K.K. UNIVERSITY

NALANDA, BIHAR - 803115

School of Applied Sciences

Bachelor of Science (B.Sc.)

Botany

(Three Years Full Programme)

2024-2025

PROGRAMME STRUCTURE & SYLLABUS

Under CBCS & NEP 2020

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Programme Structure B.Sc Botany

School Of Applied Science

(Aligned with CBCS & New Education Policy-2020)

No.	Type Of Course	Credits
1	Core Courses (CC)	56
2	Open Elective Courses (OEC)	40
3	Discipline Specific Elective Courses (DSEC)	10
4	Ability Enhancement Courses (AEC)	06
5	Skill Enhancement Courses (SEC)	08
	Total	**120**

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B.Sc. BOTANY

Programme/Course Structure
(For total credits: 120)

Year	Semester	Type Of Course	Course Code	Course Title	L	T	P	C
1	1	CC	BSBT 1101	NON - VASCULAR PLANTS-I	4	1	0	5
		CC	BSBT 1101P	NON-VASCULAR PLANTS-I LAB	0	0	4	2
		Choose Any Two Subjects (Open Elective-I)						
		OEC	BSZGS-1101	ZOOLOGY I	3	0	0	3
			BSCHS 1101	CHEMISTRY - I	3	0	0	3
			BSBCHS1101	BIOCHEMISTRY	3	0	0	3
		OEC	BSZGS1101P	ZOOLOGY- I LAB	0	0	4	2
		OEC	BSCHS1101P	CHEMISTRY- I LAB	0	0	4	2
		OEC	BSBCHS1101P	BIOCHEMISTRY LAB	0	0	4	2
		AEC	HNL1101	Hindi	2	0	0	2
			Total					**19**
	2	CC	BSBT 1201	NON- VASCULAR PLANTS-II	4	1	0	5
		CC	BSBT 1201 P	PRACTICAL : NON-VASCULAR PLANTS-II	0	0	4	2
		Choose Any Two Subjects (Open Elective-II)						
		OEC	BSZG S-1201	ZOOLOGY - II	3	0	0	3
			BSCHS1201	CHEMISTRY - II	3	0	0	3
			BSHPS1201	HUMAN PHYSIOLOGY	3	0	0	3
		OEC	BSZGS1201P	PRACTICAL : ZOOLOGY -II	0	0	4	2
		OEC	BSCHS 1201 P	PRACTICAL : CHEMISTRY -II	0	0	4	2
		OEC	BSHPS1201 P	PRACTICAL: HUMAN PHYSIOLOGY	0	0	4	2
		AEC	BSEVS 1201	ENVIRONMENTAL SCIENCE	1	1	0	2
		SEC	BSCS 1201	COMMUNICATION SKILL WORKSHOP	1	0	2	2
			Total					**21**
2	3	CC	BSBT 2101	VASCULAR PLANTS	4	1	0	5
		CC	BSBT 2101 P	VASCULAR PLANTS LAB	0	0	4	2
		Choose Any Two Subjects (Open Elective-III)						
		OEC	BSZGS2101	ZOOLOGY – III	3	0	0	3
			BSCHS 2101	CHEMISTRY – III	3	0	0	3
			BSBSS2101	BIOSTATISTICS	3	0	0	3
		OEC	BSZGS 2101 P	PRACTICAL : ZOOLGOY - III	0	0	4	2

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		OEC	BSCHS 2101 P	PRACTICAL : CHEMISTRY -III	0	0	4	2
		OEC	BSBSS2101 P	PRACTICAL: BIOSTATISTICS	0	0	4	2
		SEC	BSSE 2101	SPOKEN ENGLISH	1	1	0	2
			Total					**19**
	4	CC	BSBT 2201	MICRO BIOLOGY & PLANT PATHOLOGY	4	1	0	5
		CC	BSBT 2201 P	PRACTICAL : MICRO BIOLOGY & PLANT PATHOLOGY	0	0	4	2
		Choose Any Two Subjects (Open Elective-IV)						
		OEC	BSZGS 2201	ZOOLOGY – IV	3	0	0	3
			BSCHS 2201	CHEMISTRY – IV	3	0	0	3
			BSBPHS2201	BIOPHYSICS	3	0	0	3
		OEC	BSZGS 2201 P	PRACTICAL: ZOOLOGY- IV	0	0	4	2
		OEC	BSCHS2201 P	PRACTICAL: CHEMISTRY -IV	0	0	4	2
		OEC	BSBPHS2201 P	PRACTICAL: BIOPHYSICS	0	0	4	2
		AEC	BSEN 2201	ENGLISH	2	0	0	2
		Total						**19**
3	**5**	CC	BSBT 3101	PLANT PHYSIOLOGY	4	1	0	5
		CC	BSBT 3102	CYTOGENETICS & PLANT BREEDING	4	1	0	5
		CC	BSBT 3101 P	PRACTICAL : PLANT PHYSIOLOGY	0	0	4	2
		CC	BSBT 3102 P	PRACTICAL: CYTOGENETICS & PLANT BREEDING	0	0	4	2
		DSEC	BSBT 3103	PLANT BIOTECHNOLOGY & TISSUE CULTURE	2	1	0	3
		DSEC	BSBT 3013 P	PRACTICAL : PLANT BIOTECHNOLOGY & TISSUE CULTURE	0	0	4	2
		SEC	BSPDHW 3101	PLANT DIVERSITY & HUMAN WELFARE	2	0	0	2
		Total						**21**
	6	CC	BSBT 3201	BIO- CHEMISTRY & MOLECULAR BIOLOGY	4	1	0	5
		CC	BSBT 3203	PLANT ANATOMY AND EMBRYOLOGY	4	1	0	5
		CC	BSBT 3201 P	PRACTICAL: BIO- CHEMISTRY & MOLECULAR BIOLOGY	0	0	4	2
		CC	BSBT 3203 P	PRACTICAL : PLANT ANATOMY AND EMBRYOLOGY	0	0	4	2
		DSEC	BSBT 3202	PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	2	1	0	3
		DSEC	BSBT 3202P	PRACTICAL: PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	0	0	4	2
		SEC	BSHC 3201	HERBAL COSMETICS	2	0	0	2

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		Total				**21**

Total Credits: 120 (Six Semesters)

L- Lecture, T- Tutorial, P- Practical

K. K. UNIVERSITY

School Of Applied Sciences

Bachelor Of Science In Botany

SYLLABUS

Objective of the Program:

The Bachelor of Science in Botany program aims to provide students with a strong foundation in the biological sciences with a focus on plant biology. The objectives of the program include imparting comprehensive knowledge of plant diversity, anatomy, physiology, ecology, and genetics. Students will gain an understanding of the principles and theories governing plant life, as well as practical skills in plant identification, laboratory techniques, and fieldwork. The program seeks to cultivate critical thinking, analytical skills, and the ability to evaluate scientific information. Furthermore, it aims to foster a deep appreciation for the role of plants in ecosystems, conservation, and sustainable development. Ultimately, the B.Sc. Botany program aims to prepare students for further studies or careers in botany, plant sciences, biotechnology, agriculture, environmental science, and related fields by providing a solid scientific foundation and practical skills applicable to diverse professional settings.

PROGRAMME OUTCOME

PO1: Demonstrate Advanced Knowledge of Botany: Graduates will have a thorough understanding of key concepts, theories, and principles in botany, including

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plant anatomy, physiology, ecology, genetics, and evolution.

PO2: Apply Research Methods: Graduates will be proficient in applying scientific research methods, including experimental design, data collection, statistical analysis, and interpretation of results, to investigate botanical questions.

PO3: Conduct Independent Research: Graduates will be able to plan, execute, and present original research projects in botany, demonstrating autonomy, creativity, and critical thinking.

PO4: Interpret and Communicate Scientific Findings: Graduates will be able to effectively communicate scientific information through oral presentations, written reports, and scientific publications, tailored to both scientific and lay audiences.

PO5: Analyze Plant Diversity and Function: Graduates will be able to identify and classify plants, analyze their ecological roles, and understand their adaptations to various environments.

BSBT 1101: Non Vascular Plants- I

&

BSBT 1101P: Non Vascular Plant- I Lab

COURSE OUTCOME

CO1: Understanding of Non-Vascular Plant Diversity

CO2: Knowledge of Reproductive Strategies and Life Cycles

CO3: Students will gain practical skills in identifying non-vascular plants in the field and laboratory.

CO4: Analyse evolutionary relationships among different groups of non-vascular plants.

CO5: Students will be able to evaluate research articles and data related to non-vascular plants.

COURSE OBJECTIVE

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This course provides an in-depth exploration of algae and bryophytes, focusing on their taxonomy, morphology, physiology, ecology, and significance in various ecosystems. Students will engage in theoretical learning as well as practical exercises to understand the diversity and ecological roles of these important plant groups.

BSBT 1101: NON- VASCULAR PLANTS –I

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Algae: General character and classification of algae, General characteristics of Cyanophyceae with reference to Oscillatoria and Rivularia. Algae in relation to human welfare. Fungi: Occurrence, Cell wall composition, Modern concepts in classification of Fungi, Nutrition, Role of Fungi in human welfare. Typical life history of: Pythium, Phytopthora, Mucor, Saccharomyces, Europium, Peziza, Puccini a, Agarics, Alter aria, Collectotrichum. General account of Lichen.	10	1,2,3,4
II	General characters and classification of Bryophytes. Structure and life history of the following genera with reference to comparative studies of gametophytes and saprophytes: Marchantia, Pellia, Anthoceros, Sphagnum and Polytrichum. Fossils: Rhyme, Lepidodendron and Calamites.	6	5,6,7
	A general account of thallus and ultra-structure of Cyanobacterial cell, Photosynthesis and Reproduction. Economic importance as biofertilizer and as food (Single Cell Protein – SCP). Type study of Scytonema, Oscillatoria, Gloeotrichia.	8	8,9,10

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III			
IV	A general account of habitat, thallus structure, pigments, plastids, (including pyrenoids) reproduction, life cycle pattern and classification (based on Fritsch). Study of Structure, Reproduction and Lifecycles of Oedogonium, Consmarium, Chara, Caucheria, Diatoms (Pinnularia), Sargassum, Polysiphonia. Economic importance of Algae, Algal blooms (Diatomaceous earth)	**8**	**11,12, 13**
V	Revision Week	**8**	**14,15**

BSBT 1101 (P): NON – VASCULAR PLANTS –I LAB

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Mounting Technique : Mounting of Algae in Glycerine. Study of Cyanobacteria – Mycrocystis, Oscillatoria, Scytonema, Gloeotrichia.	**10**	**1,2,3,4**
II	Morphology, Structure and Reproductive parts of Algae (based on theory syllabus). Study of plant materials as prescribed in Algae, Fungi, Bryophyta.	**8**	**5,6,7**
III	Revision Week	**8**	**8,9,10**

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RECOMMENDED BOOKS:

1. V. Singh Pandey and Jain, A textbook of Botany (Algae, Fungi, Virus, Microbiology, Plant Pathology, Bryophytes, Pteridophytes and Gymnospersm) Rastogi Publications, Shivaji Road, Meerut.
2. Webster, J. and Weber, R. (2007) Introduction to Fungi. 3rd Edition, Cambridge University Press, Cambridge.
3. Raven, P.H., Johnson, G.B., Losos, J.B. and Singer, S.R. (2005) Biology. Tata MC Graw Hill.
4. Richardson, D.H.S. (1981) The Biology of Mosses. John Willey and Sons, New York.
5. Sambamurty (2008) A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany. IK International Publishers.
6. Shaw, A.J. and Goffinet, B. (2000) Bryophyte Biology. Cambridge University Press.

RECOMMENDED ONLINE RESOURCES:

https://youtu.be/lxEuquIAK9g?si=Nbb2dpDUDdxhmVzT

https://youtu.be/DEBhMn7zXsg?si=L9xMVZBCA_7Lwdm5

BSZG-S- 1101: ZOOLOGY –I

BIODIVERSITY-I: NON-CHORDATA

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Protozoa: General Characters and Reproduction in Protozoa. Metazoa : Origin of metazoan, Porifera: General Characters and Structural organization of Sycon. Cnidaria: General characters and Polymorphism in Cnidarians.	10	1,2,3,4

II	Platyhelminthes: General characters and Fasciola: Structure and life history Aschelminthes : General characters and Life history of Ascaris and its parasitic adaptations. Annelida: Gneral Characters and Adaptive radiations in Polychaeta.	**8**	**5,6,7**
III	Arthropoda: General Characters and Larval forms of crustacean; metamorphosis in Insecta Mollusca: General characters and Torsion and detorsion Echinodermata: General Characters and Water – vascular system and larval forms.	**10**	**8,9,10, 11**
IV	Revision Week	**8**	**12,13**

Suggested Readings:

1. Barnes, R.D. Invertebrate Zoology (1982) VI Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J. W., Golding, D.W. & J.I., Spicer (2002) The Invertebrates: a New Synthesis. III Edition. Blackwell Science.
3. Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson
4. Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students. Asia Publishing Home.

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BSCH-S- 1101: CHEMISTRY –I

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
1	Physical Chemistry Gaseous State (a) Kinetic Theory of gases, Derivation of kinetic gas equation, deduction of gas law, calculation of gas constants and kinetic theory. (b) Types of solids, crystal forces, law of constancy of angles, seven crystal systems, law of rational indices, Bragg's Law, Lattice energy, Born-Haber cycle	10	1,2,3,4
	Thermochemistry (a) Heat in chemical reactions, Reaction enthalpy, standard enthalpy changes. (b) Hess Law, Kirchoff Law (c) Bond energy and determination	8	5,6,7
	Ionic Equilibrium (a) Ionic Product of water, pH, pK_a, pK_b, pK_w (b) Buffer solution, Idea of buffer solution in everyday life. (c) Solubility product and it application in salt analysis. (d) Specific conductance, Molar conductance, Equivalent conductance.	8	8,9,10
II	Inorganic Chemistry Atomic Structure and Bonding (a) Features of H-spectra and Bohr's theory. (b) Shapes of orbital's and their labeling, idea of quantum number (c) Pauli's Exclusion Principle, Hund's rule, Aufbau Principle (d) Electronic configuration of elements	10	11,12

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	(e) Idea of ionic and covalent bonds, Ionization potential, Electro negativity, Electron affinity, Fajan's rule Chemistry of the following elements Li, Sn, Fluorine, Chlorine, Iodine		
III	Organic Chemistry Structure and Mechanism (a) Hybridization, bond angle, bond length, idea of bonds. (b) Inductive effect, electrometric effect, mesmeric effect (c) Bond fission and products.	8	13, 14
IV	Revision Week	6	15

HNL 1101: HINDI – I

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Hindi Bhasha ke Vibhinna Roop – Rashtra Bhasha, Rajbhasha, Janbhasha. Tippan, Aalekhan, Sankshepan, Sarkari Patra ke Prakar, Paribhashik Shabdawali. Anuvaad ki Paribhasha, Prakar, Upyogita aur Mahatva, Achhe Anuvaad ke Gun, Anuvaad Prayog (Hindi se Englishme Anuvaad).	**12**	**1,2,3,4,5**
II	Sambhashan Kala ka Artha, Sambhashan Ke Vibhinn Roop – Vaartalap, Vyakhyan, Vaad- Vivaad, Ekaalap, Avaachik Abhivyakti, Jan Sambodhan, Sambhashan kala ke Upaadaan – Bhasha Gyan, Antaraal Dhawani (Volume), Lahaja (Accent).	**10**	**6,7,9,10**
III	Sambhashan kala ke vibhinn Roop – Udghoshna, Sanchalan, Aankho Dekha Haal, vaachan Kala, Vaad-Vivaad Pratiyogita, Samuh Samvaad.	**8**	**11,12, 13**
IV	Revision Week	**8**	**14**

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Suggested Readings:

1. Karayalayeeya Hindi – Dr. Kailashnath Pandey – Prabhat Prakashan, New Delhi.
2. Prayojanmulak Hindi – Prayukti aur Anuvaad – Madhav Sontakke
3. Anuvaad Vigyan – Bholanath Tiwari
4. Bhashan aur Sambhashan ki Divya shakti – shri ram Aacharya – Yug Nirman Yojana Press, Mathura
5. Bhashan Kala – Dr. Mahesh Shama – GyanGanga Delhi.

BSZG –S- 1101 (P): ZOOLOGY –I LAB

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Protozoa: 1. Examination of Amoeba, Euglena, Parameciusm, Noctilluca, and Vorticella. Porifera. 2. Study of Sycon (including T.S. and L.S.) Euplectella: 3. Temporary mounts of spicules, gemmules and sponging fibres. Cnidaria: Study of Obelia, Sertularia, Millepora, Aurelia, and Metridium (including T.S. and L.S.).	14	1,2,3,4
II	Platyhelminthes: 4. Study of Fasciola, Taenia,, Echinococcus: life history and sections of Fasciola and Taenia Aschelminthes: 5. Study of male and female Ascaris (including sections). Annelida: 6. Demonstration through CD/charts etc: digestive and nervous systems of earthworm. 7. Temporary mounts: Ovary, pharyngeal and septal nephridia of earthworm. 8. Slides: T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm.	12	5,6,7

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	9. Specimens : Aphrodite, Heteronereis, Chaetopterus, Pheretima, Tubifex, Hirudinaria.		
III	Arthropoda: 10. Demonstration through CD/charts etc: digestive and nervous systems of cockroach. 11. Specimens/Slides: Limulus, spider, crustacean larvae, Daphnia, Balanus, Saculina, Cancer, Eupagurus, Scolopendra, Julus, termite, louse, wasp, honeybee, silkmoth and peripatus. Mollusca: 12. Demonstrations throughCD/charts etc: digestive system of Pila: Temporary mountsradula and gill of Pilla. 13. Specimens: Chiton, Dentalium Unio, Ostrea, Teredo, Loligo, Sepia, octopus and nautilus.	**12**	**8,9,10, 11**
IV	Echinodermata: 14. Slides : T.S. arm of Pentaceros, Echinoderm larvae. 15. Specimens: Pentaceros, Ophiura, Echinus, Cucumaria and Antedon.	**10**	**12,13, 14**
V	Revision Week	**8**	**15**

BSCH-S-1101 P: PRACTICAL: CHEMISTRY – I

PRACTICAL	
1.	Inorganic chemistry Volumetric Analysis (a) Acidimetric and alkalimetry (b) Use of Potassium permanganate and potassium dichromate (c) Iodometry
2.	Note book and Viva voce.

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B.SC. Botany 2 Years Course Structure

B.Sc. BOTANY (Hons.) - Program Structure - Total Credit - 118						
B.Sc. BOTANY (Hons.)						
Semester : I						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 1101	NON - VASCULAR PLANTS-I	3	1	0	4
2	BSZG-S- 1101	ZOOLOGY -I	3	0	0	3
3	BSCH-S- 1101	CHEMISTRY -I	3	0	0	3
4	HNL - 1101	HINDI-I	2	0	0	2
5	BSBT 1101(P)	NON-VASCULAR PLANTS-I LAB	0	0	6	3
6	BSZG-S-1101(P)	ZOOLOGY- I LAB	0	0	4	2
7	BSCH-S-1101(P)	CHEMISTRY- I LAB	0	0	4	2
						19
semester : II						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 1201	NON- VASCULAR PLANTS-II	3	1	0	4
2	BSZG -S- 1201	ZOOLOGY -II	3	0	0	3
3	BSCH-S- 1201	CHEMISTRY-II	3	0	0	3
4	ENG 1201	ENGLISH-II	2	0	0	2
5	BSBT 1201 (P)	PRACTICAL : NON-VASCULAR PLANTS-II	0	0	6	3
6	BSZG-S- 1201(P)	PRACTICAL : ZOOLOGY -II	0	0	4	2
7	BSCH-S- 1201 (P)	PRACTICAL : CHEMISTRY -II	0	0	4	2
						19
semester : III						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**

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1	BSBT 2101	VASCULAR PLANTS	3	1	0	4
2	BSZG-S- 2101	ZOOLOGY-III	3	0	0	3
3	BSCH-S- 2101	CHEMISTRY-III	3	0	0	3
4	HNL 2101	HINDI-II	2	0	0	2
5	BSBT 2101 (P)	VASCULAR PLANTS LAB	0	0	6	3
6	BSZG-S- 2101 (P)	PRACTICAL : ZOOLGOY - III	0	0	4	2
7	BSCH-S- 2101 (P)	PRACTICAL : CHEMISTRY -III	0	0	4	2
						19

B.Sc. BOTANY (Hons.) - Program Structure - Total Credit - 118

B.Sc. BOTANY (Hons.)

Semester : IV

S.No.	Subject Code	Subject Name	L	T	P	Total Credit
1	BSBT 2201	MICRO BIOLOGY & PLANT PATHOLOGY	3	1	0	4
2	BSZG-S- 2201	ZOOLOGY -IV	3	0	0	3
3	BSCH-S- 2201	CHEMISTRY- IV	3	0	0	3
4	ENL -2201	ENGLISH-II	2	0	0	2
5	BSBT 2201 (P)	PRACTICAL : MICRO BIOLOGY & PLANT PATHOLOGY	0	0	6	3
6	BSZG-S- 2201 (P)	PRACTICAL: ZOOLOGY- IV	0	0	4	2
7	BSCH-S- 2201 (P)	PRACTICAL: CHEMISTRY -IV	0	0	4	2
						19

semester : V

S.No.	Subject Code	Subject Name	L	T	P	Total Credit
1	BSBT 3101	PLANT PHYSIOLOGY	3	1	0	4
2	BSBT 3102	CYTOGENETICS & PLANT BREEDING	3	1	0	4
3	BSBT 3103	PLANT BIOTECHNOLOGY & TISSUE CULTURE	3	1	0	4
4	BSBT 3101 (P)	PRACTICAL : PLANT PHYSIOLOGY	0	0	6	3

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5	BSBT 3102 (P)	PRACTICAL: CYTOGENETICS & PLANT BREEDING	0	0	6	3
6	BSBT 3013 (P)	PRACTICAL : PLANT BIOTECHNOLOGY & TISSUE CULTURE	0	0	6	3
						21
semester : VI						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 3201	BIO- CHEMISTRY & MOLECULAR BIOLOGY	3	1	0	4
2	BSBT 3202	PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	3	1	0	4
3	BSBT 3203	PLANT ANATOMY AND EMBRYOLOGY	3	1	0	4
4	BSBT 3201 (P)	PRACTICAL: BIO- CHEMISTRY & MOLECULAR BIOLOGY	0	0	6	3
5	BSBT 3202(P)	PRACTICAL: PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	0	0	6	3
6	BSBT 3203 (P)	PRACTICAL : PLANT ANATOMY AND EMBRYOLOGY	0	0	6	3
						21

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School Of Applied Sciences

Bachelor Of Science In Botany

Semester : II						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 1201	NON- VASCULAR PLANTS-II	3	1	0	4
2	BSZG -S- 1201	ZOOLOGY -II	3	0	0	3
3	BSCH-S- 1201	CHEMISTRY-II	3	0	0	3
4	ENG 1201	ENGLISH-II	2	0	0	2
5	BSBT 1201 (P)	PRACTICAL : NON-VASCULAR PLANTS-II	0	0	6	3
6	BSZG-S- 1201(P)	PRACTICAL : ZOOLOGY -II	0	0	4	2

SYLLABUS

K.K. UNIVERSITY 803115 NALANDA

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7	BSCH-S- 1201 (P)	PRACTICAL : CHEMISTRY -II	0	0	4	2
						19

Objective of the Program:

The Bachelor of Science in Botany program aims to provide students with a strong foundation in the biological sciences with a focus on plant biology. The objectives of the program include imparting comprehensive knowledge of plant diversity, anatomy, physiology, ecology, and genetics. Students will gain an understanding of the principles and theories governing plant life, as well as practical skills in plant identification, laboratory techniques, and fieldwork. The program seeks to cultivate critical thinking, analytical skills, and the ability to evaluate scientific information. Furthermore, it aims to foster a deep appreciation for the role of plants in ecosystems, conservation, and sustainable development. Ultimately, the B.Sc. Botany program aims to prepare students for further studies or careers in botany, plant sciences, biotechnology, agriculture, environmental science, and related fields by providing a solid scientific foundation and practical skills applicable to diverse professional settings.

PROGRAMME OUTCOME

PO1: Demonstrate Advanced Knowledge of Botany: Graduates will have a thorough understanding of key concepts, theories, and principles in botany, including plant anatomy, physiology, ecology, genetics, and evolution.

PO2: Apply Research Methods: Graduates will be proficient in applying scientific research methods, including experimental design, data collection, statistical analysis, and interpretation of results, to investigate botanical questions.

PO3: Conduct Independent Research: Graduates will be able to plan, execute, and present original research projects in botany, demonstrating autonomy, creativity, and critical thinking.

PO4: Interpret and Communicate Scientific Findings: Graduates will be able to effectively communicate scientific information through oral presentations, written reports, and scientific publications, tailored to both scientific and lay audiences.

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PO5: Analyze Plant Diversity and Function: Graduates will be able to identify and classify plants, analyze their ecological roles, and understand their adaptations to various environments.

BSBT 1201: Non Vascular Plants- II

&

BSBT 1201P: Non Vascular Plant- II Lab

COURSE OUTCOME

CO1: Understanding of Non-Vascular Plant Diversity

CO2: Knowledge of Reproductive Strategies and Life Cycles

CO3: Students will gain practical skills in identifying non-vascular plants in the field and laboratory.

CO4: Analyse evolutionary relationships among different groups of non-vascular plants.

CO5: Students will be able to evaluate research articles and data related to non-vascular plants.

COURSE OBJECTIVE

This course provides an in-depth exploration of algae and bryophytes, focusing on their taxonomy, morphology, physiology, ecology, and significance in various ecosystems. Students will engage in theoretical learning as well as practical exercises to understand the diversity and ecological roles of these important plant groups.

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BSBT 1201: NON- VASCULAR PLANTS –II

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Recent trends and criteria used in the classification of Fungi (C.J. Alexopoulos) Structure and reproduction: Albugo, Aspergillus, Pencillium, and Ceercospora. Cultivation methods of Mushroom: Mushrooms production: spawn and paddy straw polythene method of cultivation.	8	1,2,3,4
II	General characteristics, classification of Bryophytes. Structure and Reproduction of Marchantia, Anthoceros, Funaria. Economic importance of Bryophytes. Evolution – Gametophytes and Sporophytes. Systems and classification of – Bentham and Hooker, Engler and Prantl and Takhtajan's systems. Modern taxonomy – supporting evidence taxonomy in relation to embryology, Palynology, Cytology, Secondary metabolites (Chemotaxonomy).	10	5,6,7,8
III	Phylogeny of Angiosperm – A general account of Origin and Evolution Angiosperm (Special reference to bennettitalean. Gnetalean and Herbaceous, Origin theories). Important characters of the following Angiosperm families – Ranuculaceae, Euphorbiaceae, Acanthaceae, Amaranthaceae, Asclepiadaceae, Cucurbitaceae, Poaceae and Cyperaceae.	8	9,10,11,12
IV	Revision Week	8	13,14

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BSBT 1201 (P): PRACTICAL: NON – VASCULAR PLANTS – II

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Study of structure and reproductive parts (External and Internal) of Marchantia, Anthoceros and Funaria. Practical records, Herbarius field report.	24	1-12
II	Revision Week	8	13-14

RECOMMENDED BOOKS:

1. Vasishtha B.R. and others, Bryophytes S.Chand an Co New Delhi.
2. S.C. Dey "Mushroom Growing" Agro Bios Jodhpur.

RECOMMENDED ONLINE RESOURCES:

https://www.youtube.com/watch?v=wbyAyBClMx8&list=PLIMEmoNzKu2klUZQezm0xUbehaw-MwjfI

https://youtu.be/BYniptI5qTY?si=mD4YVQ8J7wTjiSa-

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BSZG-S- 1201: ZOOLOGY – II

BIODIVERSITY- II: CHORDATA

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	**Chordates:** Introduction and origin. **Protochordates:** General features and Phylogeny of Hemichordates, Urochordates and Cephalochordates. Retrogressive metamorphosis.	12	1,2,3,4,5
II	**Agnatha:** General features of living Agnatha. **Pisces:** Osmoregulation, Migration and parental care. **Amphibia:** Origin, Poisonous and non-poisonous snakes in India, Biting mechanism in snakes, Affinities of Sphenodon.	10	6,7,9,10
III	**Aves:** Origin, Flight adaptations, Mechanism of flight and Migration. **Mammals:** Origin of Mammals. Origin and evolution of human.	8	11,12
IV	Revision Week	8	14

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Suggested Readings:

1. Kardong, K.V. (2005) Vertebrates Comparative Anatomy, Function and evolution. IV Edition. McGraw –Hill Higher Education.
2. Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies.
3. Young, J.Z. (2004). The life of vertebrates. III Edition. Oxford university press.
4. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Barlett Publishers.

BSCH-S- 1201: CHEMISTRY –II

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
1	**Physical Chemistry** **Chemical Kinetics** (a) Rate of reaction, order and molecularity. (b) Expression for specific rate constant of first order reaction. (a) Half-life period and Units	8	1,2,3
	Colligative Properties (a) Osmosis and its determination. (b) Vapour Pressure (c) Raoult's law of lowering vapour pressure (d) Relation between osmotic pressure and lowering of vapour pressure.	10	4,5,6,7
II	**Inorganic Chemistry** Principles involved in the volumetric and gravimetric estimation of Cu and Fe. Isotopes: Brief idea of detection and separation, Radiocarbon dating .	8	8,9,10

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III	**Organic Chemistry** **Nomenclature** (a) IUPAC Nomenclature of aliphatic and aromatic compounds Chemistry of monohydric alcohol and Grignard reagent Idea of purification of compounds, Chromatography	8	11,12,13
IV	**Revision Week**	6	14

ENG 1201: ENGLISH –I

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	**I. Prose:** 1. The Bet - Anton Chekov 2. Socrates and the Schoolmaster – F.L. Brayne 3. An Astrologer's Day – R.K. Narayan 4. The Gift of the Magi – O' Henry 5. With the Photographer – Stephen Leacock	**12**	**1,2,3,4,5**
II	**II. Spoken Communication:** 1. Meeting People, Exchanging Greetings and Taking Leave 2. Introducing Yourself 3. Introducing People to Others 4. Answering the Telephone and Asking for Someone 5. Dealing with a Wrong Number 6. Taking and Leaving Messages 7. Making Inquiries on the Phone 8. Calling for Help in an Emergency	**10**	**6,7,9,10**

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III	I. Grammar and Vocabulary : Articles, prepositions, modal auxiliaries, antonyms, synonyms, one-word substitutes. Written Communication : Summarizing	**8**	**11,12**
IV	Revision Week	**8**	**14**

BSZG –S- 1201 (P) : PRACTICAL : ZOOLOGY –II

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	1. Protochordata : Study of Balanoglossus, Herdmania, Branchiostoma Balanoglossus sections through Probosis, Collar, branchiogenital & hepatic region. Amphioxus – oral hood, Whole Mount sections through pharyngeal, intestinal & caudal regions 2. Fishes: Study of Petromyzon, Scolidon, Sphyrna, Pristis, Trygon, Torpedo, Chimaera, Notopterus, Labeo, Catla, Cirrihina, Heteroneustes, Mystus, Exocoetus. Demonstrations through CD/charts etc: Cranial nerves of Scoliodon. Temorary unstained preparation of placoid, Cycloid and Ctenoid scales.	**12**	**1,2,3,4,5**

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II	1. Amphibia: Study of Necturus, Salamander, Bufo, Hyla, Rhacophorus. 2. Reptiles: Study of Chelone, Testuda, Kachuga, Hemidactytus, Varanus, Uromastix, Chameoleon, Draco, Hydrophis, Bungarus, Viper, Krait, Coral snakes, Crocodiles. 3. Aves : Study of dozen Birds of local place/district/ Zoo/ National park. 4. Mammals: Study of Sorex/Hedgehog, Bat (Insectivorous & frugivorous).	**10**	**6,7,9,10**
III	Revision Week	**8**	**14**

BSCH-S- 1201P: PRACTICAL: CHEMISTRY –II

PRACTICAL	
1.	Organic chemistry Detection of nitrogen suphur and halogen in organic compouns Detection of following functional group of organic compounds (a) OH (Phenolic) (b) CHO(c) = O (d) COOH (e) NH_3 and NO_2
1.	Note book and Viva voce.

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B.SC. Botany 2 Years Course Structure

B.Sc. BOTANY (Hons.) - Program Structure - Total Credit - 118						
B.Sc. BOTANY (Hons.)						
Semester : I						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 1101	NON - VASCULAR PLANTS-I	3	1	0	4
2	BSZG-S- 1101	ZOOLOGY -I	3	0	0	3
3	BSCH-S- 1101	CHEMISTRY -I	3	0	0	3
4	HNL - 1101	HINDI-I	2	0	0	2
5	BSBT 1101(P)	NON-VASCULAR PLANTS-I LAB	0	0	6	3
6	BSZG-S-1101(P)	ZOOLOGY- I LAB	0	0	4	2
7	BSCH-S-1101(P)	CHEMISTRY- I LAB	0	0	4	2
						19
semester : II						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 1201	NON- VASCULAR PLANTS-II	3	1	0	4
2	BSZG -S- 1201	ZOOLOGY -II	3	0	0	3
3	BSCH-S- 1201	CHEMISTRY-II	3	0	0	3
4	ENG 1201	ENGLISH-II	2	0	0	2
5	BSBT 1201 (P)	PRACTICAL : NON-VASCULAR PLANTS-II	0	0	6	3
6	BSZG-S- 1201(P)	PRACTICAL : ZOOLOGY -II	0	0	4	2
7	BSCH-S- 1201 (P)	PRACTICAL : CHEMISTRY -II	0	0	4	2
						19
semester : III						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**

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1	BSBT 2101	VASCULAR PLANTS	3	1	0	4
2	BSZG-S- 2101	ZOOLOGY-III	3	0	0	3
3	BSCH-S- 2101	CHEMISTRY-III	3	0	0	3
4	HNL 2101	HINDI-II	2	0	0	2
5	BSBT 2101 (P)	VASCULAR PLANTS LAB	0	0	6	3
6	BSZG-S- 2101 (P)	PRACTICAL : ZOOLGOY - III	0	0	4	2
7	BSCH-S- 2101 (P)	PRACTICAL : CHEMISTRY -III	0	0	4	2
						19

B.Sc. BOTANY (Hons.) - Program Structure - Total Credit - 118

B.Sc. BOTANY (Hons.)

Semester : IV

S.No.	Subject Code	Subject Name	L	T	P	Total Credit
1	BSBT 2201	MICRO BIOLOGY & PLANT PATHOLOGY	3	1	0	4
2	BSZG-S- 2201	ZOOLOGY -IV	3	0	0	3
3	BSCH-S- 2201	CHEMISTRY- IV	3	0	0	3
4	ENL -2201	ENGLISH-II	2	0	0	2
5	BSBT 2201 (P)	PRACTICAL : MICRO BIOLOGY & PLANT PATHOLOGY	0	0	6	3
6	BSZG-S- 2201 (P)	PRACTICAL: ZOOLOGY- IV	0	0	4	2
7	BSCH-S- 2201 (P)	PRACTICAL: CHEMISTRY -IV	0	0	4	2
						19

semester : V

S.No.	Subject Code	Subject Name	L	T	P	Total Credit
1	BSBT 3101	PLANT PHYSIOLOGY	3	1	0	4
2	BSBT 3102	CYTOGENETICS & PLANT BREEDING	3	1	0	4
3	BSBT 3103	PLANT BIOTECHNOLOGY & TISSUE CULTURE	3	1	0	4

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4	BSBT 3101 (P)	PRACTICAL : PLANT PHYSIOLOGY	0	0	6	3
5	BSBT 3102 (P)	PRACTICAL: CYTOGENETICS & PLANT BREEDING	0	0	6	3
6	BSBT 3013 (P)	PRACTICAL : PLANT BIOTECHNOLOGY & TISSUE CULTURE	0	0	6	3
						21
semester : VI						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 3201	BIO- CHEMISTRY & MOLECULAR BIOLOGY	3	1	0	4
2	BSBT 3202	PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	3	1	0	4
3	BSBT 3203	PLANT ANATOMY AND EMBRYOLOGY	3	1	0	4
4	BSBT 3201 (P)	PRACTICAL: BIO- CHEMISTRY & MOLECULAR BIOLOGY	0	0	6	3
5	BSBT 3202(P)	PRACTICAL: PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	0	0	6	3
6	BSBT 3203 (P)	PRACTICAL : PLANT ANATOMY AND EMBRYOLOGY	0	0	6	3
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K. K. UNIVERSITY

School Of Applied Sciences

Bachelor Of Science In Botany

SYLLABUS

semester : III						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 2101	VASCULAR PLANTS	3	1	0	4
2	BSZG-S- 2101	ZOOLOGY-III	3	0	0	3
3	BSCH-S- 2101	CHEMISTRY-III	3	0	0	3
4	HNL 2101	HINDI-II	2	0	0	2
5	BSBT 2101 (P)	VASCULAR PLANTS LAB	0	0	6	3
6	BSZG-S- 2101 (P)	PRACTICAL : ZOOLGOY - III	0	0	4	2
7	BSCH-S- 2101 (P)	PRACTICAL : CHEMISTRY -III	0	0	4	2
						19

Objective of the Program:

The Bachelor of Science in Botany program aims to provide students with a strong foundation in the biological sciences with a focus on plant biology. The objectives of the program include imparting comprehensive knowledge of plant diversity, anatomy, physiology, ecology, and genetics. Students will gain an understanding of the principles and theories governing plant life, as well as practical skills in plant identification, laboratory techniques, and fieldwork. The program seeks to cultivate critical thinking, analytical skills, and the ability to evaluate scientific information. Furthermore, it aims to foster a deep appreciation for the role of plants in ecosystems, conservation, and sustainable development. Ultimately, the B.Sc. Botany program aims to prepare students for further studies or careers in botany, plant sciences, biotechnology, agriculture, environmental science, and related fields by providing a solid scientific foundation and practical skills applicable to diverse professional settings.

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PROGRAMME OUTCOME

PO1: Demonstrate Advanced Knowledge of Botany: Graduates will have a thorough understanding of key concepts, theories, and principles in botany, including plant anatomy, physiology, ecology, genetics, and evolution.

PO2: Apply Research Methods: Graduates will be proficient in applying scientific research methods, including experimental design, data collection, statistical analysis, and interpretation of results, to investigate botanical questions.

PO3: Conduct Independent Research: Graduates will be able to plan, execute, and present original research projects in botany, demonstrating autonomy, creativity, and critical thinking.

PO4: Interpret and Communicate Scientific Findings: Graduates will be able to effectively communicate scientific information through oral presentations, written reports, and scientific publications, tailored to both scientific and lay audiences.

PO5: Analyze Plant Diversity and Function: Graduates will be able to identify and classify plants, analyze their ecological roles, and understand their adaptations to various environments.

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BSBT 2101: Vascular Plants

&

BSBT 2101P: Vascular Plant Lab

COURSE OUTCOME

CO1: Knowledge of Vascular Plant Diversity

CO2: Understanding of Plant Morphology and Anatomy

CO3: Proficiency in Plant Taxonomy and Systematics

CO4: Insight into Plant Evolutionary History

CO5: Students will be able to evaluate research articles and data related to vascular plants.

COURSE OBJECTIVE

This course provides an in-depth exploration of vascular plants, covering their diversity, morphology, anatomy, and ecological significance. Through lectures, laboratory sessions, fieldwork, and interactive discussions, students will gain a comprehensive understanding of the structure, function, and evolutionary history of vascular plants, as well as their interactions with the environment.

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BSBT 2101: VASCULAR PLANTS

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Classification, comparative study of morphology, anatomy and reproduction in : Psilotum, Lycopodius, Selaginella, Equisetum, Merselia, Pteris. Stelar organization. A general account of Rhynia, Sigillaria and Clamites. Generl distribution and Economic Importance.	8	1,2,3
II	Occurrence and functions and types of root system – Modification for storage, support and vital functions – (Respiratory, Photosynthetic, Haustorial and Epipyhtic). Stem – Characteristics and functions, types of underground, Aerial and Sub-Aerial modifications. Laf – Structure and functions , types of phyllotaxy, venation, types of leaves (simple and compound), modifications (stipule and leaf), insectivorous plants (Drosera, Utricularia and compound), modifications (stipule and leaf) , insectivorous plants (Drosera, utricularia and nepenthes).	10	4,5,6,7
III	Inflorescence- Types of inflorescence (Racemose, Cymose and special type- Cyathium, Hypanthodium and Verticellaster.) Flowers – brack, Calyx (variations), Corolla- (variations and Aestivation), Androecium – (variations), Gynoecium (variations), Placentation and types of llowers (Technical terms used to describe a flower). Fruits- Classification and types (Simple, aggregate and composite).	10	9,10,11,12
IV	Revision Week	8	13,14

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BSBT 2101 (P): VASCULAR PLANTS LAB

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Study of morphological, anatomical and reproductive structures in Lycopodium, Selaginell, Marsilea, Equisetum. Study of fossils – Rhynia, Lepidodendron, Calamities 9slides or materials).	12	1,2,3,4,5
II	Study of morphological, anatomical and reproductive features of Cycas, Pinus and Gnetum. A. project report on morphological (Angiosperm or Gymnosperms as herbarium of photographs) peculiarities, like calyx forms, corolla forms, stamens, Cycas male or female cones, leaves and stipule modifications.	12	6,7,8,9 ,10
III	Revision Week	8	11-12

RECOMMENDED BOOKS:

1. Singh, Pandey and Jain, Pteridophyta, Gymnosperm and Paleobotany, Rastogi Publication, Meerut.
2. S. Sundarajan, College Botany, Vol II, Himalya publishing House, New Delhi.
3. AC Datta College Botany (For degree students), Manzar Khan Oxford University, Press Kolkata.
4. Gangulee Das and Dutta – College Botany Vol – I, New central Book Agency, Kolkatta.
5. Pandey and Ajanta Chaddna A. Text Book of Botany Vol II, Vikas Publication Pvt. Ltd, New Delhi.

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RECOMMENDED ONLINE RESOURCES:

https://www.youtube.com/watch?v=rySC4NUdw1o&list=PLIdO_1ysznhca6qu6lnZuXm02KzFWQs2M

https://youtu.be/GNLjOPhB_XE?si=M7JNk8TeRf73LxRD

BSZG-S- 2101: ZOOLOGY –III

ANIMAL PHYSIOLOGY AND FUNCTIONAL HISTORY

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	1. Digestive system: Structure and types of mode of digestive system and its glands; process of digestion, assimilation and various disorders. 2. Respiratory System : Structure and functions of respiratory system; Control and coordination of respiration.	12	1,2,3,4,5
II	1. General organization: Neuron resting membrane potential and its basis; Origin of action potential. 2. Nervous System: Its propagation in myelinated and unmyelinated nerve fibers; Synaptic transmission and types of synapses, Neuro- muscular junction; Physiology of hearing and vision. 3. Muscle: Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit.	10	6,7,9,10

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III	1. Reproductive System: Histology of male and female reproductive systems, puberty, physiology of male and female reproduction; Methods of contraception (depicted through flow chart); Disorders of reproductive system. 2. Endocrine System: Histology and functions of endocrine glands; Nature of hormones; Mode of action of hormones; Hypothalamus – principal nuclei involved in control of endocrine system, control of anterior pituitary hormones by hypothalamic releasing hormones (neuroendocrine mechanisms)	**8**	**11,12, 13**
IV	Revision Week	**8**	**14**

Suggested Readings:

1. Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Herecourt Asia PTE Ltd./ W.B. Saunders Company.
2. Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition. John wiley & sons, Inc.
3. Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional Correlations. XII Edition. Lippincott W. & Wilkins.
4. Arey, L.B. (1974). Human Histology. IV Edition. W.B. Saunders.

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BSCH-S- 2101: CHEMISTRY – III

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
1	**Physical Chemistry** **States of Matter** (a) Van der Waals equation, critical constants, collision frequency, mean free path. (b) Idea of lattice planes, stoichiometric and non-stoichiometric defects in simple ionic solid	4	1,2,3
	Thermodynamics (a) Extensive and Intensive system. (b) First and second law of thermodynamics (c) Carnot cycle	4	4,5
II	**Inorganic Chemistry** **Atomic structure and bonding** Atomic structure and bonding (a) De Broglie waves (b) Schrodinger wave equation (c) Idea of overlap and hybridization (d) Metallic bonding (e) Double salts and complex salts (f) Werner's theory	4	6,7,8
	Introduction to the transition metal complex Variable oxidation states, magnetism	2	9

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III	**Organic Chemistry** **Structure and Mechanism** (a) Different types of isomerism (b) Elementary and nucleophilic substitution at saturated carbon	4	10,11
	Natural Products (a) Carbohydrates (b) Elementary idea of Alkaloids and Terpenoids	4	12,13
IV	Revision Week	6	14

HNL – 2101 : HINDI –II

- गोदान – प्रेमचंद्र
- कहानियाँ – सं0 डॉ0 जितेन्द्र वत्स, राजा राधिका रमण प्रसाद सिंह (माँ), धर्मवीर भरती (गुलकी बन्नो), भीष्म साहनी (अमृतसर आ गया), शिवप्रसाद सिंह (कर्मनाशा की हार), मन्नू भांडारी (रानी माँ का चबूतरा), उषा प्रियंवदा (वापसी), निशांतकेतु (माटी–टीला)

BSZG-S- 2101 (P) : PRACTICAL : ZOOLOGY –III

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Recording of simple muscle twitch with electrical stimulation. Demonstration of the knee jerk reflex.	10	1,2,3,4
II	Preparation of temporary mounts: Squamous epithelium, Cliliated epithelium, Striated muscle fibres and nerve cells. Examination of sections of Mammalian skin, Cartilage, Bone, pancreas, Testis, Ovary, pituitary, Adrenal, Thyroid, Parathyroid.	8	5,6,7

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III	Preparation of permanent slide of any five mammalian tissues- Microtomy. Pollination and Ferilization (outlines) Endosperm development and types.	**8**	**8,9,10**
IV	Revision Week	**8**	**14**

BSCH-S- 2101P: PRACTICAL: CHEMISTRY –III

PRACTICAL	
1.	**Inorganic chemistry** **Qualitative inorganic analysis of mixtures containing Acid and Basic radicals** **Basic radicals: Pb^{2+}, Cu^{2+}, Fe^{2+}, Fe^{3+}, Cr^{3+}, Ni^{2+}, Co^{2+}, Zn^{2+}, Mg^{2+}, Na^{+}, K^{+}** **Acid radicals: CO_3^{2-}, SO_3^{2-}, S^{2-}, SO_4^{2-}, NO_2^{-}, NO_3^{-}**
1.	**Note book and Viva voce.**

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B.SC. Botany 2 Years Course Structure

B.Sc. BOTANY (Hons.) - Program Structure - Total Credit - 118						
B.Sc. BOTANY (Hons.)						
Semester : I						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 1101	NON - VASCULAR PLANTS-I	3	1	0	4
2	BSZG-S- 1101	ZOOLOGY -I	3	0	0	3
3	BSCH-S- 1101	CHEMISTRY -I	3	0	0	3
4	HNL - 1101	HINDI-I	2	0	0	2
5	BSBT 1101(P)	NON-VASCULAR PLANTS-I LAB	0	0	6	3
6	BSZG-S-1101(P)	ZOOLOGY- I LAB	0	0	4	2
7	BSCH-S-1101(P)	CHEMISTRY- I LAB	0	0	4	2
						19
semester : II						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 1201	NON- VASCULAR PLANTS-II	3	1	0	4
2	BSZG -S- 1201	ZOOLOGY -II	3	0	0	3
3	BSCH-S- 1201	CHEMISTRY-II	3	0	0	3
4	ENG 1201	ENGLISH-II	2	0	0	2
5	BSBT 1201 (P)	PRACTICAL : NON-VASCULAR PLANTS-II	0	0	6	3
6	BSZG-S- 1201(P)	PRACTICAL : ZOOLOGY -II	0	0	4	2
7	BSCH-S- 1201 (P)	PRACTICAL : CHEMISTRY -II	0	0	4	2
						19
semester : III						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**

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1	BSBT 2101	VASCULAR PLANTS	3	1	0	4
2	BSZG-S- 2101	ZOOLOGY-III	3	0	0	3
3	BSCH-S- 2101	CHEMISTRY-III	3	0	0	3
4	HNL 2101	HINDI-II	2	0	0	2
5	BSBT 2101 (P)	VASCULAR PLANTS LAB	0	0	6	3
6	BSZG-S- 2101 (P)	PRACTICAL : ZOOLGOY - III	0	0	4	2
7	BSCH-S- 2101 (P)	PRACTICAL : CHEMISTRY -III	0	0	4	2
						19

B.Sc. BOTANY (Hons.) - Program Structure - Total Credit - 118

B.Sc. BOTANY (Hons.)

Semester : IV

S.No.	Subject Code	Subject Name	L	T	P	Total Credit
1	BSBT 2201	MICRO BIOLOGY & PLANT PATHOLOGY	3	1	0	4
2	BSZG-S- 2201	ZOOLOGY -IV	3	0	0	3
3	BSCH-S- 2201	CHEMISTRY- IV	3	0	0	3
4	ENL -2201	ENGLISH-II	2	0	0	2
5	BSBT 2201 (P)	PRACTICAL : MICRO BIOLOGY & PLANT PATHOLOGY	0	0	6	3
6	BSZG-S- 2201 (P)	PRACTICAL: ZOOLOGY- IV	0	0	4	2
7	BSCH-S- 2201 (P)	PRACTICAL: CHEMISTRY -IV	0	0	4	2
						19

semester : V

S.No.	Subject Code	Subject Name	L	T	P	Total Credit
1	BSBT 3101	PLANT PHYSIOLOGY	3	1	0	4
2	BSBT 3102	CYTOGENETICS & PLANT BREEDING	3	1	0	4
3	BSBT 3103	PLANT BIOTECHNOLOGY & TISSUE CULTURE	3	1	0	4
4	BSBT 3101 (P)	PRACTICAL : PLANT PHYSIOLOGY	0	0	6	3

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5	BSBT 3102 (P)	PRACTICAL: CYTOGENETICS & PLANT BREEDING	0	0	6	3
6	BSBT 3013 (P)	PRACTICAL : PLANT BIOTECHNOLOGY & TISSUE CULTURE	0	0	6	3
						21
semester : VI						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 3201	BIO- CHEMISTRY & MOLECULAR BIOLOGY	3	1	0	4
2	BSBT 3202	PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	3	1	0	4
3	BSBT 3203	PLANT ANATOMY AND EMBRYOLOGY	3	1	0	4
4	BSBT 3201 (P)	PRACTICAL: BIO- CHEMISTRY & MOLECULAR BIOLOGY	0	0	6	3
5	BSBT 3202(P)	PRACTICAL: PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	0	0	6	3
6	BSBT 3203 (P)	PRACTICAL : PLANT ANATOMY AND EMBRYOLOGY	0	0	6	3
						21

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K. K. UNIVERSITY

School Of Applied Sciences

Bachelor Of Science In Botany

SYLLABUS

Semester : IV						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 2201	MICRO BIOLOGY & PLANT PATHOLOGY	3	1	0	4
2	BSZG-S- 2201	ZOOLOGY -IV	3	0	0	3
3	BSCH-S- 2201	CHEMISTRY- IV	3	0	0	3
4	ENL -2201	ENGLISH-II	2	0	0	2
5	BSBT 2201 (P)	PRACTICAL : MICRO BIOLOGY & PLANT PATHOLOGY	0	0	6	3
6	BSZG-S- 2201 (P)	PRACTICAL: ZOOLOGY- IV	0	0	4	2
7	BSCH-S- 2201 (P)	PRACTICAL: CHEMISTRY -IV	0	0	4	2
						19

Objective of the Program:

The Bachelor of Science in Botany program aims to provide students with a strong foundation in the biological sciences with a focus on plant biology. The objectives of the program include imparting comprehensive knowledge of plant diversity, anatomy, physiology, ecology, and genetics. Students will gain an understanding of the principles and theories governing plant life, as well as practical skills in plant identification, laboratory techniques, and fieldwork. The program seeks to cultivate critical thinking, analytical skills, and the ability to evaluate scientific

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information. Furthermore, it aims to foster a deep appreciation for the role of plants in ecosystems, conservation, and sustainable development. Ultimately, the B.Sc. Botany program aims to prepare students for further studies or careers in botany, plant sciences, biotechnology, agriculture, environmental science, and related fields by providing a solid scientific foundation and practical skills applicable to diverse professional settings.

PROGRAMME OUTCOME

PO1: Demonstrate Advanced Knowledge of Botany: Graduates will have a thorough understanding of key concepts, theories, and principles in botany, including plant anatomy, physiology, ecology, genetics, and evolution.

PO2: Apply Research Methods: Graduates will be proficient in applying scientific research methods, including experimental design, data collection, statistical analysis, and interpretation of results, to investigate botanical questions.

PO3: Conduct Independent Research: Graduates will be able to plan, execute, and present original research projects in botany, demonstrating autonomy, creativity, and critical thinking.

PO4: Interpret and Communicate Scientific Findings: Graduates will be able to effectively communicate scientific information through oral presentations, written reports, and scientific publications, tailored to both scientific and lay audiences.

PO5: Analyze Plant Diversity and Function: Graduates will be able to identify and classify plants, analyze their ecological roles, and understand their adaptations to various environments.

BSBT 2201: Microbiology and Plant Pathology

&

BSBT 2201P: Practical: Microbiology and Plant Pathology

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COURSE OUTCOME

CO1: Understanding of Microbial Diversity

CO2: Knowledge of Microbial Structure and Function

CO3: Identification and Classification of Plant Pathogens

CO4: Application of Integrated Pest Management (IPM) Principles

CO5: Critical Thinking and Problem-Solving Skills

COURSE OBJECTIVE

Microbiology and plant pathology explore the diverse world of microorganisms and their impact on plants, agriculture, and ecosystems. This course provides an in-depth understanding of the principles of microbiology as they relate to plant diseases, including the identification, diagnosis, and management of plant pathogens.

BSBT 2201: MICRO BIOLOGY & PLANT PATHOLOGY

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	**Aim and scope of Microbiology:** A general account of microbes from soil, air and water. History of Microbiology, Classification of Microorganisms and Characteristics of different groups.	**8**	**1,2,3**

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II	**Methods in Microbiology:** Basic principles of micrometry, Staining, Sterlization methods, Culture Media, Population estimation and growth determination. **Structure:** Ultrastructure of prokaryotic micro organisms.	**8**	**4,5,6**
III	**Viruses:** Properties and Classification host- Virus interaction, Bacteriophage, TMV. **Bacteria:** Structure, genetic recombination, Mycoplasma and Actinomycetes – General account. Role of Micro- organisms in biogeochemical cycling of nitrogen and Carbon, Biological nitrogen fixation. **Industrial application of micro-organisms:** organic acids, alcohol, food processing, milk products, antibiotics and biopesticide.	**10**	**7,8,9,10**
IV	Historical development of Plant pathology. Pathogen attract and defense mechanisms: Physical, Physiological, Biochemical. Plant disease epidemiology: Transmission and spread of pathogens Disease cycles. Plant disease management, Chemical, Biological, Development of transgenic. Genetics of resistance and susceptibility. General account of some diseases of crop plants: a. Tobacco mosaic b. Citrus canker C. Red rot of sugarcane d. Rust of wheat e. Smut of Barley f. Late blight of Potato g. Ergot of Rye.	**12**	**11,12, 13,14**
V	Revision Week	**8**	**15**

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BSBT 2201 (P): PRACTICAL: MICRO BIOLOGY & PLANT PATHOLOGY

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Study of viral diseases of plants using local available specimens – Tobacco mosaic, Red rot of sugarcane, Rust of wheat. Study of plant disease mentioned in the syllabus. Study of plant diseases caused by Bacteria: (Localy available specimens) Citrus canker.	24	1-12
II	Revision Week	8	13,14

RECOMMENDED BOOKS:

1. Hans G. (1993) General Microbiology Volume – I Cambridge University, press Cambridge.
2. C.L. Mandar (1978) Introduction to plant Viruses.
3. Mathews (1981) Plant Viruses.
4. K.M. Smith (1977) Plant Viruses.

RECOMMENDED ONLINE RESOURCES:

https://www.youtube.com/watch?v=LYNa1i9rTNY&pp=ygURbWljcm9iaW9sb2d5IGIuc2M%3D

https://www.youtube.com/watch?v=NH_we3ehg2s&list=PLIMEmoNzKu2mn784DTnXRqw1GsN2XKuQH

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BSZG-S- 2201: ZOOLOGY –IV

ECOLOGY I

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	**Introduction to the Biosphere:** Inter – relationships between the living world and the environment, the components and dynamism, homeostasis. **Soil:** Importance, origin, formation, composition; physical, chemical and biological components; soil profile; role of climate in soil development.	12	1,2,3,4,5
II	**Water:** Importance; role of climate in soil development. Atmospheric moistur; precipitation types; water in soil, water table, water bodies; aquifers, water shed. **The Atmosphere:** Composition and stratification; radiation flux; role of electromagnetic radiations, UV, visible spectrum; variations in temperature; wind as a factor.	10	6,7,9,10
III	**The Living World:** Biotic component of environment; types of biotic interactions. **Fire:** As an ecological factor. **Levels or Organization:** Individual, population, community; concepts of autecology, synecology; concept of biological diversity; habitat and ecological niche. **Population Ecology:** Distribution and characteristics of population; population dynamics; Ecological Speciation.	8	11,12, 13
IV	Revision Week	8	14

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Suggested Readings

1. Singh, J.S., Singh, S.P. and Gupta, S. (2006) Ecology Environment and Resource Conservation. Anamaya Publication, New Delhi.
2. Wilkinson, D.M. (2007). Fundamental processes in Ecology. An Earth Approach. Oxford.
3. Daubenmier, R.F. (1970). Plant Communities, Willey Eastern Private Limited
4. Odum, E. (2008) Ecology. Oxford and IBH Publisher.
5. Sharma, P.D. (2010) Ecology and Environment, (8th Ed.) Rastogi Publications, Meerut.

BSCH-S- 2201: CHEMISTRY –IV

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
1	**Physical Chemistry** **Ionic Equilibrium** (a) Oswald's dilution law (b) Salt Hydrolysis (c) Theory of acid – base indicator	4	1,2,3
	Chemical Kinetics (a) Second order reaction, expression of rate constant. (b) Effect of temperature on reaction rate (c) Arrhenius equation	4	4,5
II	**Inorganic Chemistry** (a) Chemistry of Group 4 elements (b) Idea of Major pollutants in environments	4	6,7

	Chemistry of Fe, Cr, Ni compounds	4	7,8
III	**Organic Chemistry** Structure of Benzene and benzene Diazonium chloride	4	8,9
	Brief idea of Polymers, resins, drugs	4	10,11
IV	Revision Week	4	12-13

ENL 2201: ENGLISH –II

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	**I. Short Stories** 1. Maupassant – The Necklace 2. O. Henry – The Last Leaf 3. Catherine Mansfield – A Cup of Tea 4. R.K. Narayan – Selvi 5. M.R. Anand – The Lost Child 6. Jhumpa Lahiri – The Interpreter of Maladies 7. Shashi Deshpande – Hear Me Sanjaya!	**12**	**1,2,3,4,5**
II	**II. Piece of Prose** 1. James Bryce- Some hints of Public Speaking 2. C.E.M. Toad- A Dialogue on Civilization 3. Hill- Principles of good writing. 4. Bapsi Sidhwa – Why do I write? 5. Jawahar Lal Nehru – The Reawakening of India	**10**	**6,7,9,10**

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	6. Subhash Chandra Bose – to Delhi, to Delhi 7. Dr. Rukhmabai – Purdah – The Need for its abolition		
III	I. Novel: Lord of the Flies – William Golding	**8**	**11,12, 13**
IV	Revision Week	**8**	**14**

BSZG-S- 2201 (P) : PRACTICAL : ZOOLOGY –IV

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	1. Study of following microclimatic variables in different habitats: soil and air temperature, wind velocity, relative humidity, rainfall and light intensity. 2. Permeability (percolation; total capacity as well as rate of movement) of different soil samples.	**12**	**1,2,3,4,5**
II	1. Saturation capacity and field capacity of different soil samples and rapid test texture of soils. 2. Density and porosity and rate of infiltration of water in undisturbed soils. 3. Soil organic matter in different soil samples by titration method.	**10**	**6,7,9,10**
III	Revision Week	**8**	**11,12**

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BSCH-S- 2201P: PRACTICAL: CHEMISTRY –IV

PRACTICAL	
1	**Organic chemistry** **Preparation of Organic compounds by using following reactions:** **(a) Acetylation of Aniline** **(b) Oxidation of benzaldehyde** **(c) Hydrolysis of esters**
2	**Note book and Viva voce.**

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B.SC. Botany 2 Years Course Structure

B.Sc. BOTANY (Hons.) - Program Structure - Total Credit - 118						
B.Sc. BOTANY (Hons.)						
Semester : I						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 1101	NON - VASCULAR PLANTS-I	3	1	0	4
2	BSZG-S- 1101	ZOOLOGY -I	3	0	0	3
3	BSCH-S- 1101	CHEMISTRY -I	3	0	0	3
4	HNL - 1101	HINDI-I	2	0	0	2
5	BSBT 1101(P)	NON-VASCULAR PLANTS-I LAB	0	0	6	3
6	BSZG-S-1101(P)	ZOOLOGY- I LAB	0	0	4	2
7	BSCH-S-1101(P)	CHEMISTRY- I LAB	0	0	4	2
						19
semester : II						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 1201	NON- VASCULAR PLANTS-II	3	1	0	4
2	BSZG -S- 1201	ZOOLOGY -II	3	0	0	3
3	BSCH-S- 1201	CHEMISTRY-II	3	0	0	3
4	ENG 1201	ENGLISH-II	2	0	0	2
5	BSBT 1201 (P)	PRACTICAL : NON-VASCULAR PLANTS-II	0	0	6	3
6	BSZG-S- 1201(P)	PRACTICAL : ZOOLOGY -II	0	0	4	2
7	BSCH-S- 1201 (P)	PRACTICAL : CHEMISTRY -II	0	0	4	2
						19
semester : III						

S.No.	Subject Code	Subject Name	L	T	P	Total Credit
1	BSBT 2101	VASCULAR PLANTS	3	1	0	4
2	BSZG-S- 2101	ZOOLOGY-III	3	0	0	3
3	BSCH-S- 2101	CHEMISTRY-III	3	0	0	3
4	HNL 2101	HINDI-II	2	0	0	2
5	BSBT 2101 (P)	VASCULAR PLANTS LAB	0	0	6	3
6	BSZG-S- 2101 (P)	PRACTICAL : ZOOLGOY - III	0	0	4	2
7	BSCH-S- 2101 (P)	PRACTICAL : CHEMISTRY -III	0	0	4	2
						19

B.Sc. BOTANY (Hons.) - Program Structure - Total Credit - 118

B.Sc. BOTANY (Hons.)

Semester : IV

S.No.	Subject Code	Subject Name	L	T	P	Total Credit
1	BSBT 2201	MICRO BIOLOGY & PLANT PATHOLOGY	3	1	0	4
2	BSZG-S- 2201	ZOOLOGY -IV	3	0	0	3
3	BSCH-S- 2201	CHEMISTRY- IV	3	0	0	3
4	ENL -2201	ENGLISH-II	2	0	0	2
5	BSBT 2201 (P)	PRACTICAL : MICRO BIOLOGY & PLANT PATHOLOGY	0	0	6	3
6	BSZG-S- 2201 (P)	PRACTICAL: ZOOLOGY- IV	0	0	4	2
7	BSCH-S- 2201 (P)	PRACTICAL: CHEMISTRY -IV	0	0	4	2
						19

semester : V

S.No.	Subject Code	Subject Name	L	T	P	Total Credit
1	BSBT 3101	PLANT PHYSIOLOGY	3	1	0	4
2	BSBT 3102	CYTOGENETICS & PLANT BREEDING	3	1	0	4

3	BSBT 3103	PLANT BIOTECHNOLOGY & TISSUE CULTURE	3	1	0	4
4	BSBT 3101 (P)	PRACTICAL : PLANT PHYSIOLOGY	0	0	6	3
5	BSBT 3102 (P)	PRACTICAL: CYTOGENETICS & PLANT BREEDING	0	0	6	3
6	BSBT 3013 (P)	PRACTICAL : PLANT BIOTECHNOLOGY & TISSUE CULTURE	0	0	6	3
						21
semester : VI						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 3201	BIO- CHEMISTRY & MOLECULAR BIOLOGY	3	1	0	4
2	BSBT 3202	PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	3	1	0	4
3	BSBT 3203	PLANT ANATOMY AND EMBRYOLOGY	3	1	0	4
4	BSBT 3201 (P)	PRACTICAL: BIO- CHEMISTRY & MOLECULAR BIOLOGY	0	0	6	3
5	BSBT 3202(P)	PRACTICAL: PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	0	0	6	3
6	BSBT 3203 (P)	PRACTICAL : PLANT ANATOMY AND EMBRYOLOGY	0	0	6	3
						21

K. K. UNIVERSITY

School Of Applied Sciences

Bachelor Of Science In Botany

SYLLABUS

semester : V						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 3101	PLANT PHYSIOLOGY	3	1	0	4
2	BSBT 3102	CYTOGENETICS & PLANT BREEDING	3	1	0	4
3	BSBT 3103	PLANT BIOTECHNOLOGY & TISSUE CULTURE	3	1	0	4
4	BSBT 3101 (P)	PRACTICAL : PLANT PHYSIOLOGY	0	0	6	3
5	BSBT 3102 (P)	PRACTICAL: CYTOGENETICS & PLANT BREEDING	0	0	6	3
6	BSBT 3013 (P)	PRACTICAL : PLANT BIOTECHNOLOGY & TISSUE CULTURE	0	0	6	3
						21

Objective of the Program:

The Bachelor of Science in Botany program aims to provide students with a strong foundation in the biological sciences with a focus on plant biology. The objectives of the program include imparting

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comprehensive knowledge of plant diversity, anatomy, physiology, ecology, and genetics. Students will gain an understanding of the principles and theories governing plant life, as well as practical skills in plant identification, laboratory techniques, and fieldwork. The program seeks to cultivate critical thinking, analytical skills, and the ability to evaluate scientific information. Furthermore, it aims to foster a deep appreciation for the role of plants in ecosystems, conservation, and sustainable development. Ultimately, the B.Sc. Botany program aims to prepare students for further studies or careers in botany, plant sciences, biotechnology, agriculture, environmental science, and related fields by providing a solid scientific foundation and practical skills applicable to diverse professional settings.

PROGRAMME OUTCOME

PO1: Demonstrate Advanced Knowledge of Botany: Graduates will have a thorough understanding of key concepts, theories, and principles in botany, including plant anatomy, physiology, ecology, genetics, and evolution.

PO2: Apply Research Methods: Graduates will be proficient in applying scientific research methods, including experimental design, data collection, statistical analysis, and interpretation of results, to investigate botanical questions.

PO3: Conduct Independent Research: Graduates will be able to plan, execute, and present original research projects in botany, demonstrating autonomy, creativity, and critical thinking.

PO4: Interpret and Communicate Scientific Findings: Graduates will be able to effectively communicate scientific information through oral presentations, written reports, and scientific publications, tailored to both scientific and lay audiences.

PO5: Analyze Plant Diversity and Function: Graduates will be able to identify and classify plants, analyze their ecological roles, and understand their adaptations to various environments.

BSBT 3101: Plant Physiology

&

BSBT 3101P: Practical: Plant Physiology

COURSE OUTCOME

CO1: Understand Fundamental Plant Processes

CO2: Examine Plant Adaptations

CO3: Investigate Plant Water Relations

CO4: Explore Cellular Mechanisms

CO5: Analyze Plant Nutrition

COURSE OBJECTIVE

This course provides an in-depth understanding of the physiological processes governing plant growth, development, and responses to environmental stimuli. Through lectures, lab work, and discussions, students will explore the fundamental principles and mechanisms underlying plant physiology and their practical applications.

BSBT 3101: PLANT PHYSIOLOGY

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Introduction to plant physiology. Plant water relation – Importance of water of plant life, diffusion, Osmosis, Ascent of sap and Transpiration. Mineral nutrition – Role of micro and macro elements. Photosynthesis – Historical aspect, photosynthetic pigments, mechanisms, C_3 and C_4 cycles photospiration.	8	1,2,3,4
II	Repiration – Glycolysis, Kreb's cycle, Pentose phosphate pathway. Growth and movement- Phases of growth and evelopment, Kinetics and growth, Phototropism, Geotropism, Seismonasty, Auxins, Gibberellins, Cytokinins.	8	5,6,7
III	Ennzymes – Nomenclature, classification and mode of action. Photosynthesis – Introduction, significance, Structure and function of chloroplast. Quantosomes, Solar spectrum and its importance. Mechanism of photosynthesis – Light reaction, cyclic and non-cyclic photo photosphorylation	8	9,10,11
IV	Mineral absorption – passive absorption, ion exchange, Donnan's equilibrium. Active absorption – carrier concept, Landgrath's theory, Protien Leacithin	8	12,13, 14

	theory. Transpiration – definition, types, structure of stomatal apparatus. Mechanism of opening and closing of stomata.		
V	Revision Week	**8**	**15**

BSBT 3101 (P): PRACTICAL: PLANT PHYSIOLOGY

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	1. Diffusion – Diffusion of solid into liquid (minor) 2. Osmosis – Physical and physiological – Endosmosis and Exosmosis (minor). 3. Ascent of Sap: (a) To show ascent of Sap by Balsan plant and in a fresh plant twig (minor). (b) To show root pressure. (c) To show suction due to transpiration.	**14**	**1-6**

II	4. Photosynthesis: (a) Evolution of oxygen (minor). (b) Effect of quality of light on photosynthesis. (c) Effect of CO_2 concentration on photosynthesis. (d) Light is essential for photosynthesis (minor). (e) CO_2 is essential for photosynthesis. (f) Chlorophyll separation by paper chromatography method. (g) Chlorophyll is necessary for photosynthesis (minor). (With starch test).	**14**	**7-12**
III	Revision Week	**8**	**13-14**

RECOMMENDED BOOKS:

1. Hopkins, W.G. and Huner, P.A. (2008) Introduction to Plant Physiology. John wiley & Sons.
2. Nelson, D.L., Cox, M.M. (2004) Lehninger Principle of Biochemistry, 4th Edition, W.H. Freeman and Company, New York, USA.
3. Salisbury, F.B. and Ross, C.W. (1991) Plant Physiology, Wadsworth Publishing Co. Ltd.
4. Taiz, L. and Zeiger, E. (2006) Plant Physiology, 4th Edition, Sinauer Associates Inc. MA, USA.

RECOMMENDED ONLINE RESOURCES:

https://www.youtube.com/watch?v=PEgebKlDsVE&list=PLBH3OLLSN1qt8mOvhyYviFBKDyR1-_bur

BSBT 3102: Cytogenetics & Plant Breeding

&

BSBT 3102P: Practical: Cytogenetics & Plant Breeding

COURSE OUTCOME

CO1: Understanding Chromosome Structure and Function

CO2: Genetic Mapping and Marker-Assisted Selection

CO3: Explore methods for inducing polyploidy and its implications in breeding.

CO4: Application of Introgression and Gene Transfer

CO5: Critically Evaluate Cytogenetic Studies and Research

COURSE OBJECTIVE

This course explores the principles and applications of cytogenetics in plant breeding. It provides a comprehensive understanding of chromosome structure, behavior, and manipulation, and how these concepts are utilized to develop improved plant varieties through breeding techniques.

BSBT 3102: CYTOGENETICS & PLANT BREEDING

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks

I	Cell division – Mitosis and Meosis. Cell Cycle and regulation – Apoptosis. Prokaryotic and Eukaryotic chromosome structure, Lampbrush and Polythene chromosome. Mendel's experiment and principles of inheritance. Gene interaction and modified dihybrid rations (Epistatic, Complimentary, Suplementary and Duplicate factors). Linkage and crossing over.	**10**	**1,2,3,4**
II	Sex-linked inheritance in Drosophila and Man, Mechanism of sex determination. Chromosomal aberration. Mutation – Spontaneous and Induced. Polyploidy- Types and effects of auto and allopolyploidy, origin and meiosis in Nullisomics, Monosomics, Trisomics. Methods of plant improvement – Hybridization, Hybrid vigour. Standard error, Standard deviation and Chi- square test. Linkage and crossing over mechanism in maize. (coupling and repulsion)	**8**	**5,6,7**
III	Nucleic acids: (a) Structure, chemical composition and function of DNA and RNA. (b) DNA replication, semiconservative. Genetic Code – meaning and properties, protein synthesis. Introduction, objectives.	**8**	**9,10,11**
	Methods in plant breeding. (a) Mass selection	**8**	**12,13,14**

IV	(b) Pure line selection (c) Clonal selection Hybridization and somatic hybridization. Heterosys and its significance.		
V	Revision Week	**8**	**15**

BSBT 3102 (P): PRACTICAL: CYTOGENETICS & PLANT BREEDING

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Cytological technique of making (Mitosis and Meiosis) permanent slides. Observation of polythene and lamp brush chromosomes (Permanent slides). Genetics problems based on theory syllabus – monohybeid, dihybrid, test cross and interaction of factors.	**14**	**1-5**
II	Practice of hybridization techniques in a self-pollinated and cross pollinated plants (any available plant). Visit to agricultural research centre for observation and record of inter variety, inter specified integration plants.	**12**	**6-11**
III	Revision Week	**8**	**12-13**

RECOMMENDED BOOKS:

1. Genetics – P.K. Gupta, Rastogi Publications, Meerut.
2. College Botany Vol 04 – S. Sudarajan, Himalaya Publishing House, Mumbai.
3. Cytogenetics – P.K. Gupta, Rastogi Publications, Meerut.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

RECOMMENDED ONLINE RESOURCES:

https://www.youtube.com/watch?v=5_mUusbXpMQ&list=PL2TkTmP1zeRXib141bwfLf0Eqaw58im_x

BSBT 3103: Plant Biotechnology & Tissue Culture

&

BSBT 3103P: Practical: Plant Biotechnology & Tissue Culture

COURSE OUTCOME

CO1: Understanding of Plant Biology and Genetics

CO2: Knowledge of Plant Biotechnology Techniques

CO3: Proficiency in Tissue Culture Techniques

CO4: Awareness of Applications in Agriculture and Industry

CO5: Critical Thinking and Problem-Solving Skills

COURSE OBJECTIVE

Plant biotechnology and tissue culture are integral parts of modern agriculture and biotechnology industries. This course provides an in-depth understanding of the principles, techniques, and applications of plant biotechnology and tissue culture.

BSBT 3103: PLANT BIOTECHNOLOGY & TISSUE CULTURE

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	**Plant Tissue Culture:** Historical Perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Ebryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and hybrids; Cryopreservation; Germplasm Conservation).	**10**	**1,2,3,4**
II	**Recomibinant DNA technology:** Restriction Endonucleases (History, Types I-IV, biological role and application); Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC 19, pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotice Vectors (YAC).	**8**	**5,6**
III	**Gene Cloning:** Recombinant DNA, Bacterial Transformation and selection of genomic and eDNA clones, PCR mediated gene cloning; Gene Construct; construction of genomic and cDNA libraries, screening. DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; PCR. **Methods of gene transfer:** Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Micro projectile bombardment; Selection of transgenics- selectable marker and reporter genes (Luciferase, GUS, GFP).	**10**	**7,8,9,10**

IV	**Applications of Biotechnology:** Pest resistant (Bt-cotton); herbicide resistant plants (RoundUp Ready soybean); Transgenic crops with imporoved quality traits (Flavr Savr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible vaccines; Industrial enzymes (Aspergillase, Protease, Lipase); Gentically Engineered Products – Human Growth Hormone; Humulin; Biosafety concerns.	**10**	**11,12, 13,14**
V	Revision Week	**8**	**15**

BSBT 3103 (P): PRACTICAL: PLANT BIOTECHNOLOGY & TISSUE CULTURE

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	1. (a) Preparation of MS medium. 2. (b) Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc. 3. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs. 4. Isolation of protoplasts.	**14**	**1-5**
II	1. Construction of restriction map of circular and linear DNA from the data provided. 2. Study of methods of gene transfer through photographs: Agrobacterius-mediated, direct. 3. Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr tomato through photographs.	**12**	**6-11**

	4. Isolation of plasmid DNA.		
III	Revision Week	**8**	**13-14**

RECOMMENDED BOOKS:

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. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms. Vikas Publication House Pvt. Ltd., New Delhi. 5th edition.
4. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K. 5th edition.

RECOMMENDED ONLINE RESOURCES:

https://www.youtube.com/watch?v=Wz0K1B_PiJA&pp=ygUrcGxhbnQgYmlvdGVjaG5vbG9neSBhbmQgdGlzc3VlIGN1bHR1cmUgYi5zYw%3D%3D

B.SC. Botany 2 Years Course Structure

B.Sc. BOTANY (Hons.) - Program Structure - Total Credit - 118						
B.Sc. BOTANY (Hons.)						
Semester : I						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 1101	NON - VASCULAR PLANTS-I	3	1	0	4
2	BSZG-S- 1101	ZOOLOGY -I	3	0	0	3
3	BSCH-S- 1101	CHEMISTRY -I	3	0	0	3
4	HNL - 1101	HINDI-I	2	0	0	2
5	BSBT 1101(P)	NON-VASCULAR PLANTS-I LAB	0	0	6	3
6	BSZG-S-1101(P)	ZOOLOGY- I LAB	0	0	4	2
7	BSCH-S-1101(P)	CHEMISTRY- I LAB	0	0	4	2
						19
semester : II						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 1201	NON- VASCULAR PLANTS-II	3	1	0	4
2	BSZG -S- 1201	ZOOLOGY -II	3	0	0	3
3	BSCH-S- 1201	CHEMISTRY-II	3	0	0	3
4	ENG 1201	ENGLISH-II	2	0	0	2
5	BSBT 1201 (P)	PRACTICAL : NON-VASCULAR PLANTS-II	0	0	6	3
6	BSZG-S- 1201(P)	PRACTICAL : ZOOLOGY -II	0	0	4	2
7	BSCH-S- 1201 (P)	PRACTICAL : CHEMISTRY -II	0	0	4	2

						19
semester : III						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 2101	VASCULAR PLANTS	3	1	0	4
2	BSZG-S- 2101	ZOOLOGY-III	3	0	0	3
3	BSCH-S- 2101	CHEMISTRY-III	3	0	0	3
4	HNL 2101	HINDI-II	2	0	0	2
5	BSBT 2101 (P)	VASCULAR PLANTS LAB	0	0	6	3
6	BSZG-S- 2101 (P)	PRACTICAL : ZOOLGOY - III	0	0	4	2
7	BSCH-S- 2101 (P)	PRACTICAL : CHEMISTRY -III	0	0	4	2
						19
B.Sc. BOTANY (Hons.) - Program Structure - Total Credit - 118						
B.Sc. BOTANY (Hons.)						
Semester : IV						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 2201	MICRO BIOLOGY & PLANT PATHOLOGY	3	1	0	4
2	BSZG-S- 2201	ZOOLOGY -IV	3	0	0	3
3	BSCH-S- 2201	CHEMISTRY- IV	3	0	0	3
4	ENL -2201	ENGLISH-II	2	0	0	2
5	BSBT 2201 (P)	PRACTICAL : MICRO BIOLOGY & PLANT PATHOLOGY	0	0	6	3
6	BSZG-S- 2201 (P)	PRACTICAL: ZOOLOGY- IV	0	0	4	2
7	BSCH-S- 2201 (P)	PRACTICAL: CHEMISTRY -IV	0	0	4	2
						19

semester : V						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**

1	BSBT 3101	PLANT PHYSIOLOGY	3	1	0	4
2	BSBT 3102	CYTOGENETICS & PLANT BREEDING	3	1	0	4
3	BSBT 3103	PLANT BIOTECHNOLOGY & TISSUE CULTURE	3	1	0	4
4	BSBT 3101 (P)	PRACTICAL : PLANT PHYSIOLOGY	0	0	6	3
5	BSBT 3102 (P)	PRACTICAL: CYTOGENETICS & PLANT BREEDING	0	0	6	3
6	BSBT 3013 (P)	PRACTICAL : PLANT BIOTECHNOLOGY & TISSUE CULTURE	0	0	6	3
						21
semester : VI						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 3201	BIO- CHEMISTRY & MOLECULAR BIOLOGY	3	1	0	4
2	BSBT 3202	PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	3	1	0	4
3	BSBT 3203	PLANT ANATOMY AND EMBRYOLOGY	3	1	0	4
4	BSBT 3201 (P)	PRACTICAL: BIO- CHEMISTRY & MOLECULAR BIOLOGY	0	0	6	3
5	BSBT 3202(P)	PRACTICAL: PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	0	0	6	3
6	BSBT 3203 (P)	PRACTICAL : PLANT ANATOMY AND EMBRYOLOGY	0	0	6	3
						21

K. K. UNIVERSITY

School Of Applied Sciences

Bachelor Of Science In Botany

SYLLABUS

semester : VI						
S.No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**Total Credit**
1	BSBT 3201	BIO- CHEMISTRY & MOLECULAR BIOLOGY	3	1	0	4
2	BSBT 3202	PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	3	1	0	4
3	BSBT 3203	PLANT ANATOMY AND EMBRYOLOGY	3	1	0	4
4	BSBT 3201 (P)	PRACTICAL: BIO- CHEMISTRY & MOLECULAR BIOLOGY	0	0	6	3
5	BSBT 3202(P)	PRACTICAL: PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY	0	0	6	3
6	BSBT 3203 (P)	PRACTICAL : PLANT ANATOMY AND EMBRYOLOGY	0	0	6	3
						21

Objective of the Program:

The Bachelor of Science in Botany program aims to provide students with a strong foundation in the biological sciences with a focus on plant biology. The objectives of the program include imparting comprehensive knowledge of plant diversity, anatomy, physiology, ecology, and genetics. Students will gain an understanding of the principles and theories governing plant life, as well as practical skills in plant identification, laboratory techniques, and fieldwork. The program seeks to cultivate critical thinking, analytical skills, and the ability to evaluate scientific information. Furthermore, it aims to foster a deep appreciation for the role of plants in ecosystems, conservation, and sustainable development. Ultimately, the B.Sc. Botany program aims to prepare students for further studies or careers in botany, plant sciences, biotechnology, agriculture, environmental science, and related fields by providing a solid scientific foundation and practical skills applicable to diverse professional settings.

PROGRAMME OUTCOME

PO1: Demonstrate Advanced Knowledge of Botany: Graduates will have a thorough understanding of key concepts, theories, and principles in botany, including plant anatomy, physiology, ecology, genetics, and evolution.

PO2: Apply Research Methods: Graduates will be proficient in applying scientific research methods, including experimental design, data collection, statistical analysis, and interpretation of results, to investigate botanical questions.

PO3: Conduct Independent Research: Graduates will be able to plan, execute, and present original research projects in botany, demonstrating autonomy, creativity, and critical thinking.

PO4: Interpret and Communicate Scientific Findings: Graduates will be able to effectively communicate scientific information through oral presentations, written

reports, and scientific publications, tailored to both scientific and lay audiences.

PO5: Analyze Plant Diversity and Function: Graduates will be able to identify and classify plants, analyze their ecological roles, and understand their adaptations to various environments.

BSBT 3201: Biochemistry & Molecular Biology

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BSBT 3201P: Practical: Biochemistry & Molecular Biology

COURSE OUTCOME

CO1: Understand the Structure and Function of Biomolecules

CO2: Analyze Enzyme Structure, Function, and Kinetics

CO3: Explain Metabolic Pathways and Regulation

CO4: Explore Cellular Signaling Mechanisms

CO5: Apply Laboratory Techniques in Biochemistry and Molecular Biology

COURSE OBJECTIVE

This course provides a comprehensive understanding of the fundamental principles and techniques in biochemistry and molecular biology. It covers the structure, function, and regulation of biomolecules, as well as the molecular mechanisms underlying cellular processes. Emphasis is placed on critical thinking, problem-solving, and the application of biochemical and molecular concepts to real-world scenarios.

BSBT 3201: BIO-CHEMISTRY & MOLECULAR BIOLOGY

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	**Enzyme –** Discovery, nomenclature, characteristic and mode of action, factors affecting enzyme activity. **Amino acids and Proteins –** Types and structure, Biosynthesis of amino acids and proteins. **Lipid –** Structure and function of lipid, oxidation, Classification, Biosynthesis of lipids. **Physico –** Chemical organization and role of Mitochondria, Chloroplasts, Ribosomes and Glyxisomes in metabolic pathways in plants. Outline of the secondary plant metabolites and their role. Carbohydrates and their structure and classification.	**10**	**1,2,3,4**
II	**Nucleic acids: Carrier of genetic information –** Historical perspective; DNA as the carrier of genetic information (Griffith's, Hershey & Chase, Avery, McLeod & McCarty experiment. **The Structure of DNA and RNA/ Genetic Material –** DNA Structure: Miescher to Watson and Crick – historic perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation.	**8**	**5,6,7**

III	**The replication of DNA –** General principles – bidirectional, semiconservative and semi discontinuous replication, RNA Priming; Various models of DNA replication, Enzymes involved in DNA replication. Central dogma and genetic code Transcription - Transcription in prokaryotes and eukaryotes. Principles of transcriptional regulation; Prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in E. coli. Eukaryotes; transcription factors, heat shock proteins, steroids and peptide hormones; Gene silencing.	**10**	**8,9,10, 11**
IV	**Central dogma genetic code Transcription –** Transcription in prokaryotes and eukaryotes. Principles of transcriptional regulation; prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in E.coli. Eukaryotes; transcription factors, hear shock proteins, steroids and peptide hormones; Gene silencing. **Translation –** Ribosome structure and assembly, mRNA; Charging of tRNA, Various steps in protein synthesis, elongation and termination of proteins.	**10**	**12,13, 14**
V	Revision Week	**8**	**15**

BSBT 3201 (P) : PRACTICAL : BIO-CHEMISTRY & MOLECULAR BIOLOGY

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	1. Detection of organic acids: citric, tartaric, oxalic and malic from laboratory samples. 2. Detection of carbohydrate and protein form plant samples. 3. Detection of the nature of carbohydrate – glucose, fructose, sucrose	**14**	**1-5**

	and starch from laboratory samples.		
II	1. Detection of Ca, Mg, Fe, S from plant ash sample. 2. Preparation of solutions and buffers. 3. Estimation of glucose by Benedicts quantitative reagent.	**12**	**6-11**
III	Revision Week	**8**	**12-13**

RECOMMENDED BOOKS:

1. Conn, E.E., Stumpf, P.K. and Bruening, G. (2006) Outlines of Biochemistry, 4th Edition, John Wiley and Sons Inc.
2. Buchanan, B., Gruissem, W. and Jones, R. (2000) Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists.
3. Elliot (2009) Biochemistry and Molecular Biology. Oxford Publishers.
4. Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John wiley & Sons. Inc.
5. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams.

RECOMMENDED ONLINE RESOURCES:

https://www.youtube.com/watch?v=rxt9nadNitY&pp=ygURYmlvY2hlbWlzdHJ5IGIuc2M%3D

https://www.youtube.com/watch?v=Yd32Zt_T7mM&pp=ygURYmlvY2hlbWlzdHJ5IGIuc2M%3D

BSBT 3202: Plant Ecology & Environmental Biology

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BSBT 3202P: Practical: Plant Ecology & Environmental Biology

COURSE OUTCOME

CO1: Understanding of Ecological Principles

CO2: Analysis of Plant Communities

CO3: Application of Ecological Principles

CO4: Fieldwork and Data Analysis Skills

CO5: Students will develop critical thinking skills to evaluate ecological problems and propose solutions

COURSE OBJECTIVE

The course "Plant Ecology and Environmental Biology" provides a comprehensive understanding of how plants interact with their environment and the ecological processes shaping natural systems. Beginning with foundational principles, students explore the intricate relationships between plants, their surroundings, and other organisms.

BSBT 3202: PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	Plants and environment – Edaphic Climatic and biotic factors. Interrelationship between the living world and the environment. Earth as a system: The biosphere, the hydrosphere, the lithosphere, atmosphere, components within biosphere.	8	1,2,3

II	Population: Basic concept, interaction and regulation. Community: Characteristics and their measurement, species diversity, ecological niche. Anatomical and Physiological responses of plants to water – Hydrophytes, Xerophytes, ligh-heriophytes, sciopmytes. Ecosystem: Types, structure and functions.	**8**	**4,5,6**
III	Food Chain: Food web, trophic levels, ecological pyramids, Bio-geochemical cycles. Productivity: Concepts and types. Ecological Succession: Hydrosere and Xerosere. Plant indicators and their role in environment monitoring.	**8**	**7,8,9,10**
IV	Soil conservation: Principles and management. Renewable and non-renewable natural resource and their management. Conservation of endangered species, wild life management. Forestation, Social and agro forestry. Major sources of environmental pollution and their control. Major vegetation belts in India. Environmental education and organizations.	**10**	**11,12, 13,14**
V	Revision Week	**8**	**15**

BSBT 3202 (P): PRACTICAL: PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	1. Minimum size of the quadrate by species area curve method. 2. Measurement of frequency and density in a grassland. 3. Water holding capacity of soil.	20	1-11
II	Revision Week	10	12-14

RECOMMENDED BOOKS:

1. Odum, E.P. (2005). Fundamentals of ecology. Cenagage Learning India Pvt. Ltd., New Delhi. 5th editin.
2. Singh, J.S., Singh, S.P., Gupta, S. (2006). Ecology Environment and Resource Conversation. Anamaya Publicaions, New Delhi, India.
3. Sharma, P.D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
4. Wilkinson, D.M. (2007). Fundamental Processes in Ecology. An Earth Systems Approach. Oxford University Press. U.S.A.
5. Kormondy, E.J. (1996). Concepts of ecology. PHI Learning Pvt. Ltd., Delhi, India. 4th edition.

RECOMMENDED ONLINE RESOURCES:

https://www.youtube.com/watch?v=uDzYq3FX0dI&list=PL1zxEeUFe9ldMsOAigN6G0CndXOtLNWVs

https://www.youtube.com/watch?v=KdlbjoXz7sE&list=PLeb3ZIuIVVHYyGNa3_Pa7Enl2DEt7zLuV

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

BSBT 3203: Plant Anatomy & Embryology

&

BSBT 3203P: Practical: Plant Anatomy & Embryology

COURSE OUTCOME

CO1: Understand Plant Anatomy

CO2: Analyse Plant Morphology and Adaptations

CO3: Apply Knowledge to Agriculture and Horticulture

CO4: Communicate Scientific Findings

CO5: Critically Evaluate Scientific Literature

COURSE OBJECTIVE

This course provides an in-depth exploration of the structure and development of plants, focusing on their anatomical features and embryonic development. Through lectures, laboratory work, and field studies, students will gain a comprehensive understanding of plant anatomy and embryology, from cellular to whole-plant levels.

BSBT 3203: PLANT ANATOMY AND EMBRYOLOGY

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks

I	Meristematic and permanent tissues. Root and shoot apical meristems: Simple and complex tissues. Internal organization of plant body. The three tissue systems, types of cells and tissues. Evolution of concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica corpus theory, continuing meristematic residue). Types of vascular bundles.	**10**	**1,2,3,4**
II	Organization of tissue in relation to environment, (Ecological and Anatomy). Anamolous secondary growth in – Bignonia, Nyctanthes, Achyranthes, Boerhaavia, Tecoma, Dracaena. Root – Stem transition.	**8**	**5,6,7**
III	Various development processes in Microsporo genesis, male gametophyte megaspore genesis in female gametophyte, Endosprm, Embryogenesis. Importance of anther and embryo culture. Pollination and Ferilization (outlines) Endosperm development and types.	**8**	**8,9,10**
IV	Development of Dicot and Monocot embryos, Polyembryony. Ovule structure and types; Megasporogenesis, development of Monosporic, Bisporic and Tetrasporic types	**8**	**11,12, 13**

	(Pepromia, Drusa, Adoxa) of embryo sacs.		
V	Revision Week	**8**	**14**

BSBT 3203 (P): PRACTICAL: PLANT ANATOMY AND EMBRYOLOGY

UNITS	CONTENTS	Contact Hrs.	No. Of Weeks
I	1. Study of meristems (permanent slides/photographs). 2. Study of simple tissues – parenchyma, chlorenchyma, collenchymas and sclerenchyma (fresh specimens/ permanent slides.) 3. Primary Structure. (a) Stems of Helianthus annus / Eupatorium odorum and Oryza sativa / Zea mays. (b) Roots of Helianthus annus / Eupatorium odorum and Oryza / Zea mays. (c) Leaves of Helianthus annus / Eupatorium odorum or any other suitable dicot plant. (d) Leaves of Oryza sativa or Zea mays.	**12**	**1,2,3,4**

II	1. Maceration of wood, structure of xylem & phloem (permanent slides, photographs). 2. Structure of perineum (permanent slide). 3. T.S. of stems of Boerhaaia, Bignonia and Dracaena showing anomalous secondary growth (fresh or preserved specimens). 4. Epidermal appendages and stomata types (fresh/permanent slides).	**10**	**5,6,7,8**
III	1. Anatomical adaptations: Xerophytes (Opuntia); Hydrophytes (any hydrophytes – anatomy of stem/root/leaf), Halophyte (leaf and pneumatophore of Avicennia), Epiphyte (aerial root of any epiphyte). 2. Structure of anther (young and mature); tapetum – amoeboid and secretary (Permanent slides / pictures / photographs). 3. Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/campylotropous (permanent slides/pictures/photographs).	**10**	**9,10,11**
IV	1. Female gametophyte: Polygonal (monosporic), Alliums (bishopric) and Fritillaria or peperomia (tetrasporic) types of embryo sac development (permanent slides/ photographs). 2. Pollution types and dispersal mechanisms of fruits/seeds (any 4types – live/preserved/photographs and/specimens). 3. Demonstration of polyembryony using Citrus seeds.	**10**	**12,13, 14**
V	Revision Week	**8**	**15**

RECOMMENDED BOOKS:

1. "Plant Anatomy and Embryology" by K. Esau.
2. "Plant Anatomy: A Concept-Based Approach" by P. Stewart and D. Rothwell.

RECOMMENDED ONLINE RESOURCES:

https://www.youtube.com/watch?v=gKJmNKDqh_g&list=PLz-yxFzpe5VEFxwP09V2J0OTk6fUOKkhr

https://www.youtube.com/watch?v=PDnDXZjTyDE&list=PLz-yxFzpe5VHOJAL6gveISSkqpukoEc7R