

# **Annexure-I**

**Session 2014-15 & 2015-16**

**HIMACHAL PRADESH UNIVERSITY SHIMLA-171005**

**CHOICE BASED CREDIT SYSTEM  
(CBCS)-B.Sc. Botany (Major)**

**Syllabus and Examination for B.Sc. Botany (Major)**

**Under CBCS**

**Semester System**

Approved in BOS meeting in the Subject of Botany held on  
7 November 2016

Annexure-I of  
BOS Meeting

**BIOSCIENCES DEPARTMENT  
HIMACHAL PRADESH UNIVERSITY**

**OUT LINES OF SYLLABI AND COURSES OF READING**

**IN THE SUBJECT OF BOTANY FOR B. Sc. WITH MAJOR IN BOTANY AND  
MINORELECTIVE IN BOTANY JUNE-2016**

**(A) Structure Outline of Major in Botany (Minimum Credits to be Earned=48)**

Semester	Course Code	Course Type	Course Name	Credit(s)/ week	Cumulated Credits Category wise
I (Odd)		Compulsory Course I	To be Selected from the list of Compulsory Courses	3	Compulsory – 6 <b>Core – 8</b> Elective – 8 GI & H – 1 Total – 23
		Compulsory Course II (Skill Based)	To be Selected from the list of Compulsory Courses (Skill Based)	3	
	<b>BSCBOT0101</b>	Major Core Course I	<b>Phycology, Mycology and Plant Pathology</b>	3	
	<b>BSCBOT0102</b>	Major Core Course II	<b>Bryophyta and Pteridophyta</b>	3	
		Minor Elective Course I (a)	To be Selected from the list for Minor Elective Subject other than Botany	3	
		Minor Elective Course I (b)	To be Selected from the list for Minor Elective Subject other than Botany	3	
	<b>BSCBOT0101(P)</b>	Major Core Lab Course I	<b>Phycology, Mycology and Plant Pathology</b>	1	
	<b>BSCBOT0102(P)</b>	Major Core Lab Course II	<b>Bryophyta and Pteridophyta</b>	1	
		Minor Elective Lab Course I (a)	To be Selected from the list for Minor Elective Subject other than Botany	1	
		Minor Elective Lab Course I (b)	To be Selected from the list for Minor Elective Subject other than Botany	1	
		GI and H Course I	To be Selected from the list GI and Hobby Courses	1	

Semester	Course Code	Course Type	Course Name	Credit(s)/week	Cumulated Credits Category wise
II (Even)		Compulsory Course III	To be Selected from the list of Compulsory Courses	3	Compulsory – 6 (12) <b>Core – 8 (16)</b> Elective – 8 (16) GI & H – 1 (2) Total 23 (46)
		Compulsory Course IV(Skill Based)	To be Selected from the list of Compulsory Courses (Skill Based)	3	
	<b>BSCBOT0203</b>	Major Core Course III	<b>Palaeobotany and Gymnosperms</b>	3	
	<b>BSCBOT0204</b>	Major Core Course IV	<b>Plant Taxonomy and Selected Families of Angiosperms</b>	3	
		Minor Elective Course II (a)	To be Selected from the list for Minor Elective Subject other than Botany	3	
		Minor Elective Course II (b)	To be Selected from the list for Minor Elective Subject other than Botany	3	
	<b>BSCBOT0203(P)</b>	Major Core Lab Course III	<b>Palaeobotany and Gymnosperms</b>	1	
	<b>BSCBOT0204(P)</b>	Major Core Lab Course IV	<b>Plant Taxonomy and Selected Families of Angiosperms</b>	1	
		Minor Elective Lab Course II (a)	To be Selected from the list for Minor Elective Subject other than Botany	1	
		Minor Elective Lab Course II ()	To be Selected from the list for Minor Elective Subject other than Botany	1	
		GI and H Course II	To be Selected from the list GI and Hobby Courses	1	
III (Odd)		Compulsory Course V	To be Selected from the list of Compulsory Courses	3	Compulsory – 6 (18) (Complete) <b>Core – 8 (24)</b> Elective – 8 (24) GI & H – 1 (3) (Complete) Total 23 (69)
		Compulsory Course VI	To be Selected from the list of Compulsory Courses (Skill Based)	3	
	<b>BSCBOT0305</b>	Major Core Course V	<b>Economic Botany and Plant Anatomy</b>	3	
	<b>BSCBOT0306</b>	Major Core Course VI	<b>Embryology of Angiosperms</b>	3	

Semester	Course Code	Course Type	Course Name	Credit(s)/week	Cumulated Credits Categorywise
		Minor Elective Course III (a)	To be Selected from the list for Minor Elective Subject other than Botany	3	
		Minor Elective Course III(b)	To be Selected from the list for Minor Elective Subject other than Botany	3	
	<b>BSCBOT0305(P)</b>	Major Core Lab Course V	<b>Economic Botany and Plant Anatomy</b>	1	
	<b>BSCBOT0306(P)</b>	Major Core Lab Course VI	<b>Embryology of Angiosperms</b>	1	
		Minor Elective Lab Course III(a)	To be Selected from the list for Minor Elective Subject other than Botany	1	
		Minor Elective Lab Course III(b)	To be Selected from the list for Minor Elective Subject other than Botany	1	
		GI and H Course III	To be Selected from the list GI and Hobby Courses	1	
<b>IV (Even)</b>	<b>BSCBOT0407</b>	Major Core Course VII	<b>Cytogenetics</b>	3	<b>Core – 12 (36)</b> Elective – 8 ((32) Core / Elective (additional) - 4 Total 24 (93)
	<b>BSCBOT0409</b>	Major Core Course IX	<b>Cell Biology</b>	3	
		Minor Elective Course IV (a)	To be Selected from the list for Minor Elective Subject other than Botany	4	
		Minor Elective Course IV (b)	To be Selected from the list for Minor Elective Subject other than Botany	4	
	<b>BSCBOT0407(P)</b>	Major Core Lab Course VII	<b>Cytogenetics</b>	1	
	<b>BSCBOT0409(P)</b>	Major Core Lab course IX	<b>Cell Biology</b>	1	
		Minor Elective Lab Course IV (a)	To be Selected from the list for Minor Elective Subject other than Botany	1	

Semester	Course Code	Course Type	Course Name	Credit(s)/week	Cumulated Credits Categorywise
		Minor Elective Lab Course IV(b)	To be Selected from the list for Minor Elective Subject other than Botany	1	
		Core / Elective Course (Additional)*		4	
<b>V (Odd)</b>	<b>BSCBOT0510</b>	Major Core Course X	<b>Biochemistry</b>	3	<b>Core – 12 (48)</b> Elective – 8 (40) (Complete) Core / Elective (additional) - 4 Total 24 (117)
	<b>BSCBOT0511</b>	Major Core Course XI	<b>Biotechnology</b>	3	
		Minor Elective Course V(a)	To be Selected from the list for Minor Elective Subject other than Botany	3	
		Minor Elective Course V(b)	To be Selected from the list for Minor Elective Subject other than Botany	3	
	<b>BSCBOT0510(P)</b>	Major Core Lab Course X	<b>Biochemistry</b>	1	
	<b>BSCBOT0511(P)</b>	Major Core Lab Course XI	<b>Biotechnology</b>	1	
		Minor Elective Lab Course V (a)	To be Selected from the list for Minor Elective Subject other than Botany	1	
		Minor Elective Lab Course V (b)	To be Selected from the list for Minor Elective Subject other than Botany	1	
	Core / Elective Course (Additional)*	Any one of the Additional or open elective courses	4		
<b>VI (Even)</b>	<b>BSCBOT0613</b>	Major Core Course XIII	<b>Ecology</b>	3	<b>Core – 8 (56)</b> Core / Elective (additional) – 20* Total 28 (145)
	<b>BSCBOT0614</b>	Major Core Course XIV	<b>Plant Physiology</b>	3	
	<b>BSCBOT0613(P)</b>	Major Core lab Course XIII	<b>Ecology</b>	1	
	<b>BSCBOT0614(P)</b>	Major Core lab Course XIV	<b>Plant Physiology</b>	1	
	BSC(Or Other than Science) BOT(or other than Botany) 06**	Core / Elective Course (Additional)*	Any one of the Additional or open elective courses	4	

Semester	Course Code	Course Type	Course Name	Credit(s)/week	Cumulated Credits Category wise
	BSC(Or Other than Science) BOT(or other than Botany) 06**	Core / Elective Course (Additional)*	Any one of the Additional or open elective courses	4	
	BSC(Or Other than Science) BOT(or other than Botany) 06**	Core / Elective Course (Additional)*	Any one of the Additional or open elective courses	4	
	BSC(Or Other than Science) BOT(or other than Botany) 06**	Core / Elective Course (Additional)*	Any one of the Additional or open elective courses	4	
	BSC(Or Other than Science) BOT(or other than Botany) 06**	Core / Elective Course (Additional)*	Any one of the Additional or open elective courses	4	

**Note: Students in VI semester can opt any of the following courses.**

**\*Additional Elective Courses offered by Biosciences Department in Botany (can be chosen for earning credits over and above 48 Major subject credits, 48 Minor elective credits, 9 (Min.) Compulsory course credits and 1 (Min.) 3GI & H Course credits i.e. total 106 credits; for getting B.Sc. Degree a learner has to earn a minimum of 120 credits.) Students in VI semester can opt any of the following courses.**

Semester	Course Code	Course Type	Course Name	Credit(s)/week	Cumulated Credits Category wise
VI	BSCBOT0408	Core Elective	Evolutionary Biology	3	
VI	BSCBOT0408(P)		Evolutionary Biology	1	
VI	BSCBOT 0512	Core Elective	Molecular biology	3	
VI	BSCBOT0512(P)		Molecular biology	1	

VI	BSCBOT0615	Core / Elective Course (Additional)*	Plant Pathology	4	
VI	BSCBOT0616	Core / Elective Course (Additional)*	Microbiology	4	
VI	BSCBOT0617	Core / Elective Course (Additional)*	Techniques in Biological Research	4	
VI	BSCBOT0618	Core / Elective Course (Additional)*	Utilization of Plants	4	
VI	BSCBOT0619	Core / Elective Course (Additional)*	Ethnobotany	4	
VI	BSCBOT0620	Core / Elective Course (Additional)*	Plant Breeding	4	
VI	BSCBOT0621 (also Open in IV semester)	Core / Elective Course (Additional)*	Biodiversity	4	
VI	BSCBOT0622 (also Open in V Semester)	Core / Elective Course (Additional)*	Bioinformatics	4	

**\*Open Elective Courses offered by Botany Department**

Semester	Course Code	Course Type	Course Name	Credit(s)/ week	Cumulated Credits Categorywise
VI	BSCBOT0623	Open /Core Elective Course (Additional)*	Floriculture	4	
VI	BSCBOT0624	Core / Elective Course (Additional)*	Mushroom Cultivation	4	

### General Interest Courses Offered by Botany Department

Semester	Course Code	Course Type	Course Name	Credit(s)/week	Cumulated Credits Categorywise
I/II/III	BSCBOT**25	GI/H	Psychoactive Plants and Society	1	
I/II/III	BSCBOT**26	GI/H	Digital Photography	1	
I/II/III			Botanical Garden & Herbaria		
I/II/III			Diversity In Orchids		
I/II/III			Mechanism of pollination in plants		
I/II/III			Bioluminescence & Insectivorous plants		



**(B) Structure Outline of Minor Elective in Botany for other than Major Botany Students (Minimum Credits to be Earned=24). Other than Botany Major Learner can do Double major by earning 34 more credits over and above 24 credits of Minor Elective.**

Semester	Course Code	Course Name	Course Name	Credit(s)/week	Cumulated Credits Category-wise
I (Odd)		Compulsory Course I		3	Compulsory – 6 Core – 8 <b>Minor Elective 1(a) – 4(4)</b> Minor Elective 1(b)=4 Total Minor Electives – 8 (8) GI & H – 1 Total – 23
		Compulsory Course II (Skill Based)		3	
		Major Core Course I		3	
		Major Core Course II		3	
	<b>BSCBOT0101</b>	<b>Minor Elective Course I (a)</b>	<b>Phycology, Mycology and Plant Pathology</b>	<b>3</b>	
		Minor Elective Course I (b)		1	
		Major Core Lab Course I		1	
		Major Core Lab Course II		1	
	<b>BSCBOT0101(P)</b>	<b>Minor Elective Lab Course I (a)</b>	<b>Phycology, Mycology and Plant Pathology</b>	<b>1</b>	
		Minor Elective Lab Course I (b)		1	
	GI and H Course I		1		
II (Even)		Compulsory Course III		3	Compulsory – 6 (12) Core – 8 (16) <b>Minor Elective 1I(a) – 4 (8)</b> Minor Elective 1I(b) – 4 (8) Total Minor Electives – 8 (16) GI & H – 1 (2) Total 23 (46)
		Compulsory Course IV(Skill Based)		3	
		Major Core Course III		3	
		Major Core Course IV		3	
	<b>BSCBOT0203</b>	<b>Minor Elective Course II (a)</b>	<b>Palaeobotany and Gymnosperms</b>	<b>3</b>	
		Minor Elective Course II (b)		3	
		Major Core Lab Course III		1	
		Major Core Lab Course IV		1	
	<b>BSCBOT0203(P)</b>	<b>Minor Elective Lab Course II (a)</b>	<b>Palaeobotany and Gymnosperms</b>	<b>1</b>	
		Minor Elective Lab Course II		1	
	GI and H Course II		1		

III (Odd)		Compulsory Course V		3	Compulsory – 6 (18) (Complete) Core – 8 (24) <b>Minor Elective III(a) – 4 (12)</b>
		Compulsory Course VI		3	
		Major Core Course V		3	
		Major Core Course VI	-----	3	
<b>Semester</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Course Name</b>	<b>Credit(s)/week</b>	<b>Cumulated Credits Category-wise</b>
	<b>BSCBOT0102</b>	<b>Minor Elective Course III (a)</b>	<b>Bryophyta and Pteridophyta</b>	<b>3</b>	Minor Elective III(b) – 4 (12) Elective – 8 (24) GI & H – 1 (3) (Complete) Total 23 (69)
		Minor Elective Course III (b)	-----	3	
		Major Core Lab Course V	-----	1	
		Major Core Lab Course VI	-----	1	
	<b>BSCBOT0102(P)</b>	<b>Minor Elective Lab Course III(a)</b>	<b>Bryophyta and Pteridophyta</b>	<b>1</b>	
		Minor Elective Lab Course III (b)	-----	1	
		GI and H Course III	-----	1	
IV (Even)		Major Core Course VII	-----	4	Core – 12 (36) <b>Minor Elective IV(a) – 4 (16)</b> Minor Elective IV(b) – 4 (16) Total Minor Electives – 8 (32) Core / Elective (additional) - 4 Total 24 (93)
		Major Core Course VIII	-----	4	
		Major Core Course IX	-----	4	
	<b>BSCBOT0204</b>	<b>Minor Elective Course IV (a)</b>	<b>Plant Taxonomy and Selected Families of Angiosperms</b>	<b>4</b>	
		Minor Elective Course IV (b)	-----	4	
		Major Core Lab Course VII	-----	1	
		Major Core Lab Course VIII	-----	1	
	<b>BSCBOT0204(P)</b>	<b>Minor Elective Lab Course IV (a)</b>	<b>Plant Taxonomy and Selected Families of Angiosperms</b>	<b>1</b>	
		Minor Elective Lab Course IV (b)	-----	1	
	Core / Elective Course (Additional)*	-----	4		

V (Odd)		Major Core Course X	-----	3	Core – 12 (48) <b>Minor Elective V(a) – 4 (20)</b> Minor Elective V(b) – 4 (20) Total Minor Electives – 8 (40) (Complete) Core / Elective (additional) - 4
		Major Core Course XI	-----	3	
		Major Core Course XII	-----	3	
	<b>BSCBOT305</b>	<b>Minor Elective Course V(a)</b>	<b>Economic Botany and Plant Anatomy</b>	<b>3</b>	
		Minor Elective Course V (b)	-----	3	
		Major Core Lab Course X	-----	1	
		Major Core Lab Course XI	-----	1	
<b>Semester</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Course Name</b>	<b>Credit(s)/week</b>	<b>Cumulated Credits Category-wise</b>
		Major Core Lab Course XII *	-----	1	Total 24 (117)
	<b>BSCBOT305(P)</b>	<b>Botany Lab V</b>	<b>Economic Botany and Plant Anatomy</b>	<b>1</b>	
		Minor Elective Lab Course V (b)	-----	1	
		Core / Elective Course (Additional)*	-----	4	
VI (Even)		Major Core Course XIII	-----	4	Core – 8 (56) Core / Elective (additional) – 20* Total 28 (145)
	<b>BSCBOT0614</b>	<b>Minor Elective Course VI (a)</b>	<b>Plant Physiology</b>	<b>3</b>	
		Core / Elective Course (Additional)*	-----	4	
		Core / Elective Course (Additional)*	-----	4	
		Core / Elective Course (Additional)*	-----	4	
		Core / Elective Course (Additional)*	-----	4	
		Core / Elective Course (Additional)*	-----	4	
	<b>BSCBOT0614 (P)</b>	<b>Botany Lab VI</b>	<b>Plant Physiology</b>	<b>1</b>	

**Code: BSCBOT0614**

**Plant Physiology**

**Credits = 3**

Course duration- 40Hours

**UNIT-I**

**Subunit-A (Plant Water Relations):** Overview of plant cell structure and its chemical constituents; importance of water to plant life; Water as Biological solvent, physical and chemical properties of water; Solutions and Colloids; Diffusion and osmosis; Water potential and DPD; Absorption and transport of water; Transpiration and physiology of stomata.

\_\_\_\_\_ **06 Hours**

**Subunit-B (Mineral Nutrition):** Criteria of essentiality of minerals; Macro and micro elements and their role; Mechanism of mineral uptake; Deficiency and toxicity symptoms.

\_\_\_\_\_ **03 Hours**

**Subunit-C (Photosynthesis):** Significance; Historical aspects; Photosynthetic pigments; Photosynthetically active radiations; Absorption and action spectra; Red drop and enhancement effect; Concept of two photosystems; Z-Scheme of photosynthetic electron transport chain; Theories of photophosphorylation; Types of photophosphorylation; C-3, C-4 pathway of Carbondioxide fixation; CAM plants; Photorespiration; Law of limiting factors.

\_\_\_\_\_ **10 Hours**

**UNIT-II**

**Subunit-D (Transport of Organic Solutes):** Mechanism of phloem transport; Source sink relationship; Factors affecting translocation. \_\_\_\_\_ **03 Hours**

**Subunit-E (Plant Growth):** Definitions; Phases of growth and development; Kinetics of growth; Measurement of growth. \_\_\_\_\_ **02 Hours**

**Subunit-F (Plant Growth Hormones):** History, discovery, physiological role and mechanism of action of Plant growth hormones: Auxins, Gibberellins, Cytokinins, Abscisic acid and Ethylene; Physiology of senescence. \_\_\_\_\_ **07 Hours**

**Subunit-G (Photomorphogenesis):** Definition; Discovery of Phytochromes, physiological role and mechanism of action; Cryptochromes and their role in development; Concept of Photoperiodism; Physiology of flowering and Florigen concept; Biological clocks; General account of Signal transduction. \_\_\_\_\_ **04 Hours**

**Subunit-H (Seed Germination and Dormancy):** Definitions; Physiology of seed germination; Type of seed dormancy; Factors affecting seed dormancy; Methods of breaking seed dormancy; Significance of seed dormancy; Concept of vernalization. \_\_\_\_\_ **02 Hours**

**Subunit-I (Plant Movements):** Overview of plant movements; detailed account of Phototropism, Gravitropism and Nastic movements. \_\_\_\_\_ **03 Hours**

PRACTICAL  
Code: BSCBOT 0614(P)

Plant Physiology                      Credit = 1

1. Methods of expressing the strength of a solution (Percent solution, Molar solution, Molal solution and ppm solution).
2. Demonstration of Tyndall phenomenon.
3. Preparation of suspension, emulsion, suspenoid and emulsoid.
4. Demonstration of diffusion and Brownian movement.
5. Observation of streaming movement of the protoplasm.
6. Demonstration of Imbibition and Imbibition pressure.
7. Demonstration of Osmosis, Exosmosis and Endosmosis.
8. Measurement of Osmotic pressure of a plant cell.
9. Demonstration of effect of temperature and organic solvents on membrane permeability.
10. Demonstration of water movement through xylem.
11. Demonstration of root pressure and guttation.
12. **Stomatal studies:** Calculation of stomatal index; Effect of light and dark; Effect of Potassium ions and ABA.
13. Demonstration of transpiration, its water lifting power and loss of weight during transpiration.
14. Study of relative rates of transpiration from the upper and lower surfaces of the leaf; A comparative study (Four leaf method; Cobalt chloride method and bell-jar method).
15. Measurement of transpiration rate by Simple, Ganong, Farmer and Bose photometers.
16. Preparation of nutrient solution for water culture experiments (Study of mineral deficiency).
17. Test of Phosphate, Nitrate, Potassium, Calcium and Iron in plant tissues.
18. Isolation of photosynthetic pigments by differential solubility method and Paper chromatography technique (Ascending & Horizontal).
19. Determination of Absorption spectrum of Chlorophyll-a and Chlorophyll-b.
20. **Light reaction of Photosynthesis:** Effect of different wavelengths;  
Ganong's light screen; Chlorophyll essentiality; Oxygen evolution and its measurement (Wilmott bubbler & Ganong's photosynthometer); Hill reaction demonstration.
21. **Dark reaction of Photosynthesis:** Carbon dioxide essentiality;  
Starch synthesis in chloroplasts.
22. Test the presence of Carbohydrates, Amino acids, Proteins, Lipids and Nucleic acids in plant tissues.
23. Demonstration of Catalase activity, Effect of temperature, pH, and Substrate concentration.
24. **Translocation of Carbohydrates:** Translocation out of leaves; Phloem as translocation channel.
25. **Respiration:** Demonstration of anaerobic and aerobic respiration;  
Fermentation (Kuhne's fermentation vessel); Release of carbon dioxide and use of oxygen during aerobic respiration;
26. **Respiratory quotient (RQ):** Measurements by Ganong's respirometer and Double respirosopes.
27. **Growth:** Axial stem growth measurement by Arc-auxanometer and  
Pfeffer's (Automatic) auxanometer; Rooting effect of Auxins (IBA); Effect of Gibberellins (GA) on plant growth; Delaying of senescence by Cytokinins and fastening by Abscisic acid (ABA); Demonstration of etiolation in germinating seeds; Determination of seed viability by NTC test; Plant movements study (Phototropism, Geotropism, Hydrotropism and Seismonasty).

## For the Session 2014-15

**Scheme of Examinations for every major /minor and additional course:**

End semester examination = **50** marks Time 3 hrs

**Internal Assessment: 50 marks**

Mid –term test after 8 weeks (48 days) of teaching = 15 marks  
 Mid- term test after 15 weeks (90 days) of teaching = 15 marks  
 Seminar/Assignment/term paper = 15 marks Time 30 mins  
 Attendance = 05 marks

Practicals **50** Marks Time 3 hrs.

## For the session 2015-16

**Scheme of Examinations for every major /minor and additional course:**

End semester examination = **40** marks Time 3 hrs

Internal Assessment= **30** Marks (Unit Test= 15 Marks, Assignment=10 Marks & Attendance= 5 Marks)

Practicals of every major/minor/additional course **30** Marks Time 3 hrs

GI/Hobby Courses 25 Marks