIT-1

Classification – brief study of Artificial (Linnaeus), Natural (Bentham and Hooker) and Phylogenetic (Bessey and Takhtajan) systems, Detailed study on modern system of classification, Angiosperm Phylogeny Group (APG) SYSTEM – Principles of the APG System - APG I, APG II, APG III and APG IV

UNIT- 2

Classification of taxonomical literature, general indices, floras, icons, monographs, reviews and journals; Molecular Plant identification, Herbarium – definition, steps involved in the development of herbarium, utility of herbarium and their maintenance, general account of National and regional herbaria with special reference to Central National Herbaria

UNIT -3

Phylogenetic systematics; Taxa and characters; Features of cladogram, Cladogram construction, Cladogram analysis, brief description about major angiosperm clades; Evolution of flowering plants; Angiosperm apomorphies, origin of angiosperms; molecular phylogeny, Gene and Species tree. Molecular evolution and Kimura's theory, Phylogenetic Trees, Terminology in Phylogenetic tree. Phylogram, Significance of Molecular Phylogeny.

UNIT-4

Plant Systematics an over view; Modern concepts and trends in plant systematics. Elementary treatment of i. Cytotaxonomy, ii. Chemotaxonomy, iii. Numerical taxonomy (taximetrics), iv. Molecular taxonomy vs. Biosystematics.

UNIT-5

Study of the following angiosperm families giving importance to morphological peculiarities if any (Special emphasis should be given on morphological and phylogenetic interrelationships, recent revisions and rearrangements between and within the families, and its critical analysis if any): i. Ranunculaceae ii. Brassicaceae iii. Malvaceae iv. Asteraceae v. Fabaceae vi. Rosaceae vii. Apiaceae viii. Apocynaceae ix. Solanaceae x. Lamiaceae xi. Liliaceae xii. Poaceae

REFERENCES:

1. Arora PK and Nayar EK. Wild relatives of Crops plants in India, NBPGR Sci. Monograph No. 7.
2. Simpson MG. Plant Systematics, Elsevier publications.
3. Judd WS, Campbell CS, Kellogg EA & Stevens PF (1999), Plant Systematics. Sinauer Associates, Inc., Massachusetts, USA.
4. Kocher LS (1981) Economic Botany in the Tropics, Macmillan.
5. Lawrence GHM (1964), Taxonomy of Vascular Plants, Mac Millan Co., New York.
6. Rendle AB (1967), Classification of flowering plants, Cambridge University Press.
7. Sharma OP (1990) Plant Taxonomy, Oxford Publishers, New Delhi.
8. Singh G (1999), Plant systematics: Theory and Practice, Oxford IBH.
9. Sivarajan, V. V. 1999. Principles of Plant Taxonomy, Oxford and IBH Publishing Co
10. Sivarajan, V. V. 1991. An introduction to Principles of Taxonomy, London
11. Stace, C. 1985. Plant Taxonomy and Biosystematics, London.
12. Hutchinson, J. 1959. Families of Flowering Plants, Cambridge University Press.

Course Name: Principles of Ecology and Environment

Course Code: PLS 470

Credits = 02

Learning outcomes:

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

- To understand characteristics of plants at community, population and ecosystem levels.
- To have sound background of ecosystem structure and function.
- To use various tools and techniques for ecological studies
- To understand the source of the environmental pollution and how to control the pollution in a sustainable way

UNIT-1

Basic concept of Ecology, Environment interaction with ecological factors, Approaches to Ecology, Biological Clocks, Ecological niche, and type of niche, Ecological Equivalents and Character Displacement, Basic Concepts of Population, Population Characteristics and Population Dynamics.

UNIT-2

Methods of study of communities, Individualistic concept and vegetational continuum concept of communities, Interspecific associations and ordination, Community Dynamics, Types of Succession, General process of succession, Hydrosere, Lithosere and Heterotrophic Succession.

UNIT-3

Ecosystem Development, Climax concept and Biome, Structure of Ecosystem, Function of an ecosystem, Ecological Energetic, Nutrients cycles in ecosystem, Basic concept of system ecology, Freshwater Ecology, Marine Ecology, Estuarine ecology, terrestrial ecology and desert ecology

UNIT-4

Forest resources, forest cover, Forest survey of India, Deforestation, Desertification, Afforestation, Energy plantations for ethanol and biodiesel, Conventional and non conventional sources of energy

UNIT-5

Environmental pollution, Kinds, sources, Climate change, Basic concepts of sustainable development, Industrial ecology and recycling industry, role of natural products and biodiversity in international trade.

Reference Books:

1. Ambasht, R. S. and Ambasht, A. K. 2002. A textbook of Plant Ecology. C.B.S. Publishers and Distributors.
2. Kumar, H. D. 2000. Modern Concepts of Ecology. Prentice Hall India, New Delhi.
3. E. P. Odum, 2005, Fundamentals of Ecology, Cengage Publisher, 5 edition
4. P. D. Sharma, 2011, Ecology and Environment, Rastogi Publication
5. Chapman, J.L. and Reiss, M.J. 1988. Ecology – Principles and Applications, Cambridge University Press, U.K.
6. Tiwari, S.C. 1993. Concept of Modern Ecology, Bishan Singh Mahendra Pal Singh, Dehra Dun.
7. Kormondy, E.J. 1996. Concepts of Ecology, Prentice-Hall of Indian Ltd., New Delhi

Course Name: Community Development

Course Code: PLS 471

Credits = 02

Learning outcomes:

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

- To understand characteristics of plants at community, population and ecosystem levels.
- To have sound background of ecosystem structure and function.
- To use various tools and techniques for ecological studies
- To understand the source of the environmental pollution and how to control the pollution in a sustainable way

Under this course, projects will be given to students to study the concepts in plant sciences with practical approach such as

1. Study of agricultural crop pattern around the villages near to University campus
2. Survey of biodiversity of villages

3. Agricultural weeds
4. Survey and documentation of medicinal Ayurveda practitioners in the surrounding areas to discuss the traditional medicines being used since ages
5. Community Based Natural Resource Management
6. Field trips: Field visit to gardens, standing crop sites, nurseries, vegetable gardens and horticultural fields at agricultural institutes / universities or other suitable locations to aware the students about the natural vegetation, Preparation of Field Notes
7. Plant sample collection, Preparation of Herbarium sheets and preservation. Purpose and importance of herbaria.
8. Attempt be made to grow the ethnobotanical plants
9. Workshops : Creative Writing and Entrepreneurship in plant science (Botany) (Soft skill)

Course Name: Methods for Vegetation Mapping

Course Code: PLS 472

Credits = 02

Learning outcomes:

After completing this course, the student will be able:

- To evaluate vegetation dynamics, variations, mapping and distribution of vegetation.
- To analyse data reviews, sampling approach and management using modern tools

UNIT-1

Nature of Vegetation, Community vs. Continuum, Vegetation Structure and Parameters (occurrence of species, Frequency, Cover), Different methods for field sampling - Quadrat, linetransect and random spot method

UNIT-2

Vegetation Dynamics (Seasonal Variations and Succession) and its spatial distribution, various approaches for sampling (Stratified Random Sampling, Ecological gradients, Sampling scale issue and Gradient Oriented Transect (Gradsect) Sampling)

UNIT-3

Relationships between Classification and Mapping, Characteristics of a Successful Sampling Approach (Flexibility, Replicability, Cost Effectiveness)

UNIT-4

Overview of Planning Process and Field Methods: Preliminary Collection and Review of Existing Information, Initial Site Visit and Information Gathering, Review of data

UNIT-5

Sampling Approach, Collection of Field Data, GIS and GPS, Remote Sensing, Management and Analysis and Photo interpretation

Reference Books:

1. Causton, D.R.(1988). An Introduction to Vegetational Analysis: Principles, Practice and Interpretation. Unwin Hyman, Boston.
2. Pearcy, R.W., Mooney, H.A., Rundel, P.W. (2011). Plant Physiological Ecology: Field methods and instrumentation. Springer.
3. Ferretti, M., Fischer, R. (2013). Forest Monitoring: Methods for Territorial investigations in Europe with an overview of North America and Asia. Elsevier.
4. Brocklehurst, P., Lewis, D., Napier, D., Lynch, D. (2007) Northern Territory Guidelines and Field Methodology for Vegetation Survey and Mapping. Technical Report No. 02/2007D. Department of Natural Resources, Environment and the Arts, Palmerston, Northern Territory.
5. William G. Cochran (2012) Sampling Techniques, 3ed, Wiley

Course Name: Fundamentals of Seed Technology

Course Code: PLS 473

Credits = 02

Learning outcomes:

After completion of the course, the students will be able:

- To understand the seed development process and different ways of its processing
- To examine the various methods of Seed testing
- To explain the concept of hybrid seed production

UNIT-1

Overview of seed Technology: types of seeds and their characteristics, Development of seed and morphology, Difference between monocot and dicot seed, Seed Dormancy, methods of breaking dormancy

UNIT-2

Seed germination: pattern and basic requirement for germination, normal and abnormal seedlings, germination inhibitors, Evaluation of seed related traits

UNIT-3

Seed processing: Methods of seed conditioning, Methods used for seed treatment, Principles of seed storage: various methods for seed storage, factors affecting seed storage, Seed viability, Methods of testing of seed viability

UNIT-4

Overview of seed certification, Function of seed certification agency, Seed Legislation and Act in India, Basic concept of seed pathology and seed entomology.

UNIT-5

Principles and methods of seed production, Importance of seed marketing, Concept of hybrid seed and its production

Reference Books:

1. Agrawal, P. K., (2010). Principles of Seed Technology. Indian Council of Agricultural Research, New Delhi.
2. Agrawal, R.L. (2015). Seed Technology. Oxford & Ibh Publishing Co Pvt Ltd.
3. Basra, A. (2006). Handbook of Seed Science and Technology. CRC Press.
4. Khare, D. and Bhale, M. S. (2014). Seed Technology 2nd Revision, Jain Book

Course Name: Historical Perspectives of Economic Plants of India

Course Code: PLS 474

Credits = 02

Learning outcomes:

At the end of the course, Student will be able:

- To identify the concept of Traditional knowledge and its importance.
- To explain the need and importance of protecting traditional knowledge.
- To explain the importance of Traditional knowledge in Agriculture and Medicine

UNIT-1

Traditional knowledge (TK) vs western knowledge, Legal concepts for the protection of traditional knowledge, Traditional medicine system, Traditional knowledge in agriculture.

UNIT-2

The Pre-Vedic Period (10000 B.C. – 1500 B.C.), Vedic Period (1500 B.C. – 500 B.C.) and Post-Vedic Period (500 B.C. – A.D. 600): The Brief description of use of Medicinal plants, Functional foods in Vedas viz. Rigveda, Yajurveda, Atharveda and ancient Ayurvedic treatises like Charaka Samhita, Sushruta Samhita.

UNIT-3

The Early Mediaeval Period (A.D. 600 - A.D. 1400): Brief description of plants, foods in various ancient Ayurvedic treatises like, Ashtanga Hridya, Chakradatta, Sharangdhara Samhita, Bhel Samhita, Harita Samhita, Vangasena.

UNIT-4

The Late Mediaeval Period (A.D. 1400 – A.D. 1800): Brief description of use of Medicinal plants, Functional foods in various ancient Ayurvedic treatises like Bhava Prakasha, Bhaishajya Ratnavali, and Arka Prakasha.

UNIT-5

Yoga and Holistic Health care

Reference Books:

1. Traditional Knowledge System and Technology in India (English, Hardcover, Basanta Kumar Mohanta, Vipin Kumar Singh) Edition : 2012 Language English
2. Panpaatu Maanudaviyal: Author: Bakthavachala Barathi, Meyappan Pathippagam, Chidambaram- Edition 2009; Language: Tamil

3. Traditional Knowledge System in India, by Amit Jha, 2009.
4. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
5. Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino.
6. V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014



हिमाचल प्रदेश केन्द्रीय विश्वविद्यालय

Central University of Himachal Pradesh

(Established under Central Universities Act 2009)

शाहपुर परिसर , ज़िला काँगड़ा, हिमाचल प्रदेश -176206
Shahpur Campus , Distt. Kangra (HP) - 176206
Website: www.cuhimachal.ac.in



SEMESTER - III

Course Name: Fundamentals of “Omics” Technologies

Course Code: PLS 515

Credits = 04

Objectives:

- To provide the basic knowledge on Bioinformatics and its applications
- To familiarize the students on protein and nucleic acid data bases
- To introduce the advance aspects of genomics, proteomics and metabolomics and its applications

UNIT-1

Introduction to Bioinformatics: Definition and History of Bioinformatics; Biological databases Types of data and databases, Nucleotide sequence database (EMBL, GENBANK, DDBJ) - Protein sequence database (PIR, SWISS-PROT, TrEMBL), Secondary Databases (PROSITE, PRINTS, BLOCKS), Protein Structure Database (PDB).

UNIT-2

Tools (Softwares) used in Bioinformatics - BLAST (including ALGORITHM of BLAST), Sequin, ClustalX, Clustal W, RasMol, Treeview, Phylip, GRAIL, GENSCAN, BIOPERL.

UNIT-3

Genomics: Genome, Molecular markers: RFLP, RAPD, SSR, SNPs, Sangers DNA Sequence, Brief note on Next Generation Sequencing (NGS), 16s r DNA sequencing, Whole genome sequencing (WGS); Applications of genomics Transcriptomics: Microarrays, RNA Sequencing (RNA-Seq), Applications of transcriptomics

UNIT-4

Proteomics: Gel based and gel free proteomics; SDS PAGE, 2D PAGE, Mass spectrometry, protein identification by peptide mass finger printing; Applications of proteomics

UNIT-5

Metabolomics; Metabolome tools: Gas and Liquid chromatography, Applications of metabolomics

References Books:

1. Rocha, M. & Ferreira, P.G. 2018. Bioinformatics Algorithms: 1st Edition. Academic Press.

2. Momand, J. & McCurdy, M. 2017. Concepts in Bioinformatics and Genomics. Oxford University Press.
3. Jeremy, R. 2015. Bioinformatics: An Introduction. Springer Publishing Co.
4. Choudhuri, S. 2014. Bioinformatics for Beginners. 1st Edition. Academic Press.
5. Kumar, S. A, Mohan T. C. K., Murugan, K. & Subramaniyan, S. 2011. General Informatics and Bioinformatics. Ane Books India Pvt Ltd.
6. Xiong, J. 2007. Essential Bioinformatics, Cambridge University Press India, Pvt Ltd.
7. Higgs, P. G. 2005. Bioinformatics and Molecular Evolution, Ane Books India Pvt Ltd.
8. Vyas, S.P. & Kohli, D.V. 2007. Methods in Biotechnology and Bioengineering. CBS Publishers and Distributors.
9. Evens, W.J. & Grant, G.R. 2005. Statistical Methods in Bioinformatics: An Introduction. Springer.
10. Claverie, J.M. & Notredame C. 2003 Bioinformatics for Dummies. Wiley Editor.
11. Mount, D.W. 2001. Bioinformatics – Sequence and Genome Analysis, 1st Edn, Cold Spring Harbor Laboratory Press, New York, USA.
12. Pierre Baldi & Soren Brunak. 2001. Bioinformatics: The Machine Learning Approach. 2nd Edition. The MIT Press
13. Lesk, A.M. 2002. Introduction to Bioinformatics, 1st Edn. Oxford University Press, Oxford, UK.
14. Patterson, B.K. 2000. Techniques in Quantification and Localization of Gene Expression.
15. Liu, B.H. 1998. Statistical Genomics: Linkage Mapping and QTL Analysis. CRC Press.
16. Discovering Genomics, Proteomics, and Bioinformatics, 2nd edition –A Malcom Campbell and Laurie J. Heyer (ISBN 0-8053-4722-4) Cold Spring Harbour Laboratory press and Benjamin Cummings. 28 Feb 2006.

Course Name: Ethnobotany and Ethnopharmacology

Course Code: PLS 516

Credits = 04

Learning outcomes:

At the end of the course, Student will be able:

- To know about the morphology and cultivation of plants used in daily life as food, fibers, spices etc.
- To gain the knowledge about aesthetic and medicinal and industrial values of plants
- To use different medicinal plants for a particular disease
- To understand the active mechanism of medicinal and aromatic plants.
- To learn about the uses of medicinal plants and other non-wood forest products.

UNIT-1

Ethnobotany in brief: History and objectives, Indigenous Systems of Medicines: Basic concept and development of Ayurveda, Siddha, Unani, Yoga, Homeopathy and Naturopathy

UNIT-2

Different ethnic groups and their role in conservation of medicinally important plant genetic resources, role of indigenous people for plant based drug identification, Regulatory/Legal perspective related with Ethnobotany and traditional Knowledge

UNIT-3

Definition, scope and applications in herbal medicine. Classification and identification of drugs: Need for classification of drugs; classical (taxonomic, morphological, organoleptic, therapeutic); microscopy and modern (biogenetic)

UNIT-4

Types, methods of evaluation, biological, anatomical, physical, phytochemical investigation. status of Indian medicinal plant trade, WHO regulation of herbal medicine, CHMP/ CVMP guidelines of the European Medicines Agency Inspections

UNIT-5

Principles of extraction methods, types of extraction. Extraction of Plant drugs by Microwave assisted techniques and their merits and demerits. Selection of Solvents for extraction.

References Books:

1. Dey. P.M. and J.B.Horborne: Plant Bio Chemistry Academic Press, London.
2. Sadasivam. S. and A. Manickam: Bio Chemical methods 2nd edition. New Age International Pvt. Ltd. New delhi.
3. Dennis D.T., Turpin, D.H. Lefebvre, Layzell D.D and D.B. (eds) 1997. Plant Metabolism (Second Edition) Longman, Essex, England.
4. Verma S.K. and Verma Mohit 2007. A.T. B of Plant Physiology, Biochemistry and Biotechnology, S.Chand Publications
5. Leninger A.C 1987. Principles of Biochemistry, CBS Publishers and Distributors (Indian Reprint).

Course Name: Plant Biotechnology and Genetic Engineering

Course Code: PLS 517

Credits = 04

Learning outcomes:

On the successful completion of the course, student will be able:

- To understand the different types of plant tissue culture
- To perform genetic manipulations using types of enzymes and vectors
- To examine gene cloning and evaluate different methods of gene transfer
- To analyze the major concerns and applications of transgenic technology

UNIT-1

Micropropagation: Principles and techniques of tissue culture, Principles and practices of clonal selection, Preparation of stock solution and tissue media for micropropagation, Stages of Micropropagation, Types of Micropropagation Techniques (Meristem culture, Pollen culture, Ovary culture, Callus culture), Artificial Seed production, Application of Micropropagation approach and its exploitation for commercial purpose

UNIT-2

Introduction to genetic engineering, Enzymes used in genetic engineering: Restriction enzymes, Ligases, Polymerases, Kinases and Phosphatases, DNA methylases and Topoisomerases, Homopolymer tailing, Linkers, Adaptors

UNIT-3

Isolation and purification of nucleic acids, DNA sequencing; Maxam Gilbert's and Sanger dideoxy chain termination and automated methods of DNA sequencing, Construction of genomic and c-DNA libraries, chromosome walking; Screening of libraries

UNIT-4

Vectors, General characteristics of cloning and expression vectors: Plasmids, bacteriophages, phagemids, cosmids; Artificial chromosomes as vectors: YAC, BAC and their applications

UNIT-5

Transformation methods: Chemical methods: calcium phosphate precipitation method, liposome mediated method

Physical methods: Particle bombardment, Electroporation and Microinjection, Agrobacterium mediated gene transfer in plants, Screening and selection of transformants, Generation and maintenance of transgenic plants, molecular farming, Genetically modified (GM) plants (Bt cotton, Bt Brinjal)

References Books:

1. Maheshwari, P. and Rangaswamy, N.S. (Eds.) 1963. Plant, Tissue and organ culture – A symposium, Intern. Soc. Plant Morphologists, New Delhi.
2. Plant Biotechnology and Genetics: Principles, Techniques and Applications by C.Neal Stewart (Wiley Publisher, 2008)
3. Plant Biotechnology and Genetic Engineering by N. Arumugam and V. Kumaresan, 1st Edition, Saras Publication
4. Plant Genetic Engineering by A.D. Arencibia, 1st Edition Volume 5, Elsevier Science, 2000
5. Brown, T. (2010). Gene cloning and DNA analysis: an introduction. John Wiley & Sons.
6. Primrose, S. B., & Twyman, R. (2009). Principles of gene manipulation and genomics. Wiley. com.
7. Howe, C. J. (2007). Gene cloning and manipulation. Cambridge University Press.

Course Name: Underutilized Economic plants

Course Code: PLS 518

Credits = 04

Learning outcomes:

At the end of the course, Student will be able:

- To understand the role and value of underutilized plants that has potential for diversification of food basket to ensure better food and nutritional security.
- To explore the plants and plant products encountered in everyday life
- To appreciate the diversity of plants and the plant products in human use

Course Content:

Introduction, origin and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate & seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post-harvest management, plant protection measures and seed production.

UNIT-1

Amaranth, Asparagus and Artichoke and Bamboo

UNIT-2

Leek Brussels' sprouts Chinese cabbage, broccoli, kale and Kachnar

UNIT-3

Celery, parsley, parsnip, lettuce, rhubarb, spinach, basella, bathu (chenopods), chekurmanis and Lasoda, Discoria sp.

UNIT-4

Elephant foot yam, lima bean, winged bean, vegetable pigeon pea, jack bean and sword bean

UNIT-5

Sweet gourd, Spine gourd, pointed gourd, oriental pickling melon and little gourd (kundru), colocasia

Reference Books:

1. Bhat KL 2001, Minor vegetables-untapped potential
2. Indira P & Peter KV.1984.Unexploited tropical vegetables
3. Peter KV (Ed) 2007-08.Underexploited and underutilized horticultural crops Vol.I-IV
4. Rubatzky VE Yamaguchi M (Eds).1997.World vegetables: Principles, Production and nutritive values.
5. Srivastava U,Mahajan RK,Gangopadhyay KK,Singh M & dhillon BS (2001).Minimal descriptors of agri-horticultural crops.Part-II: Vegetable Crops. NBPGR

Course Name: Fundamentals of Research Methodology

Course Code: PLS 519

Credits = 04

Learning outcomes:

At the end of the course, Student will be able:

- To understand the concept of research and different types of research in the context of biology
- To develop laboratory experiment related skills.
- To Develop competence on data collection and process of scientific documentation
- To Analyze the ethical aspects of research
- To Evaluate the different methods of scientific writing and reporting

UNIT-1: Science and Research

Scientific Research: Definition and Characteristics, Different types, Identification of the problem, assessing the status of the problem, formulating the objectives, preparing design (experimental or otherwise), Actual investigation.

UNIT-2: Introduction to Research Methodology:

Meaning and importance of Research: Types of Research, Selection and formulation of Research Problem; Research Design: Developing a Research Plan, Experimental and Sample Designs; Analysis of Literature Review; Hypothesis: Different Types, Significance, Development of Working Hypothesis, Null hypothesis; Research Methods: Scientific method vs Arbitrary Method, Logical Scientific Methods

UNIT-3: Data Collection and Analysis

Sources of Data: Primary, Secondary and Tertiary, Types of Data: Categorical, nominal & Ordinal; Methods of Collecting Data: Observation, field investigations, Direct studies: Reports, Records or Experimental observations; Sampling methods: Data Processing and Analysis strategies, Graphical representation, Descriptive Analysis, Inferential Analysis, Correlation analysis, Least square method; Data Analysis using statistical package, Generalization and Interpretation.

UNIT-4: Scientific Writing

Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports, Conclusions,

UNIT-5: Ethics

Ethical Issues: Ethical Committees, Commercialization, copy right, royalty, Intellectual Property rights and patent law; Reproduction of published material: Plagiarism, Citation and Acknowledgement, Reproducibility and accountability

Reference Books:

1. Dawson, C. (2002). Practical research methods. UBS Publishers, New Delhi.
2. Stapleton, P., Yondeowei, A., Mukanyange, J., Houten, H. (1995). Scientific writing for agricultural research scientists – a training reference manual. West Africa Rice Development Association, Hong Kong.
3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
4. Wadehra, B.L. 2000. Law relating to patents, trade marks, copyright designs and geographical indications. Universal Law Publishing.
5. Fink, A., 2009. Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications
6. Leedy, P.D. and Ormrod, J.E., 2004 Practical Research: Planning and Design, Prentice Hall.

Course Name: Biostatistics

Course Code: PLS 520

Credits = 02

Learning outcomes:

At the end of the course, Student will be able:

- To understand role of statistics in biological science
- To understand Correlation, regression, Chi-Square Test, F-Test and Analysis of Variance
- To use different methods by different software like Microsoft Office, SPSS, MATLAB

UNIT-1

Measures of Dispersion: Range, Quartile Deviation, Mean deviation, Standard deviation, Variance and their Coefficients.

UNIT-2

Correlation: Introduction and Significance. Types of Correlation, Methods of studying Correlation, Correlation coefficient, Illustrations. **Regression Analysis:** Regression analysis, Application and limitations, Regression coefficient, Regression coefficient and Regression Lines and its Illustrations.

UNIT-3

Chi-Square Test: Introduction, Properties and Applications of Chi Square Test. Chi-square test for independence of attributes, Goodness of fit and homogeneity of samples.

UNIT-4

F-Test and Analysis of Variance: Null and alternative hypothesis, Type I and type II errors, F-Test, Analysis of Variance or ANOVA-One and two way ANOVA

UNIT-5

Software Analysis: Use of different software like Microsoft Office, SPSS, MATLAB for above mentioned units

Reference Books:

1. Milton. Susan, Statistical Methods in the Biological and Health sciences, MGH, 2nd ed. or later editions.
2. Jerrold H. Zar, Biostatistical Analysis, Pearson publication.
3. S. C. Gupta & V.K. Gupta, Mathematical Statistics, Sultan Chand & Sons.
4. K. C. Aggarwal, Biostatistics, Bioinformatics & Computer Application, Nidhi Publisher.
5. Essential Bioinformatics By Jin Xiong, Cambridge University Press
6. Rao, P.S. and Richard, J., An introduction to Biostatistics, 3rd ed, 1996.
7. Principle of Biostatistics, Marcello Pagano, Thomson Learning, 2004 Brooks & Cole.
8. Introduction to Biostatistics: Glover, T. & Mitchell, K. (2002) Mc Graw- Hill, New York.

Course Name: Fundamentals of Computer Applications in Data analysis

Course Code: PLS 521

Credits = 02

Learning outcomes:

At the end of the course, Student will be able:

- To understand the IT applications in the area of biology
- To open Office tools using document preparation and spreadsheet handling packages
- To plot graphs, use of Internet and its application, acquire technical skills,

Software for paper formatting like MS Office

UNIT-1

Word Processing Word processing concepts: saving, closing, Opening an existing document, Selecting text, Editing text, Finding and replacing text, printing documents, Creating and Printing Merged Documents, Character and Paragraph Formatting, Page Design and Layout. Editing and Profiling Tools: Checking and correcting spellings. Handling Graphics, Creating Tables and Charts, Document Templates and Wizards.

UNIT-2

Spreadsheet Package Spreadsheet Concepts, Creating, Saving and Editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell / formula Copying and Moving from selected cells, handling operators in Formulae, Functions: Mathematical, Logical, statistical, Formatting a Worksheet: Formatting Cells – changing data alignment, changing date, number, character or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs – Creating, Previewing, Modifying Charts

UNIT-3

Presentation Package Creating, Opening and Saving Presentations, Creating the Look of Your Presentation, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and Correcting Typing Mistakes, Making Notes Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows, Running and Controlling a Slide Show, Printing Presentations.

UNIT-4

WWW and Web Browsers: Web Browsing software, Surfing the Internet, Basic of electronic mail, Using Emails, Document handling, Network definition, Common terminologies: LAN, WAN, Node, Host, Workstation, bandwidth, Network Components: Servers, Clients, Communication Media.

UNIT-5

Methods to search required information effectively, Multimedia software like Adobe Photoshop

Reference Books:

1. A.GoeI, Computer Fundamentals, Pearson Education, 2010.
2. P. Aksoy, L. DeNardis, Introduction to Information Technology, Cengage Learning, 2006
3. P. K.Sinha, P. Sinha, Fundamentals of Computers, BPB Publishers, 2007

Course Name: Data mining for Review of Literature

Course Code: PLS 522

Credits = 02

Learning outcomes:

At the end of the course, Student will be able:

- To present a structured philosophical framework for critically analyzing the theoretical arguments of others, as well as developing and defending one's own arguments.
- To write effective research paper, review article, research proposal and thesis.

UNIT-1

What is Literature review? Definition and characteristics of literature review. Significance of literature reviews in scientific study

UNIT-2

Difference between Literature review and Academic paper, Types of Literature reviews: Evaluative, Explorative, Instrumental and Systematics

UNIT-3

Sources of Literature Review: Primary and Secondary. Use of Search Engines in Literature Review: PubMed, Google Scholar

UNIT-4

Structure of Literature Review (Introduction, Body and Conclusion), Characteristics of a good literature review

UNIT-5

Strategies for writing discipline specific literature review, Guidelines for maintaining Academic integrity while writing Literature review

Course Name: Research Proposal/Project writing

Course Code: PLS 523

Credits = 02

Learning outcomes:

At the end of the course, Student will be able:

- To demonstrate the ability to conduct literature reviews and gather the critical scientific information related to the research proposal
- To demonstrate writing skills by writing, a clear, concise research proposal with scientifically defensible aims, methods and conclusions

UNIT-1

Guidelines for preparation of research proposals, Academic Integrity while writing for a Research Proposal, Identification of the particular research problem. **Introduction:** Explain the issue you are examining and why it is significant

UNIT-2

Background/Review of the Literature

- ❖ A description of what has already known about this area and short discussion of why the background studies are not sufficient.
- ❖ Discuss several critical studies that have already been done in this area (cite according to APA style).
- ❖ Point out why these background studies are insufficient. In other words, what question(s) do they leave unresolved that you would like to study?

Rationale

A description of the questions you are examining and an exploration of the claims.

- ❖ Explain how these research questions are related to the larger issues raised in the introduction.
- ❖ Describe what specific claim, hypothesis, and/or model you will evaluate with these questions.

UNIT-3

Methodology and Research Design

A description of how you would go about collecting data and test the questions you are examining.

Method: How would you collect the data and why?

- ❖ Describe the general methodology you choose for your study, in order to test your hypothesis.
- ❖ Explain why this method is the best for your purposes.

Design: What would the stimuli look like and why?

- ❖ Describe what kinds of manipulations/variations you would make or test for in order to test your hypothesis.
- ❖ Controls: What kinds of factors would you need to control for in your study?
- ❖ Describe what types of effects would be likely to occur which would make your results appear to confirm, or to disconfirm your hypothesis.

Analysis

- ❖ How will you analyze the results?
- ❖ What kind of results would *confirm* your hypothesis?
- ❖ What kind of results would *disconfirm* your hypothesis?

UNIT-4

Significance and Conclusion

- ❖ Discuss, in general, how your proposed research would lead to a significant improvement over the original studies, and how it would benefit the field. (In other words, why should someone care?)
- ❖ If you were applying for money to do this, why would someone fund you? If you wanted to publish your results, why would they be interesting?)

References

Include all references in APA style.

UNIT-5

Inclusion of budgetary requirement with its justification, Include permission / endorsement letter from parent organization for onward submission of Project proposal to discipline specific funding agency for the financial support



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शाहपुर परिसर , ज़िला काँगड़ा, हिमाचल प्रदेश -176206
Shahpur Campus , Distt. Kangra (HP) - 176206
Website: www.cuhimachal.ac.in

SEMESTER - IV

Course Name: Herbal medicines in Human Health Care
Course Code: PLS 565
Credits = 04

Learning outcomes:

At the end of the course, Student will be able:

- To analyse various plant drugs in single and combination dosage forms
- To understand identification, processing and finishing of herbal drugs
- To understand role of bioactive molecule in herabal drug
- To know how herbal based is used for particular disease

UNIT-1

Role of natural products in herbal medicines, General status and importance of herbal medicines, Safety of herbals/herbal pharmacovigilance

UNIT-2

Herbs as raw materials, definition of herb, herbal medicines, herbal medicinal product and herbal drug preparations, source, selection, identification and authentication of herbal materials, Drying and processing of herbal raw materials, packing and labelling of finished products

UNIT-3

Preparation of liquid orals, tablets, capsules, ointments, creams and cosmetics, monoherbal and polyherbal formulation with their merits and demerits, Excipients used in herbal formulation, pharmacokinetic aspects for herbal drugs, and clinically used herbal drugs

UNIT-4

Isolation of bioactive steroids such as, diosgenin, estrone, estrodiol, isolation and characterization of terpenes, bioactive alkaloids-isolation such as atropine, quinine, papaverine, thebaine, vincristine

UNIT-5

Screening of natural products for the various biological activities like Antidiabetic, Antihypertensive, Antipyretics, Antioxidants, Antibacterial and Immunomodulators

References Books:

1. Pharmacognosy by G.E. Trease, W.C.Evans, ELBS.
2. Pharmacognosy by Verno E. Taylor, Linn. R.Braddy, James E.Robberts, K.M.Varghese Co. Mumbai.
3. Text Book of Pharmacognosy by T.E.Wallis, CBS Publication, Delhi.
4. Indian Herbal Pharmacopoeia Vol. I and II
5. British Herbal Pharmacopoeia
6. Standardisation of botanicals testing and extraction methods of Medicinal Herbs by Dr. Rajpal.Vol. I and II
7. General Pharmacy by J.W. Cooper and Coline Gunn
8. Research guideline for evaluating for the safety and efficacy of herbal medicines, WHO publications (ISBN)
9. Quality control methods for medicinal plant materials- WHO
10. Dey. P.M. and J.B.Horborne: Plant Bio Chemistry Academic Press, London.
11. Sadasivam. S. and A. Manickam: Bio Chemical methods 2nd edition. New Age International Pvt. Ltd. New delhi.
12. Dennis D.T., Turpin, D.H. Lefebvre, Layzell D.D and D.B. (eds) 1997. Plant Metabolism (Second Edition) Longman, Essex, England.

Course Name: *In Vitro* Plant Biology

Course Code: PLS 566

Credits = 04

Learning outcomes:

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

- To familiarize with the tools and techniques of plant tissue culture
- To understand the possibility for the production of elite plants
- To apply the technique in micropropagation of plants
- To establish a commercial micropropagation unit

UNIT-1

Historical developments and landmarks in plant tissue culture, Totipotency, Basic techniques in plant tissue culture. Media formulation for plant tissue culture. Role of Plant growth regulators in plant differentiation and morphogenesis,

UNIT-2

Induction of morphogenesis *in vitro*, Somatic embryogenesis and Organogenesis. Factors affecting somatic embryogenesis and organogenesis, Synthetic seeds and their applications

UNIT-3

Somaclonal and gametoclonal variations, Meristem culture, Endosperm culture, Production of haploids using anther and pollen – Importance and applications, Initiation and maintenance of callus cultures, cell suspensions cultures, Mass cultivation of plant cells using bioreactors

UNIT-4

Production of secondary metabolites from cell cultures and hairy root cultures, Isolation, purification and culture of protoplasts, Methods used for protoplast fusion, Somatic hybridization/cybridization

UNIT-5

Germplasm storage *in vitro*, cryopreservation, Strategies used for enhanced production of secondary metabolites, Commercial exploitation of micropropagation approach

Reference Books:

1. Plant Cell and Tissue Culture Edited by Indra K. Vasil and Trevor A. Thorpe, Kluwer Academic Publishers
2. Plant Tissue Culture: Theory and Practice By S. S. Bhojwani and M. K. Razdan Elsevier Publishers
3. *In Vitro* Cultivation of Plant Cells BIOTOL Biotechnology by Open Learning Butterworth/Hernemann Ltd.
4. Plant Cell Biotechnology By R. Endress, Springer-Verlag
5. Plant Tissue Culture: Applications and Limitations By S. S. Bhojwani
6. Plant Tissue Culture By Kalyan Kumar De

Course Name: Plant Stress Biology

Course Code: PLS 567

Credits = 04

Learning outcomes:

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

- To develop the understanding of concept of stress, stress factors and resistance mechanisms.
- To develop the ability for critical appraisal of various physiological mechanisms that protect the plant from environmental stress i.e. adaptation, avoidance and tolerance.
- To analyze the role of production and scavenging mechanisms

UNIT-1

Plant and environment, environmental strain, Concept of plant stress and stress factors, biotic and abiotic stresses, stress phases, alarm reaction, hardening, resistance, Tolerance, acclimation and avoidance

UNIT-2

Stress response (specific and aspecific responses), Various mechanisms of acquiring resistance to Temperature stress, drought stress, Salinity stress, Sensing and uptake of toxic heavy metals, Photoinhibition, stress caused by excess light and Stress caused by xenobiotics, Pyrethroids, isoprenoids and alleopathy

UNIT-3

Biotic stress caused by viruses, bacteria and fungi. Constitutive and induced resistance, recognition and specificity, Wounding, Stress caused by herbivores.

UNIT-4

Signalling: Hormonal, Calcium modulation, Phospholipid signaling.

UNIT-5

Oxidative stress. Production of active oxygen forms in plants, their physiological effects, Oxidative damage of macromolecules. Protective mechanisms. Sensing of anoxia and hypoxia caused by flooding.

Reference Books:

1. Jenks M. A. and Hasegawa P. M. (eds..) Plant Abiotic Stress p.270. Blackwell Publishing, Oxford (2005)
2. Smirnoff N. (ed.) Antioxidants and Reactive Oxygen Species in Plants p. 302. Blackwell Publishing, Oxford (2005)
3. Huang B. (ed.) Plant-Environment Interactions p.388 Taylor & Francis Boca Raton, etc (2006)
4. Hopkins, W.G. and Huner, A. (2008). Introduction to Plant Physiology. 4th edition. John Wiley and Sons. U.S.A.
5. Taiz, L., Zeiger, E., Møller, I.M. and Murphy, A (2015). Plant Physiology and Development. 6th edition. Sinauer Associates Inc. USA.
6. Singh D.P. (2003). Stress Physiology. New Age International pvt. Ltd.

Course Name: Grafting techniques in Plants

Course Code: PLS 568

Credits = 04

Learning outcomes:

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

- To understand the concept of plant propagation and grafting techniques for skill enhancement
- To learn the basic steps for grafting followed for all type of plants

UNIT-1

Historical Background of Grafting, Importance and Scope in India, Grafting: Concept, Production Process, Present Status and Benefits

UNIT-2

Disease Management in Plants through Resistant Rootstocks, Infrastructure and Grafting Aids, Importance and Selection of Rootstocks, Suitable Potential Crops for Grafting, Grafting Techniques in Vegetables

UNIT-3

Grafting techniques in major fruit/ vegetable plants (Mango, Citrous, Guava, Post Grafting Handling Management in fruits/Vegetable Crops, Transplanting of Grafted Seedlings and After Care

UNIT-4

The Future Recombinant Horticultural Wonder Plants, Robotic Grafting, Impact of Grafting on Quality of Vegetables and Fruit plants, Physiological and Molecular Mechanism of grafting

UNIT-5

Establishment of commercial nurseries for plant propagation, Visit to commercial plant propagation units, Post Grafting Handling Management in fruits/Vegetable Crops.

Reference Books:

1. Manual of Plant Grafting: Practical Techniques for Ornamentals, Vegetables, and Fruit by Peter McDonald
2. Grafting and Budding: A Practical Guide for Fruit and Nut Plants and Ornamentals by Donald McEwan Alexander
3. Practical Manual on “Grafting Techniques in Vegetable Crops” by Pardeep Kumar, Parveen Sharma and Binny Vats
4. The Plant Propagator's Bible: A Step-by-Step Guide to Propagating Every Plant in Your Garden by Miranda Smith

Course Name: Academic Writings

Course Code: PLS 569

Credits = 02

Learning outcomes:

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

- To acquaint the students to different types of scientific writing.
- To identify ethics of research in writing research proposal, thesis and research paper.
- To represent the research proposal, thesis and research paper effectively

UNIT-1

Introduction of academic and research writing, Structure and components of Scientific Reports: types of Report, Technical Reports and Thesis, Significance

UNIT-2

Different steps in the writing: Layout, structure and Language of typical reports, citation styles, Illustrations and tables, Bibliography, Referencing and foot notes, Importance of Effective Communication.

UNIT-3

Preparing Research papers for journals, Seminars and Conferences: Design of paper using TEMPLATE, Calculations of Impact factor of a journal, citation Index, ISBN & ISSN.

UNIT-4

UGC guidelines on Academic integrity, Avoid Plagiarism, Journal metrics, author metrics

UNIT-4

Challenges in Indian research and writing, Team and Time management, time management, Open Education resources,

Reference Books:

1. Stephen B. Heard. The Scientist's Guide to Writing: How to Write More Easily and Effectively throughout Your Scientific Career, Princeton University Press (2016)
2. John M. Swales, Christine B. Feak. Academic Writing for Graduate Students: Essential Tasks and Skills, University of Michigan Press (2012)

Course Name: Paper Publications/Seminar, Conferences Presentation at National Level

Course Code: PLS 570

Credits = 02

Objective:

The basic objective of the course is to bring together students, academicians and experts from different parts of the country and abroad to exchange knowledge and ideas.

This will provide an indepth analysis of subjects and update the knowledge of the participants from academic as well as research institutions.

Learning outcomes:

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

- To write effective research paper, research proposal and thesis.
 - To identify ethics of research in writing research proposal, thesis and research paper.
 - To represent the research proposal, thesis and research paper effectively.
-
1. Preparation of manuscript for Publication of Research paper, Presenting a paper in scientific seminar
 2. Student must publish atleast one research article and one review in UGC approved research Journal/Journal of Himalayan Life Sciences.
 3. Student must participate in an oral presentation / talk in refereed conference/ Seminar after which student must submit a write up at Department to the concerned before the end of this course.
 4. Student must participate in poster presentation in a referred conference / Seminar after which student must submit a write up at Department to the concerned before the end of this course.
 5. Detailed report must be prepared after attending the discipline specific seminars and conferences

Course Name: Application of Artificial intelligence in Plant Science

Course Code: PLS 571

Credits = 02

Learning outcomes:

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

- To expand basic informatics skills and attitudes, relevant to the emerging knowledge society,
- To effectively utilize the digital knowledge resources for their chosen area of study.

UNIT-1

Artificial Intelligence (AI): History and Concept of AI, Different Research areas of AI, Applications of AI, Task classification of AI, Agents and Environment

UNIT-2

Machine learning: Decision tree induction, Artificial Neural Networks, Hidden Markov Models, Genetic Algorithms

UNIT-3

Evaluation of prediction methods: Parametric and Non-parametric tests, cross validation and empirical significance testing, Clustering (Hierarchical and K-mean), Principal Component Analysis

UNIT-4

Artificial Intelligence in the Agricultural Industry: Image-based insight generation (Disease detection, Crop readiness identification, Field management), Importance of Drone, Precision Farming, Challenges in Artificial Intelligence Adoption in Agriculture

UNIT-5

AI based systems for Traditional Medicine, Automated plant species identification

Reference Books:

1. Artificial Intelligence: A Modern Approach Third Edition Stuart Russell and Peter Norvig, 2010. Pearson Education, Inc. ISBN: 978-0-13-604259-4
2. Hutter, Marcus (2005). Universal Artificial Intelligence. Berlin: Springer. ISBN 978-3-540-22139-5.
3. Neapolitan, Richard; Jiang, Xia (2018). Artificial Intelligence: With an Introduction to Machine Learning. Chapman & Hall/CRC. ISBN 978-1-138-50238-3. Archived from the original on 22 August 2020. Retrieved 3 January 2018.
4. Nilsson, Nils (1998). Artificial Intelligence: A New Synthesis. Morgan Kaufmann. ISBN 978-1-55860-467-4. Archived from the original on 26 July 2020. Retrieved 18 November 2019.
5. Russell, Stuart J.; Norvig, Peter (2003), Artificial Intelligence: A Modern Approach (2nd ed.), Upper Saddle River, New Jersey: Prentice Hall, ISBN 0-13-790395-2.

Course Name: Advanced softwares used in Plant Sciences for Data Analysis

Course Code: PLS 572

Credits = 02

Learning outcomes:

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

- To analyze example data sets using different tools and learn to interpret the outputs.
 - To apply the mentioned softwares during research process
1. **GPS, GIS:** Global Positioning Systems or Geographic Information Systems for real-time analysis and forecasts of weather, floods, and monitoring crop area sown, lost, or damaged due to floods and rainfall.
 2. **IMAGE ANALYSIS:** Extraction of meaningful information from images; mainly from digital images by means of digital image processing techniques, Overview of plant-image-analysis.org (plant image analysis software)
 3. **BIORENDER:** Overview of Biorender, Drawing of original Illustrations or Figures
 4. **MENDLEY:** Reference Manager tool, Insertion of citation and bibliography into Microsoft word
 5. **TURNITIN:** For Plagiarism Check to maintain academic integrity.
 6. Phylogenetic softwares and other Statistical softwares used for analysis of scientific data obtained during Plant Research

Course Name: M.Sc Dissertation (50% Dissertation, 50% Presentation & Viva-Voce)

Course Code: PLS 595

Credits = 08

The course of dissertation is based on their specialization field to get more learning in particular field with Practical knowledge



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Pre Ph.D. Course in Plant Sciences (Botany)

Scheme of Courses for Pre Ph.D. Course in Plant Sciences (Botany)

Course Code	C/E*	Course Name	Credits
CPE-RPE	C	Research and Publication Ethics	2
PLS-600	C	Advances in Research Methodology	4
PLS-ITK	C	Indian Traditional Knowledge and practices	2
PLS-PTL	C	Pedagogy of teaching learning Process	2
PLS-601	E	Abiotic Stress Management in Plants	4
PLS-602	E	Greenhouse Technology for High Value Plants	4
PLS-603	E	Advanced Plant Biochemistry	4
PLS-604	E	Recent Techniques in Plant Sciences	4
PLS 605	E	Advanced Plant Biotechnology	4
PLS 606	E	"Omic" Approaches - Technologies and Applications	4

*Students can select any two elective papers from above scheme.

C- Compulsory

E-Elective

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Advances in Research Methodology (PLS-600)

Course Credit: 4

UNIT –I: Introduction to research design:

Definition of the Problem: Identifying and formulating the problem. Developing a research plan: Research objective: information required for solving the problem: defining each major concept in operational terms: an overall description of approach, clearly stating any assumptions.

UNIT –II: Scientific literature review

Reading and critical analysis of scientific literature/ research paper/case reports etc. Drafting and communicating research results in peer-reviewed journals. Acknowledgement of contributions, authorship issues; Intellectual Property Rights (IPR), scientific ethics, rules of plagiarism.

UNIT –III: Writing and presentation skills

Communication skills of research work through Poster and oral presentation Writing review paper on a relevant research topic and presentation of the same in a seminar /conferences / workshop / symposium etc.

UNIT –IV: Experimental Design and Data Analysis

Define sensitivity, accuracy, precision and specificity. The limits and range of measurement in different systems Experimental design; single and double blind studies, use of placebo in experiment Maintenance and storage of data, Concept of sampling, Positive and negative controls groups, biological and technical replicates in experiments Biostatistics: Correlation and Regression, Probability and Distributions, Principles of Hypothesis Testing, Significance, One Sample z-test, One Sample t-test, Two Sample z-test, Two Sample t-test, Chi-Square test, ANOVA. Factorial and transformation.

UNIT –V: Working in Laboratory

Good laboratory practice (GLP); Safety and bio- and radio- hazards, proper disposal of biological and chemical wastes Accuracy of liquid transfer in laboratory. Preparation of Reagents, chemicals, buffers for experiments General safety and precautions measures and its implementation during experiment. Handling of Instruments in the Central Instrumentation facility (CIF)

REFERENCES

1. Blum, Deborah and Mary Knudson, eds. A field guide for science writers: the official guide of the National Association of Science Writers, New York: Oxford University Press, 1997.
2. Booth, Wayne, Gregory G Colomb, Joseph M. Williams. The craft of Research Chicago University of Chicago Press, 1995.
3. Davis, Martha. Scientific Papers and Presentations. San Diego: Academic Press, 1997.
4. Fuscaldo, AA, Erlick, BI, Hindman, B. Laboratory Safety: Theory and Practice. New York: Academic Press, 1980.
5. Bajpai, PK. Biological Instrumentation and Methodology. New Delhi: S. Chand & Co. Ltd. 2006.,
6. Kothari, C. R. (2004). 2/e, Research Methodology- Methods and Technique.(New Age International, New Delhi)
7. Montgomery, Douglas C. and Runger, George C. (2007), 3/e. applied statistics and probability for Engineers. (Wiley, India)

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Abiotic stress management in plants (PLS-601)

Credits: 4

UNIT -I

Environmental stress and its types, soil parameters including pH, classification of plants based on susceptibility and tolerance to various types of stress; use of wild species as root stock, use of antitranspirants.

UNIT-II

Mechanism and measurements of tolerance to drought, water logging, soil salinity, frost and heat stress in plants

UNIT-III

Soil-plant-water relations under different stress conditions in plants and their management practices.

UNIT-IV

Techniques of growing plants under water deficit, water logging, salinity and sodicity.

UNIT-V

Techniques of growing plants under high and low temperature conditions, use of chemicals in alleviation of different stresses.

- I. Research papers and reviews published in peer-reviewed international journals in the above areas
- II. Suggested Readings

1. Dwivedi P & Dwivedi RS. 2005. Physiology of Abiotic stress in Plants. Agrobios.
2. Lerner HR (Ed.). 1999. Plant Responses to Environmental Stresses. Marcel Decker.
3. Maloo SR. 2003. Abiotic Stresses and Crop Productivity. Agrotech Publ. Academy.
4. Parvaiz Ahmad, M.N.V. Prasad. Abiotic Stress Responses in Plants: Metabolism, Productivity and Sustainability
5. Hale, Maynard G and Orcutt David M. The physiology of plants under stress, Wiley Eastern Ltd, New Delhi
6. Levitt. Responses of plants to environmental stresses. Academic Press, New York and London

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Greenhouse technology for high value plants (PLS-602)

Credits: 4

UNIT -I

Importance and scope of greenhouse /protected cultivation, principle used in protected cultivation, energy management, low cost structure; training methods; engineering aspects

UNIT-II

Regulatory structure used in protected structure, types of greenhouses/polyhouse/net houses, hot beds, cold frames, effect of environmental factors, viz. temperature, light, CO₂ and humidity on growth of plants, manipulation of CO₂, light and temperature for greenhouse, fertigation

UNIT-III

Nursery raising in protected structures like poly-tunnels, types of benches and containers, different media for growing nursery under cover

UNIT-IV

Production technology of high value vegetables/flowers/medicinal/aromatic plants under greenhouse structures

UNIT-V

Problem of growing plants in protected structure and their remedies, insect and disease management in protected structure; soil-less culture, use of protected structures for seed production, Vertical farming/Hydroponics/Aeroponics/Grafting technologies

References:

1. Protected Cultivation of Vegetable Crops by Balraj Singh Kalyani Publ. 2006.
2. Cultivating Vegetables in Green House by Chandra S and Som V. Indian Horticulture 45: 17-18.
3. Green House Technology for Controlled Environment by G.N Tiwari. Narosa Publications. 2003.
4. Practical Manual on Protected Cultivation by Parveen Sharma, Pardeep Kumar and N K Pathania. 2014.

Dr. Sharma
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Advanced Plant Biochemistry (PLS-603)

Credits: 4

UNIT-I

Structure, properties and functions of Carbohydrates, Structural polysaccharides cellulose and chitin, storage polysaccharides starch, glycogen, peptidoglycan and glycosaminoglycans, proteoglycans and glycoproteins,

UNIT-II

Glycolysis, kreb's cycle, Pentose phosphate pathway, glyoxylate cycle, glycogenolysis and glycogenesis, gluconeogenesis, Pyruvate Dehydrogenase and its regulation, TCA cycle, glyoxalate cycle, Electron Transport Chain, inhibitors and uncouplers of oxidative phosphorylation.

UNIT-III

Amino acids; Primary, secondary, tertiary & quaternary structure of proteins; post translational modifications. Structural organization of soluble & membrane proteins; structure-function relationships, Isolation, purification & characterization of proteins: Precipitation, fractionation & chromatographic methods.

UNIT-IV

Lipids: Classification of lipids and fatty acids. General Structure and function of major lipid subclasses, acylglycerols, phosphoglycerides, sphingolipids, glycosphingolipids and terpenes, sterols, steroids, Lipid metabolism: Biosynthesis of odd and even carbon saturated and unsaturated fatty acids, formation of ketone bodies, biosynthesis of triacylglycerols, membrane phospholipids, cholesterol and steroids.

UNIT-V

Nucleic Acids- Structure and functions: Structure and properties of purine and pyrimidine bases. Nucleosides and nucleotides. Biologically important nucleotides, Nucleic acid metabolism: Biosynthesis and break down of purine & pyrimidine nucleotide by de-novo and salvage pathway Vitamins and Hormones: their structure, properties and biological functions.

- I. Research papers and reviews published in peer-reviewed international journals in the above areas
- II. Text books
 1. Biochemistry 5th Edition Stryer Lubert (1995) or later WH Freeman & Co New York. USA.
 2. Nelson, D. L., Lehninger, A. L., & Cox, M. M. (2008). Lehninger Principles of Biochemistry. Macmillan.
 3. Biophysical Chemistry parts I through III (3 Book Series) by Charles Cantor and Paul R. Schimmel W. H. Freeman and Co, New York City. NY, USA
 4. Biochemistry by Donald and Judith Voet: John Willey and Sons, Indian Edition.



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Recent Techniques in Plant Sciences (PLS-604)

Credits: 4

UNIT-I

Introduction, light microscope, Optical sectioning, Imaging living cells and tissues, phase contrast microscopy, fluorescent microscopy, scanning and transmission electron microscopy

UNIT-II

Principles of chromatography, Chromatographic performance parameters, Ion-exchange chromatography, Molecular (size) exclusion chromatography, Affinity chromatography, Gas and Liquid chromatography

UNIT-III

Introduction, Ultraviolet and visible light spectroscopy, Fluorescence spectroscopy, Circular dichroism spectroscopy, Light scattering, Atomic spectroscopy, Infrared and Raman spectroscopy, Nuclear magnetic resonance, X-ray diffraction, tandem mass spectrometry

UNIT-IV

Electrophoresis of proteins and nucleic acids, Capillary electrophoresis, Microchip electrophoresis, pulse field gel electrophoresis (PFGE) and 2-Dimensional gel electrophoresis, Blotting techniques: Southern, Northern, Western, DNA fingerprinting

UNIT-V

Cell sorting, Hybridoma technology, Plant derived antibodies, Histochemical and Immuno-techniques, Immunochemical Techniques, Radioimmunoassay (RIA), Enzyme Linked Immunosorbent Assay (ELISA) and Autoradiography, Visit to nearby institute for instrumentation facilities

I. Research papers and reviews published in peer-reviewed international journals in the above areas

II. Recommended Books:

1. Wilson, K., & Walker, J. (Eds.). Principles and techniques of biochemistry and molecular biology. Cambridge university press.
2. Sawhney, S. K., and Randhir Singh, eds. Introductory practical biochemistry. Alpha Science Int'l Ltd.
3. Skoog, D. A., & West, D. M. Principles of Instrumental Analysis, (Saunders golden sunburst series).
4. Bajpai, P. K. Biological Instrumentation and Methodology (Tools and Techniques of Biology). S. Chand Publishing.
5. Sheehan, D. Physical biochemistry: principles and applications. John Wiley & Sons.
6. Van Holde, K. E., Johnson, W. C., & Ho, P. S. Principles of physical biochemistry.
7. Singh, B. D., and B. D. Singh. Biotechnology expanding horizons. Kalyani publishers.

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Course Name: Advanced Plant Biotechnology (PLS 605)

(Total Credits - 04)

UNIT-I

Cell and tissue culture: Plant tissue culture media, Role of plant growth regulators in tissue culture, Micropropagation techniques: Somatic embryogenesis, Synthetic seeds, Anther, pollen and ovary culture

UNIT-II

Protoplast culture and Somatic hybridization, Cryopreservation, Suspension cultures, Hairy root culture, Plant Bioreactor types for cell and tissue culture, Introduction to Hydroponics and Aeroponics grow systems

UNIT-III

Enzymes and vectors used in genetic engineering, Construction of Genomic and cDNA libraries, Introduction to PCR, Reverse transcriptase-PCR and Real Time PCR, Blotting techniques

UNIT-IV

Methods of Plant Transformation: Direct and Indirect, Plant transformation vector, T-DNA and viral vector, Agrobacterium mediated gene transfer, Particle bombardment, Electroporation and Microinjection, Selection of transgenics: selectable marker and reporter genes

UNIT-V

Emerging trends involved in metabolic engineering for the enhancement of bioactive compounds: High throughput sequencing/GWAS, Gene editing using CRISPR/Cas9, Upregulation / Downregulation of genes involved in various metabolic pathways

Suggested Readings

1. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
2. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
3. A. Slater, N.W. Scott and M.R. Fowler (2008). Plant Biotechnology. Second Edition. Oxford.
4. N. Santosh and A. Madhavi. (2010). Practical Book of Biotechnology and Plant Tissue Culture. S. Chand & Co.
5. Plant Biotechnology and Genetics: Principles, Techniques and Applications by C.Neal Stewart (Wiley Publisher, 2008)
6. Plant Genetic Engineering by A.D. Arencibia, 1st Edition Volume 5, Elsevier Science, 2000
7. Frederic P. Miller, Agnes F. Vandome, John McBrewster: AEROPONICS by Alphascript Publishing, 2009
8. Hydroponics: A Practical Guide for the Soilless Grower (2nd Edition), by Dr. J. Benton Jones

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“Omic” Approaches - Technologies and Applications (PLS 606)

Credit: 4

Objectives

Regarding knowledge and understanding

- To explain different hereditary patterns; describe different approaches at to identify disease genes a basic level,
- To explain different methods that are used to study the expression, regulation and function of biomolecules,
- To develop knowledge on the basics of omics and their versatile applications,
- Integration of omics approaches for improvement of life.

Teaching methods

The teaching includes lectures, discussions, demonstrations, self-study, seminars and a project work.

Other directives

The course language is English. Course evaluation will be carried out according to the guidelines established by the Board of studies, Central University of Himachal Pradesh. Continuous evaluation will be carried out during the course.

COURSE OUTCOMES

- Inferring the basic concepts of genomics, transcriptomics and proteomics.
- Listing and discussing the use of “omics” for society
- Suggesting and outlining solution to theoretical and experimental problems in various “omics” field such as Genomics, Transcriptomics and Proteomics fields.

COURSE OBJECTIVES

1. To develop knowledge on the basics of omics and their versatile applications.
2. Integration of omics approaches for improvement of life.
3. Knowledge development on versatile techniques in “omics”

In-depth literature

Lesk, Arthur M. Introduction to bioinformatics. 4ed. : Oxford : Oxford University Press, 2013 - 363 s. ISBN:9780199651566

Barh D, Azevedo V, Omics Technologies and Bio-engineering: Towards Improving Quality of Life, Academic Press

Wittmann, C, Lee SY, Systems metabolic engineering, Springer Science & Business Media Pevsner J, Bioinformatics and Functional Genomics, Wiley-Blackwell, ISBN: 978-81-265-3834-8

Kihara, D, Protein function prediction for omics era, Springer Science & Business Media

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हिमाचल प्रदेश केन्द्रीय विश्वविद्यालय
Central University of Himachal Pradesh
(Established under Central Universities Act 2009)



शाहपुर परिसर, जिला काँगड़ा, हिमाचल प्रदेश - 176206
Shahpur Campus, Distt. Kangra (HP) - 176206
Website: www.cuhimachal.ac.in

Course Name: Pedagogy of teaching learning Process
Course Code: PLS -PTL
Credits = 02

Course objectives:

To enable the student teachers to

- Understand the various theories of learning.
- Explain the nature and characteristics of teaching.
- Differentiate between teaching and learning

UNIT-1

Process of education and learning, Pedagogy, Andragogy, Critical Pedagogy- Meaning, Need and its implications in Teacher Education, Assessment in Pedagogy of Education-Competency Based Education, ICT in Teaching learning and assessment.

UNIT-2

Learning – concept, nature, characteristics, types, and factors affecting it; Learning Process: Behaviourist, cognitive, information processing, humanist, biologicals.

UNIT-3

Development of learner and learning process, relationship between development and learning. Dimensions of individual development: Physical, cognitive, language, affective, socio-cultural and moral their interrelationship implications for teachers.

UNIT-4

Concept, nature characteristics of teaching.
Functions of teaching, Principles of teaching, phases of teaching, classroom instruction strategies, Teacher as a learner, Teaching for culturally diverse students.

UNIT-5

Teaching models & factors effecting teaching and learning process. Organizing Teaching: Memory Level (Herbartian Model), Understanding Level (Morrison teaching Model), Reflective Level (Bigge and Hunt teaching Model).

Reference Books:

1. Bhatt, H. The diary of a school teacher: An Azim Premji University publications, www.arvindguptatoys.com/arvindgupta/diary-school-teacher-eng.pdf
2. Carr, D (2005), Making Sense of Education: An Introduction to the Philosophy and Theory of Education and Teaching, Routledge.
3. Delpit, L (2006). Other People's children, Cultural Conflict in the Classroom. The New press.
4. Lampert, M. (2001). Teaching Problems and the Problems of Teaching. Yale University press.
5. Textbook for B.Ed. Pedagogy of Science: Physical Science Part I & Part II. National Council of Educational Research and Training, 2013.

W. Sharma



हिमाचल प्रदेश केन्द्रीय विश्वविद्यालय
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Shahpur Campus, Distt. Kangra (HP) - 176206

Website: www.cuhimachal.ac.in



Course Name: Indian Traditional Knowledge and practices

Course Code: PLS-ITK

Credits = 02

Course objectives:

- To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of knowledge system.
- To make the students understand the perspective of how different cultures utilize medicinal plants.
- Explain the need and importance of protecting traditional knowledge.

UNIT-1

The Pre-Vedic Period (Primitive period) (10000 B.C. – 1500 B.C.). The Vedic Period (1500 B.C. – 500 B.C.): Description of Medicinal plants and Functional foods in Vedas viz. Rigveda, Yajurveda, Atharveda.

UNIT-2

The Post-Vedic Period (500 B.C. – A.D. 600): Description of use of Medicinal plants, Functional foods, and Pharmaceutical dosage forms in ancient Ayurvedic treatises like Charaka Samhita, Sushruta Samhita etc.

UNIT-3

The Early Mediaeval Period (A.D. 600 - A.D. 1400): Description of use of Medicinal plants, Functional foods in various ancient Ayurvedic treatises like Ashtanga Samgraha, AshtangaHridya, Chakradatta, Sharangdhara Samhita, Bhel Samhita, Harita Samhita, Vangasena, GadaNigraha etc.

UNIT-4

The Late Mediaeval Period (A.D. 1400 – A.D. 1800): Description of use of Medicinal plants, Functional foods in various ancient Ayurvedic treatises like Bhava Prakasha, BhaishajyaRatnavali, Yoga Ratnakara, ArkaPrakasha etc.

UNIT-5

Modern Period (since 19th century to continue): Recent developments in medicinal plants and pharmaceutical science

Reference Books:

1. Traditional Knowledge System and Technology in India (English, Hardcover, Basanta Kumar - Mohanta, Vipin Kumar Singh) Edition : 2012 Language English
2. Panpaatu Maanudaviyal: Author: Bakthavachala Barathi, Meyappan Pathippagam, Chidambaram- Edition 2009; Language: Tamil
3. Traditional Knowledge System in India, by Amit Jha, 2009.
4. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
5. Knowledge Traditions and Practices of India " Kapil Kapoor I, Michel Danino.
6. V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014

(Signature)

विषय विशेषज्ञों की नामों की सूची

Sr. No.	Name	Designation	Subject/Discipline	Institutional Address for Correspondence	E-mail	Contact No.	Specialization if any
1.	Dr. (Mrs.) Usha Rana	Professor	Plant Physiology	Department of Biology and Environmental Sciences, College of Basic Sciences, CSK HPKV, Palampur, Himachal Pradesh (176062)	rana.usha@rediffmail.com	9418414393	Plant Physiology (Stress Physiology)
2.	Dr. Rakesh Kumar Chahota	Professor	Plant Biotechnology	Department of Biotechnology, CSK HPKV, Palampur, Himachal Pradesh (176062)	rkchahota@gmail.com	9418369800	Plant Biotechnology
3.	Dr. Gopal Katna	Associate Professor	Plant Breeding and Genetics	Department of Organic Agriculture and Natural Farming, College of Basic Sciences, CSK HPKV, Palampur, Himachal Pradesh (176062),	gkatna@gmail.com	9418155748	Plant Breeding (potential crops and pulses)
4.	Dr. Raj Saini	Associate Professor	Microbiology	Department of Social Sciences and Basic Sciences, College of Horticulture and Forestry, NERI, Hamirpur, Himachal Pradesh (177001)	sainiraj78@yahoo.com	9418244246	Microbiology
5.	Dr. Neelam Bhardwaj	Associate Professor	Plant Breeding and Genetics	Rice and Wheat Research Station, Malan, CSK HPKV, Palampur, Himachal Pradesh (176062)	neenabhardwaj@gmail.com	9816743729	Plant Breeding (underutilized crops/organic Agriculture)
6.	Dr. Saroj Arora	Professor	Algae, Microbiology, Ecology	Dept. of Botanical and Environmental Sciences, Guru Nanak Dev University, Amritsar, Punjab-143005	dr.sarojarora@gmail.com sarojarora.gndu@gmail.com	09417285485	Algae, Microbiology, Ecology
7.	Dr. Adarsh Pal Vig	Professor	Plant Science (Botany)	Department of Botanical and Env. Sciences, Guru Nanak Dev University, Amritsar, Punjab-143005	adarshpalvig@yahoo.co.in	09417062796	Gymnosperms, Angiosperms, cell molecular, Biology, Organic farming
8.	Dr. Rohit Sharma	Assistant Professor	Forest Products	Department of Forest Products, College of Forestry, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan (HP)-173230	rohitchemistiim@gmail.com	9596689777	Phytochemistry and Medicinal & Aromatics Plants
9.	Dr. Saurabh Sharma	Deputy Director	Medicinal and Aromatics Plants	Regional Cum Facilitation Centre (RCFC) Northern Region-1, RIISM Herbal Garden and Herbarium, Joginder Nagar, Distt. Mandi, Himachal Pradesh, India	100rabh.nmpb@gmail.com	9418355621, 9736049621	Medicinal and Aromatics Plants

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10.	Dr. Neera Rashmi	Associate Professor	Biology	Government College Nurpur, Himachal Pradesh University	neerarashmi@gmail.com	9418355400	Microbiology and Plant Pathology
11.	Dr. Jai Dev Sharma	Professor	Plant Breeding and Genetics	Department of Tea Husbandry & Technology, CSK Himachal Pradesh Agriculture University, Palampur -176 062 (H.P)	jaidevsharma@gmail.com	9418054450 9816012020	Plant Breeding and Genetics
12.	Dr. Sachin Upmanyu	Senior Scientist	Plant Pathology	Rice and Wheat Research Centre- Malan, Distt.- Kangra (HP),	sachinupmanyu_mpp@redifmail.com	70180-58606	Mycology and Plant Pathology
13.	Dr. Shelly Sehgal	Assistant Professor	Molecular Microbiology	Centre for Molecular Biology, Central University of Jammu, Rahya Suchani (Bagla), Dist. Samba-181143, Jammu (JKUT)	shelleysehgal@gmail.com	09797673255	Molecular Microbiology
14.	Dr. Rahul Sharma	Assistant Professor	Plant Biotechnology	Department of Biotechnology, Govt. P.G College of Women, Gandhi Nagar, Distt. Jammu (JKUT)	rahul.aries21@gmail.com	07006293151	Plant Molecular, Biology/ Plant Biotechnology
15.	Dr. Salej Sood	Senior Scientist	Crop Improvement	Central Potato Research Institute, Shimla	salej1plp@gmail.com	99176-14660	Crop Improvement
16.	Dr. M.R. Dhiman	Principal Scientist	Floriculture & Landscaping	Indian Agricultural Research Institute- Katrain- Kullu (HP)	mrarjun01@gmail.com.	94185-06133	Breeding of ornamental plants
17.	Dr. Chaman Lal Thakur	Professor	Forestry (Agroforestry and Silviculture)	Department of Silviculture and Agroforestry, College of Forestry, Dr.Y.S.Parmar University of Horticulture and Forestry-Nauni-Solan.	chamanthakur843@gmail.com	9418828456 7018599576	Forestry (Agroforestry and Silviculture)
18.	Dr. Rakesh Banyal	Principal Scientist/Professor	Silviculture	Central Institute of Soil Salinity, Karnal, Haryana,	drbanyal08@gmail.com	9467883865	Silviculture and Agroforestry
19.	Dr. Parveen Sharma	Professor	Agriculture	Department of Vegetable Science and Floriculture, CSKHPKV-Palampur	parveens012@gmail.com	9219589366	Protected Cultivation
20.	Dr. Namita Banyal	Senior Scientist	Floriculture and Landscaping	division of Floriculture, Indian Agricultural Research Institute, New Delhi	namitabanyal@gmail.com	98914-81136	Floriculture, Landscaping and Molecular Genetics
21.	Dr. Rajesh Uppal	Professor	Agroforestry	Department of Horticulture and Agroforestry, CSKHPKV-Palampur	uppalr1964@gmail.com	8988230718	Agroforestry
22.	Dr. Hitesh Thakur	Assistant Professor	Botany	Government Degree College Palampur	hitesh_biotech@hotmail.com	98172-99188	Botany
23.	Dr. Nitesh Kumar	Assistant Professor	Ethnobotany	Botany Department of BioSciences, Himachal Pradesh University, Summer Hill, Shimla-05	niteshchauhan7@gmail.com	7876042204	Biodiversity of algae, Gymnosperms, angiosperms,

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							pteridophytes and bryophytes, angiosperms
24.	Dr. Suresh Kumar	Associate Professor	Botany	Department of BioSciences, Himachal Pradesh University, Summer Hill, Shimla-05	shahriask@gmail.com	7018982600	Taxonomy, Ethnobotany, Biodiversity
25.	Dr. Shveta Thakur	Assistant Professor	Botany	Department of BioSciences, Himachal Pradesh University, Summer Hill, Shimla-05	svetathakur19@gmail.com	8219177591	Plant Physiology and Biochemistry, Plant stress Physiology
26.	Dr. Suman Rawat	Assistant Professor	Botany	Botany Department of BioSciences, Himachal Pradesh University, Summer Hill, Shimla-05	sumanrawat84@gmail.com	9418528509	Ethnobotany, Angiosperm, Economic botany and Plant resources
27.	Dr. Dhiraj S. Rawat	Associate Professor	Botany	Botany Department of BioSciences, Himachal Pradesh University, Summer Hill, Shimla-05	rawatdhirajhpu@gmail.com	9418187822	Ethnobotany & Biodiversity
28.	Dr. Amit Seghal	Assistant Professor	Botany	Botany Department of BioSciences, Himachal Pradesh University, Summer Hill, Shimla-05	draksegahal@gmail.com	7018740700	Microbiology, Plant Pathology, fungi and algae
29.	Dr. Tara Sen Thakur	Assistant Professor	Botany	Department of Botany Sardar Vallabhbhai Patel Cluster University Mandi	stara1982@gmail.com	7018127900 9857879790	Ethnobotany & Biodiversity Conservation with special focus on wild food plants
30.	Dr. Santosh Kumari	Senior Scientist	Horticulture	College of Horticulture and Forestry, Neri Hamirpur, Himachal Pradesh, - 177001	santoshstpc@gmail.com	7018825798	Vegetable Breeding and Plant Pathology
31.	Dr. K. Shiwani	Scientist	Agriculture	Vegetable Science College of Horticulture and Forestry Thunag, Distt- Mandi	shiwani.sukhwai@gmail.com	9882157287, 8360964866	Vegetable Breeding and Plant Pathology

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Learning Outcome

1. To make the learners self reliant to identify several kind of mushrooms, types (edible & poisonous) and mushroom production
2. Learning cultivation of different edible mushrooms
3. Acquaintance with climatic requirements of mushroom cultivation
4. Building knowledge on diseases and pests of mushroom and their management
5. To provide detailed hands on training on mushroom cultivation, packaging and marketing.
6. Knowing harvesting and post harvesting processes of mushroom
7. Learning value added products preparation from mushroom
8. To develop a business plan on mushroom cultivation.
9. Having the prospects of commercial mushroom production
10. To help the learners to practice a means of self employment and income generation.

DURATION: 6 MONTHS

Course Syllabus

A. Theory

Credits:04

1. History, Introduction and types of mushroom

- 1.1 What are mushrooms?
- 1.2 Edible & Poisonous Mushrooms
- 1.3 Survival of Mushroom in nature
- 1.4 History of mushroom cultivation and present status
- 1.5 Mushroom Cultivation & Techniques
- 1.6 Nutrient Values of Mushroom

2. Basic steps in spawn production

- 2.1 Mushroom spawn (seed) production/procurement
- 2.2 Spawn preparation
- 2.3 Equipments required in spawn lab
- 2.4 Spawn storage
- 2.5 Spawn transport

3. Preparation of compost for cultivation of button mushroom

- 3.1 What is Compost?
- 3.2 Ingredients and formulations
- 3.3 Short method of composting
- 3.4 Long method of composting

4. Cultivation technique in button mushroom

- 4.1 Spawning
- 4.2 Casing preparation
- 4.3 Case Run
- 4.4 Watering
- 4.5 Maintenance of temperature and air
- 4.6 Harvesting

B. Hand on Training/Theory

Credits:04

5. Cultivation of other economically important and medicinal mushroom

- 5.1 Cultivation of King oyster
- 5.2 Cultivation of Medicinal mushroom- *Ganoderma lucidum*, and *Shiitake*

6. Mushroom growing unit/house

- 6.1 Site selection criteria
- 6.2 Farm design for cultivation of button mushroom

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- 6.3 Machinery required for spawn preparation, compost making and growing unit
- 6.4 Cost benefit ratio

Entrepreneurial skills and economics for small enterprise

- 7. Fund generation
- 7.1 Financial management
- 7.2 Terms used in project report
- 7.3 Cost of production of button mushroom in different systems

Credits:04

Hand on Training/Theory

C. Value addition of mushroom

- 8. Preservation of mushrooms
- 8.1 Drying of mushrooms
- 8.2 Canning of mushrooms
- 8.3 Steeping preservation of mushrooms
- 8.4 Value added products of mushrooms
- 8.5 Conventional products
- 8.6 Novel value added products of mushrooms
- 8.7 Quality assurance, shelf life and packaging

Credits:04

D. Hand on Training/Theory

9. Disease management in cultivated mushroom

- 9.1 Competitor/indicator/weed moulds and other indicators
- 9.2 Fungal diseases
- 9.3 Bacterial and viral diseases
- 9.4 Abiotic disorders
- 9.5 Sanitation and hygiene
- 9.6 Cook out after cropping

10. Insect-pests management in cultivated mushroom

- 10.1 Mushroom flies
- 10.2 Mites

- 10.3 Nematodes

- 10.4 Spring tails

11. Management of spent substrates and waste disposal of various mushroom

- 11.1 Cost of substrate consumed
- 11.2 Crop production
- 11.3 Reuse in the cultivation of mushrooms
- 11.4 Food for animals and fish
- 11.5 Pest management
- 11.6 Bioremediation

Credits:04

E. Hand on Training/Theory

12. Health and safety at workplace

- 12.1 Standard operating procedures (sop's) for cultivation of mushrooms
- 12.2 About health, allergies and basic facilities to workers
- 12.3 Safety practices at work place, precautions against fire and other hazards
- 12.4 Wild mushrooms and mushroom poisoning

