

FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH FROM THE YEAR 2022 TO YEAR 2025

ProgrammeCode: BSHB

**Programme Name: B.Sc. (Hons) Botany
(Semester I-II)**

Examinations: 2022-2025



DEPARTMENT OF BOTANY KHALSA COLLEGE, AMRITSAR (An Autonomous College)

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(b) Subject to change in the syllabi at any time.
(c) Please visit the University website time to time

S.No.	PROGRAMME OBJECTIVES
1.	To understand the diversity of plants and their role in maintaining ecological balance.
2.	To apply the knowledge of plants for the upliftment of society by addressing health, environmental and food scarcity issues.
3.	To provide the latest subject matter, both theoretical as well as practical related with the fundamental process of plants.
4.	The botany graduates as envisioned in this programme would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.
5.	The programme will enable the graduate to prepare for national as well as international competitive examinations.

S.No.	PROGRAMME SPECIFIC OUTCOMES (PSOS)
PSO-1	The graduated students will be able to compare the characteristic features of the different groups of plants (algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms).
PSO-2	The students will be able to collect and evaluate relevant information about the plants, their position in the classification systems and at phylogenetic level.
PSO-3	The students will be able to learn about the various functions of gene, genome, cells and tissues of the plants.
PSO-4	Students will be able to relate the physical features of the environment with the structure of populations, communities, and ecosystems.
PSO-5	The students after graduation will become competent enough in various analytical and technical skills related to plant sciences.

B.Sc. (Hons.) Botany Scheme of Course

Course Scheme						
Semester - I						
Course Code	Course Name	Hours/Week	Marks			Page No.
			Theory/ practical	Int. Ass.	Total	
BHB 101	Algae and Microbiology	6	37	13	50	4-5
BHB 102	Non-Chordates I	6	37	13	50	8-9
PHU 111	Optics	6	37	13	50	12-13
MAB 114	Maths I	6	37	13	50	16-17
BHPB-1101	Punjabi / Basic Punjabi I	6	37	13	50	18-19
BCEN-1123	Communicative English I	6	37	13	50	20-21
BHB 107	Lab I: Algae and Microbiology	6	37	13	50	6-7
BHB 108	Lab II: Non-Chordates I	6	37	13	50	10-11
PHU 112	Lab III Optics	3	19	06	25	14-15

**B.Sc. (Hons.) Botany
Semester II
Scheme of Course**

Course Scheme						
Semester -I						
Code (Course code)	Subject (Course Title)	Hours /Week	Marks			Page No.
			Theory/ practical	Int. Ass.	Total	
BHB 201	Fungi and Plant Pathology	6	37	13	50	22-23
BHB 202	Non-Chordates II	6	37	13	50	26-27
PHU 121	Modern Physics	6	37	13	50	30-31
MAB 124	Maths II	6	37	13	50	34-35
BHPB-1201	Punjabi / Basic Punjabi II	6	37	13	50	36-37
BCEN-1223	Communicative English II	6	37	13	50	38-39
BHB 207	Lab I: Fungi and Plant Pathology	6	37	13	50	24-25
BHB 208	Lab II: Non-Chordates II	6	37	13	50	28-29
PHU 122	Lab III: Modern Physics	3	19	06	25	32-33

B.Sc. (Hons.) Botany SEMESTER-I
Programme Code: BSHB
Course code: BHB 101
Course Title: Algae and Microbiology

Credit Hours (Per Week): 4

Total Hours : 60

BHB101 : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

Instructions for the paper setter:

- 1) There will be a total of 9 questions of which five are to be attempted.
- 2) Question 1 will be compulsory and will be of 5 short answer type (One mark each).
- 3) The remaining 8 questions shall include two questions from each unit. Candidate shall be required to attempt 4 questions, one from each unit. All questions shall have equal marks (8 marks each). Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives:

CO-1	To acquaint students with basic concepts of diversity of Algae, Viruses and Bacteria.
CO-2	To study systematic Position, structure, function and economic importance of these microbes.

UNIT-I

1. **Algae:** General characteristics, habit and habitat, thallus organization, cell structure, photosynthetic pigments, nutrition, food reserves and flagellation *etc.*
2. **Classification of Algae:** History and modern trends in classification of algae. Economic importance of algae.

UNIT-II

3. **Cyanophyta:** General characters, distribution, thallus organization, nutrition, cell structure, cell differentiation, distinction between heterocyst and vegetative cell, reproduction and classification. Morphology and life cycle of *Oscillatoria* and *Nostoc*
4. **Salient features, cell structure, thallus organization and reproduction of following divisions:**

Chlorophyta: *Chlamydomonas, Volvox, Oedogonium.*

Charophyta: *Chara*

Rhodophyta: *Batrachospermum*

Bacillariophyta: *Pinnularia*

Xanthophyta: *Vaucheria.*

Phaeophyta: *Ectocarpus, Sargassum*

UNIT-III

5. Viruses: Discovery, definition, nature, characteristic features; general structure and classification. Plant viruses, animal viruses, bacterial viruses (Bacteriophages).

6. Transmission of viruses: Transmission of viruses with reference to TMV and bacteriophage (lytic and lysogenic cycle).

UNIT-IV

7. Bacteria and Mycoplasma: Discovery, general characteristics; types-archaebacteria, eubacteria, cell structure; reproduction and recombination (conjugation, transformation and transduction) in bacteria. A general account on Mycoplasmas.

8. Economic importance of bacteria: Economic importance of bacteria with special reference to their role in agriculture and industry.

Suggested Reading

1. Bold, H.C. and Wynne, M.J. *Introduction to the Algae, Structure and Reproduction*, Prentice Hall, New Delhi, 1978.
2. Fritsch, F.E. *The Structure and Reproduction of Algae* (Vols. I & II), Vikas Publishing House Pvt.Ltd., New Delhi, 1979.
3. Kumar, H.D. *Introductory Phycology*, East West Press, New Delhi, 1999.
4. Lee, R.E. *Phycology*, Cambridge University Press, Cambridge, 2008.
5. Van Den Hock, C., Mann, D.G. and Jahns, H.M. *Algae: An Introduction to Phycology*, Cambridge University Press, Cambridge, 1995.
6. Tortora, G.J., Funke, B.R., Case, C.L. (2010). *Microbiology: An Introduction*, Pearson Benjamin Cummings, U.S.A. 10th edition.
7. Bos, L. *Introduction of Plant Virology*, Longman, N.Y., 1978.
8. Mathews, R.E.F. *Plant Viriology*. Academic Press, N.Y., 1981.
9. Schliegel, H.S. *General Microbiology*. Cambridge University Press, Cambridge, 1995.
9. Smith, K.M. *A Text Book of Plant Virus Diseases*, Longman, Edinburgh, 1972.

Course Outcomes:

CO-1	To gain knowledge and understanding the range of plant diversity in terms of structure and function. To study the plant classifications and distributions.
CO-2	To assimilate knowledge and concepts based on the literature available in libraries and from different internet sources. Also, to understand the evolving state of knowledge in a developing field or area.
CO-3	To carry out the practical work and field studies to establish a proper link. The field work includes the collection of required plant specimens, to carry out studies on the floristics, vegetation surveys, ecology and their statistical analysis.
CO-4	To gain knowledge about the basics of plant sciences and their formal and scientific studies.

Programme: B.Sc. (Hons.) Botany SEMESTER–I

Course Code: BHB 107

Course Title: Lab I Algae and Microbiology

Credit Hours (Per Week): 4

Total Hours : 60

BHB107 : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

Course Objectives

CO-1	The course will give hands on training to students to work in laboratories.
CO-2	Understand the diversity in vegetative and reproductive structures in algae
CO-3	Understand the diversity among bacteria

Practicals

1. Study of vegetative and reproductive structures of following genera:

Oscillatoria,
Nostoc,
Chlamydomonas,
Volvox,
Oedogonium.
Chara,
Batrachospermum,
Pinnularia,
Vaucheria,
Ectocarpus,
Sargassum

2. Study of detailed structure of TMV and T-Phage

3. Study of different types (shape, single/colony, flagellation*etc.*) of bacteria

4. Gram staining of bacteria.

Suggested Readings

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.

2. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International.

3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.

4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.

5. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
6. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi

Course Outcomes:

CO-1	Prepare and view specimens for examination using microscope.
CO-2	Differentiate algae on the basis of morphology, reproductive structures and anatomy.
CO-3	Differentiate bacteria on the basis of gram staining

Programme: B.Sc. (Hons.) Botany SEMESTER-I

Course Code: BHB 102

Course Title: Non-Chordates-I

Credit Hours (Per Week): 4

Total Hours : 60

BHB102 : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

Instructions for the paper setter:

- 1) There will be a total of 9 questions of which five are to be attempted.
- 2) Question 1 will be compulsory and will be of 5 short answer type (One mark each).
- 3) The remaining 8 questions shall include two questions from each unit. Candidate shall be required to attempt 4 questions, one from each unit. All questions shall have equal marks (8 marks each). Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives: The paper aims to

1.	Understand the animal kingdom.
2.	Understand the taxonomic position of protozoa to Annelida.
3.	Understand the general characteristics of animals belonging to protozoa to Annelida.
4.	Understand the body organization of phylum from protozoa to Annelida.
5.	Understand the origin and evolutionary relationship of different phylum from protozoa to Annelida.

UNIT-I

- Protozoa: Type study
 - *Amoeba proteus*
 - *Paramecium*

UNIT-II

- Porifera: Type study
 - *Sycon*
- Coelenterata: Type study
 - *Obelia*

UNIT-III

- Platyhelminthes: Type study
 - *Fasciola hepatica*
 - *Taenia solium*
- Parasitic adaptations in Helminthes

UNIT-IV

- Aschelminthes: Type study
 - *Ascaris*
- Annelida: Type study
 - *Pheretima posthuma*

Books Recommended

1. Barnes, R.D., Invertebrate Zoology, Saunders W.B., Co., Philadelphia, 1980
2. Dhama, P.S. and Dhama, J.K., Invertebrate Zoology, 5th ed., R. Chand & Co., New Delhi, 2004
3. Kotpal, R.L., Modern Text Book of Zoology, Invertebrates, 10th ed., Rastogi Publications, Meerut, 2012.
4. Parker, T.J. and Haswell, W.A., Text book of Zoology, Invertebrates, 7th ed., Vol. I (eds. A.J. Marshall & W.D. Williams), CBS Publishers & Distributors., Delhi, 1992.

Course Outcomes:

CO-1.	The subject of non chordates helps the students to know about the structural aspects of different animals.
CO-2.	Students also gain knowledge about the taxonomies and evolutionary aspects of Zoology.
CO-3.	To study faunal diversity and learn to implement conservation measures to save biodiversity.

Programme: B.Sc. (Hons.) Botany SEMESTER-I
Course Code: BHB 108
Course Title: Lab 2 Non-Chordates-I

Credit Hours (Per Week): 4

Total Hours : 60
BHB108 : 37 Marks
Internal Assessment : 13 Marks
Total : 50 Marks

Course Objectives: The paper aims to:

1.	Understand the structure of invertebrates and classify them.
2.	Understand the structure and function of digestive, reproductive and nervous system of earthworm.
3.	Understand the preparation of temporary slides.
4.	Study permanent stained slides of animals from protozoa to annelida.

I. Classification up to orders and study of the specimens mentioned against each phylum with ecological note and economic importance if any

Protozoa: *Amoeba, Euglena, Trypanosoma, Noctiluca, Eimeria, Monocystis, Paramecium, Opalina, Vorticella, Balantidium, Nyctotherus*
Porifera: *Sycon, Grantia, Spongilla, Euplectella, Hyalonema,*
Coelenterata: *Porpita, Velella, Physalia, Aurelia, Metridium, Tubipora, Zooanthus, Madrepora, Favia, Fungia, Obelia* (colony, medusa and polyp), *Sertularia, Tubipora, Plumularia, Bougainvillea.*
Platyhelminthes: *Planaria, Fasciola, Taenia, Dugesia, Echinococcus*
Aschelminthes: *Ascaris* (male and female), *Trichinella, Ancylostoma*
Annelida: *Pheretima, Lumbricus, Nereis, Heteronereis, Aphrodite, Amphitrite, Arenicola, Hirudinaria*

II Study of Permanent slides

Porifera: Spicules, T.S. *Sycon*
Coelenterata: *Hydra* (W.M.), T.S. through the region of testis and ovary
Platyhelminthes: Miracidium, Sporocyst, Redia, Cercaria larvae of *Fasciola*, Scolex, mature and gravid proglottids of *Taenia*
Aschelminthes: *Ascaris* (T.S. male and female)
Annelida: Earthworm (T.S. typhlosolar and gizzard region), spermathecae, setae and septal nephridium

III Temporary mounts: Spicules of *Sycon*

IV Culture Preparation: *Paramecium*

V Study of systems through charts/models

Pheretima posthuma: Digestive, Reproductive and Nervous system

VI Students must be taken out to study biodiversity among invertebrates

Guidelines to conduct Practical Examination:-

1.	Identify and classify the specimen's upto order. Write a note on their habit, habitat, special features and economic importance if any.	15
2.	Identify the slides and give at least two reasons for their identification.	6
3.	Identify the organ systems of <i>Pheretima posthuma</i> by using models.	4
4.	Preparation of Temporary mount	4
5.	Assignment	3
6.	Viva-voce & Practical file.	5

*Minor changes can be done as per the availability of materials.

Course Outcomes:

CO-1	Have knowledge about all the different phyla of invertebrates.
CO-2	Understand the comparative structure of invertebrates.
CO-3	Have an insight about the microscopic life.
CO-4	Differentiate invertebrates on the basis of morphological characteristics.

Programme: B.Sc. (Hons.) Botany SEMESTER-I
Course Code: PHU-111
Course Title: Optics

Credit Hours (Per Week): 4

Total Hours : 60

BHB103 : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

Instructions for the paper setter:

- 1) There will be a total of 9 questions of which five are to be attempted.
- 2) Question 1 will be compulsory and will be of 5 short answer type (One mark each).
- 3) The remaining 8 questions shall include two questions from each unit. Candidate shall be required to attempt 4 questions, one from each unit. All questions shall have equal marks (8 marks each). Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives:

CO-1	To gain theoretical knowledge and an in depth understanding of properties of light like reflection, refraction, interference, diffraction and polarization
CO-2	Designing and working of different optical instruments used in various fields of science.

UNIT-I

Ray Optics: Reflection of light, Refraction of light, Total internal reflection and its applications, Lenses, Lens maker's formula, Refraction and dispersion through a prism, Scattering of light, Microscope and its magnifying power.

UNIT-II

Interference: Young's experiment, Coherent Source, Phase and path differences, Theory of interference fringes, Fresnel's biprism, Thickness of thin transparent sheet, Interference in thin film due to reflected and transmitted light, Colour of thin film, Newton's rings and their applications, Michelson interferometer, Feby-Perot Interferometer, Anti reflection coatings.

UNIT-III

Diffraction: Introduction, Fraunhofer diffraction at a single slit and its discussion, Fraunhofer diffraction at double slit, Missing orders in a double slit, Diffraction of N slits and its discussion, Diffraction grating, dispersive power, Rayleigh criterion for resolving power, Resolving power of a diffraction grating.

UNIT-IV

Polarization: Transverse nature of light, Polarization by reflection and refraction, Brewster's Law, Malus Law, Double refraction, Nicol Prism, Elliptically and circularly polarized light, Quarter-wave and half-wave plates, Production and detection of polarized light, Optical activity, Specific rotation. Half shade polarimeter.

Reference Books:

1. A Text Book of Optics: N. Subramanayam, B. Lal and M. N. Avadhanulu.
2. Optics: Ajoy Ghatak. Tata Mc Graw Hill Publishing Company Limited.
3. Fundamentals of Optics: Jenkins and White.
4. A Text Book of Optics: T. S. Bhatia, V. K. Sharma, S. Vikas & Company.

Course Outcomes:

On completing the course, the students will be able to:

CO-1	Gain knowledge about wave theory of light.
CO-2	Acquire an in depth understanding of properties of light like reflection, refraction, interference, diffraction and polarization.
CO-3	Understand the applications of interference in design and working of interferometers.
CO-4	Comprehend the concept of Polarization through thorough understanding of Electromagnetic waves and their transverse nature.
CO-5	Understand the applications of diffraction and polarization in various optical instruments.

Programme: B.Sc. (Hons.) Botany SEMESTER–I

Course Code: PHU-112

Course Title: Lab III: Optics

Credit Hours (Per Week): 4

Total Hours : 60

BHB109 : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

General Guidelines for Practical Examination

I. The distribution of marks is as follows: **Max. Marks: 37+13 (Internal Assessment)**

i) One experiment **15 Marks**

ii) Brief Theory **5 Marks**

iii) Viva–Voce **10 Marks**

iv) Record (Practical file) **7 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment be allotted to more than three examinee in any group.

Course Objectives:

CO-1	To acquaint and make the students understand the working principles of different optical instruments and relate them to the theoretical concepts of Interference, diffraction and polarization.
CO-2	Gain precision in handling of optical instruments and in making accurate physical measurements using experimental uncertainty and limits

Course Contents:

1. To find the angle of prism by rotating telescope.
2. To find the refractive index of the glass prism using a spectrometer.
3. To find the refractive index of a transparent liquid using a hollow glass prism and spectrometer for given wavelength.
4. To study the variation of refractive index with wavelength of spectral line of mercury source and hence find the values of Cauchy's constant.
5. To measure the wavelength of sodium light by using Newton's rings apparatus.
6. To determine the wavelength of spectral line of mercury using diffraction grating.
7. To determine the wavelength of sodium light using plane diffraction grating.
8. To determine the resolving power of plane diffraction grating.
9. To measure an accessible distance between two points using a sextant.
10. To measure an inaccessible distance between two points using a sextant.
11. To find the magnification power of a telescope.

12. To find the specific rotation of sugar solution by Laurentz half shade polarimeter

Reference Books:

Practical Physics Vol.II, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications
Practical Physics, C.L. Arora, S. Chand & Co.

Course Outcomes:

On completing the course, the students will be able to:

CO-1	Understand the working of basic optical instruments.
CO-2	Understand and differentiate between the different phenomenon related to light such as Interference, diffraction and polarization.
CO-3	Gain precision in handling of optical instruments.
CO-4	Understand the operating principle of certain optical instruments
CO-5	Understand the applications of Interference, diffraction and polarization.

Programme: B.Sc. (Hons.) Botany SEMESTER-I
Course Code: MAB-114
Course Title: Maths-I

Credit Hours (Per Week): 4

Total Hours : 60

BHB104 : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

Medium - English

Time - 3hrs

Instructions for the paper setter:

- 1) There will be a total of 9 questions of which five are to be attempted.
- 2) Question 1 will be compulsory and will be of 5 short answer type (One mark each).
- 3) The remaining 8 questions shall include two questions from each unit. Candidate shall be required to attempt 4 questions, one from each unit. All questions shall have equal marks (8 marks each). Preferably, In case of any splitting, it should not have more than two sub-parts.

Course Objectives:

CO-1	To enable the students understand the basic concept of integration and differentiation.
CO-2	To help the students to acquit with the statistical techniques.
CO-3	To make the students aware about the differential equations.
CO-4	To correlate mathematical concepts with the botany.

Section-A

Functions: Domain and Range of a function, Graph of a function, Inverse functions, Exponential and logarithmic functions, periodic functions, Limit of functions, Algebraic computation of limits.

Matrices: Introduction and definition of matrices, types of matrices, matrix addition and scalar multiplication, transpose and inverse of a matrix (only application), solution of system of linear equations using matrices. Cayley Hamilton theorem, eigen values and eigen vectors.

Section-B

Differentiation: Derivability and Derivative, Growth rates, instantaneous rate of change, Derivatives of standard functions, Formulae on derivative of sum, difference, product and quotient of functions, Chain rule.

Derivative of trigonometric functions, exponential and logarithmic functions. Derivative of functions expressed in parametric form. Logarithmic differentiation. Derivative of higher order (upto 2nd order). Maxima and minima of a function of a single variable.

Recommended books:

1. Batschelet, E.(1971): Introduction to Mathematics for Life Scientist, Springer-Verlog, Berlin.

2. Shanti Naryan and P.K. Mittal(2011): Differential Calculus, S.Chand and Co. (New Delhi)

Course Outcomes:

CO-1	Understand the basic concept of integration and differentiation.
CO-2	To acquaint with the statistical techniques.
CO-3	Solve the problems related to the differential equations.
CO-4	Find out the maximum and minimum value of a function using derivatives.
CO-5	Correlate mathematical concepts with the botany.

Practicals: Commands of MATLAB for calculating different type of operations of Matrices. Graphs of Trigonometric functions, Exponential function, Logarithmic function, Inverse function.

B.Sc. (Hons.) Botany SEMESTER-I

Course Code: BHPB-1101

ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ

ਸਮਾਂ : 3 ਘੰਟੇ
ਕੁੱਲ ਘੰਟੇ : 60

ਕ੍ਰੈਡਿਟ ਪ੍ਰਤੀ ਹਫ਼ਤਾ : 04
ਥਿਊਰੀ ਅੰਕ: 37, ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ : 13, ਕੁੱਲ ਅੰਕ : 50

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

- ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ। ਪਹਿਲੇ ਚਾਰ ਭਾਗਾਂ ਵਿਚ 02-02 ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰੇਕ ਭਾਗ ਵਿਚੋਂ 01-01 ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੋਵੇਗਾ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ (08) ਅੰਕ ਹੋਣਗੇ। ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਪੰਜਵੇਂ ਭਾਗ ਵਿਚ ਸਾਰੇ ਸਿਲੇਬਸ ਵਿਚੋਂ 01-01 ਅੰਕ ਦੇ ਛੇ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ, ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ 05 ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ ਦੇਣਾ ਲਾਜ਼ਮੀ ਹੋਵੇਗਾ। ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।
ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ 13 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵੱਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਥਿਊਰੀ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 37+13 = 50 ਹਨ।

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objectives

CO-1	ਵਿਦਿਆਰਥੀਆਂ ਵਿਚ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪੈਦਾ ਕਰਨਾ।
CO-2	ਆਲੋਚਨਾਤਮਕ ਰਚੀਆਂ ਵਿਕਸਤ ਕਰਨਾ।
CO-3	ਮਾਤ ਭਾਸ਼ਾ ਦੀ ਸਮਝ ਨੂੰ ਵਿਕਸਤ ਕਰਨਾ

ਪਾਠ-ਕ੍ਰਮ
ਭਾਗ-ਪਹਿਲਾ

ਸਾਹਿਤ ਦੇ ਰੰਗ, ਡਾ. ਮਹਿਲ ਸਿੰਘ (ਸੰਪਾ.), ਰਵੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
ਭਾਗ ਪਹਿਲਾ - ਕਵਿਤਾ ਅਤੇ ਕਹਾਣੀ, ਡਾ.ਮਹਿਲ ਸਿੰਘ ਅਤੇ ਡਾ. ਆਤਮ ਰੰਧਾਵਾ (ਸਹਿ ਸੰਪਾ.)
(ਕਵਿਤਾ ਭਾਗ ਵਿਚੋਂ ਪ੍ਰਸ਼ੰਸਾ ਸਹਿਤ ਵਿਆਖਿਆ/ਵਿਸ਼ਾ-ਵਸਤੂ। ਕਹਾਣੀ ਭਾਗ ਵਿਚੋਂ ਸਾਰ/ਵਿਸ਼ਾ-ਵਸਤੂ)
ਭਾਗ-ਦੂਜਾ

ਇਤਿਹਾਸਿਕ ਯਾਦਾਂ
ਸ. ਸ. ਅਮੋਲ (ਸੰਪਾ.), ਪੰਜਾਬੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
(ਨਿਬੰਧ 1 ਤੋਂ 6 ਤਕ ਸਾਰ/ ਵਿਸ਼ਾ-ਵਸਤੂ/ਸ਼ੈਲੀ)

ਭਾਗ-ਤੀਜਾ

- (ੳ) ਪੈਰਾ ਰਚਨਾ (ਤਿੰਨਾਂ ਵਿਚੋਂ ਇਕ)
- (ਅ) ਪੈਰਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ

ਭਾਗ-ਚੌਥਾ

- (ੳ) ਭਾਸ਼ਾ ਵੰਨਗੀਆਂ: ਭਾਸ਼ਾ ਦਾ ਟਕਸਾਲੀ ਰੂਪ, ਭਾਸ਼ਾ ਅਤੇ ਉਪ-ਭਾਸ਼ਾ ਵਿਚਲਾ ਅੰਤਰ, ਪੰਜਾਬੀ ਉਪ-ਭਾਸ਼ਾਵਾਂ ਦੇ ਪਛਾਣ-ਚਿੰਨ੍ਹ
- (ਅ) ਪੰਜਾਬੀ ਭਾਸ਼ਾ : ਨਿਕਾਸ ਤੇ ਵਿਕਾਸ

ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)

CO-1	ਵਿਦਿਆਰਥੀ ਦੀ ਸਾਹਿਤਕ ਸੋਚ-ਸਮਝ ਵਿਕਸਤ ਹੋਵੇਗੀ।
CO-2	ਉਸ ਵਿਚ ਸਾਹਿਤ ਰੁਚੀਆਂ ਵਿਕਸਤ ਹੋਣਗੀਆਂ।
CO-3	ਉਸ ਵਿਚ ਸਾਹਿਤ ਸਿਰਜਣਾ ਦੀ ਸੰਭਾਵਨਾ ਵਧੇਗੀ।
CO-4	ਉਹ ਕਿਸੇ ਵੀ ਵਿਸ਼ੇ ਦਾ ਗਹਿਨ ਅਧਿਐਨ ਕਰਨ ਦੇ ਕਾਬਲ ਹੋਵੇਗਾ।
CO-5	ਉਹ ਮਾਤ ਭਾਸ਼ਾ ਦੇ ਵਿਕਾਸ ਵਿਚ ਵਿਸ਼ੇਸ਼ ਯੋਗਦਾਨ ਪਾਉਣਗੇ।

Programme: B.Sc. (Hons.) Botany SEMESTER-I

Course Code: BHB 105

Course Title: ਪੰਜਾਬੀ (ਮੁੱਢਲੀ ਪੰਜਾਬੀ)-I

Credit Hours (Per Week): 4

Total Hours : 60

BHB105 : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

1. ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਤੇ ਗੁਰਮੁਖੀ ਲਿਪੀ

ੳ) ਨਾਮਕਰਣ ਤੇ ਸੰਖੇਪ ਜਾਣ ਪਛਾਣ : ਗੁਰਮੁਖੀ ਵਰਣਮਾਲਾ, ਅੱਖਰ ਕ੍ਰਮ, ਸਵਰ ਵਾਹਕ (ੳ ਅ ਈ), ਲਗਾਂ ਮਾਤਰਾਂ, ਪੈਰ ਵਿਚ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣ, ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣ, ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ।

ਅ) ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ

15 ਅੰਕ

2. ਗੁਰਮੁਖੀ, ਆਰਥੋਗ੍ਰਾਫੀ ਅਤੇ ਉਚਾਰਨ : ਸਵਰ, ਵਿਅੰਜਨ : ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ ਅਤੇ ਉਚਾਰਣ, ਮੁਹਾਰਨੀ, ਲਗਾਂ ਮਾਤਰਾਂ ਦੀ ਪਛਾਣ ।

10 ਅੰਕ

3. ਪੰਜਾਬੀ ਸਬਦ ਜੋੜ : ਮੁਕਤਾ (ਦੋ ਅੱਖਰਾਂ ਵਾਲੇ ਸਬਦ, ਤਿੰਨ ਅੱਖਰਾਂ ਵਾਲੇ ਸਬਦ), ਸਿਹਾਰੀ ਵਾਲੇ ਸਬਦ, ਬਿਹਾਰੀ ਵਾਲੇ ਸਬਦ, ਔਂਕੜ ਵਾਲੇ ਸਬਦ, ਦੁਲੈਂਕੜ ਵਾਲੇ ਸਬਦ, ਲਾਂ ਵਾਲੇ ਸਬਦ, ਦੁਲਾਵਾਂ ਵਾਲੇ ਸਬਦ, ਹੋੜੇ ਵਾਲੇ ਸਬਦ, ਕਨੌੜੇ ਵਾਲੇ ਸਬਦ, ਲਗਾਂਖਰ (ਟਿੱਪੀ, ਬਿੰਦੀ, ਅੱਧਕ) ਵਾਲੇ ਸਬਦ, ਸੁੱਧ-ਅਸੁੱਧ।

15 ਅੰਕ

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪਹਿਲੇ ਭਾਗ ਵਿਚੋਂ ਵਰਣਨਾਤਮਕ ਪ੍ਰਸਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸਨਾਂ ਦਾ ਉੱਤਰ ਦੇਣਾ ਲਾਜਮੀ ਹੈ। ਹਰ ਪ੍ਰਸਨ ਦੇ ਪੰਜ-ਪੰਜ ਅੰਕ ਹਨ।

(5+5+5) 15 ਅੰਕ

2. ਭਾਗ ਦੂਸਰਾ ਵਿਚੋਂ ਦੋ-ਦੋ ਨੰਬਰ ਦੇ ਪੰਜ ਪ੍ਰਸਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਸਾਰੇ ਪ੍ਰਸਨ ਲਾਜਮੀ ਹਨ।

10 ਅੰਕ

3. ਭਾਗ ਤੀਸਰਾ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿਨ੍ਹਾਂ ਦੇ ਪੰਜ-ਪੰਜ ਅੰਕ ਹਨ।

15 ਅੰਕ

Programme: B.Sc. (Hons.) Botany SEMESTER-I

Course Code: BCEN1123
Course Title: Communicative English-I

Credit Hours (Per Week): 4
Total Hours: 60
Max. Marks: 50
Theory: 37
Internal Assessment: 13

Suggested paper pattern:-

1. Practical Question on Paragraph Writing with internal choice as prescribed in *The Written Word* (8 marks)
2. Short answer type questions from Unit 1 and 2 of *Making Connections: A Strategic Approach To Academic Reading* (12 marks)
3. Essay type question with internal choice from Unit 1 and 2 of *Making Connections: A strategic Approach to Academic Reading* (8 marks)
4. Practical question on Letter Writing from *The Written Word* (5 marks)
5. The question will carry 08 words out of 30 prescribed words from the “Word List” in *The Written Word*. The student will attempt any four (4) out of the eight (08). (4X1= 4 marks)

Course Objectives:

CO-1	To develop competence in written communication.
CO-2	To inculcate innovative and critical thinking among the students.
CO-3	To enable them to grasp the application of communication theories.
CO-4	To acquire the knowledge of latest technology related with communication skills.
CO-5	To provide knowledge of multifarious opportunities in the field of this programme.

Course Contents:

1. Reading and Comprehension Skills:

The students will be required to read and comprehend the essays in Unit 1 and 2 of the book *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Third Edition. They will be required to answer the questions given after each essay.

2. Developing Vocabulary and using it in the Right Context:

The students will be required to give the meaning of the words from the “Word List” from the Chapter “Vocabulary” in the book *The Written Word*. The question will be set from the following words :

Acute, Arrogant, Apathy, Bliss, Brevity, Cease, Chronic, Dearth, Discontent, Effigy, Fastidious, Giddy, Hamper, Guile, Inauspicious, Juxtapose, Kinetic, Laudable, Meticulous, Mundane, Naive, Opaque, Peevish, Proficient, Prolific, Remedial, Strife, Verbose, Woe, Zenith.

3. Writing Skills

The students will be required to write a Paragraph and a Letter as in the book *The Written Word* by Vandana R. Singh, Oxford University Press, New Delhi.

Course Outcomes:

The completion of this course enables students to:

CO-1	Identify common errors in language and rectify them.
CO-2	Develop and expand writing skills through controlled and guided activities.
CO-3	Develop coherence, cohesion and competence in written discourse through intelligible pronunciation.
CO-4	Develop the ability to handle the interview process confidently and learn the subtle nuances of an effective group discourse.
CO-5	Communicate contextually in specific and professional situations with courtesy

Programme: B.Sc. (Hons.) Botany SEMESTER–II

Course Code: BHB 201

Course Title: Fungi & Plant Pathology

Credit Hours (Per Week): 4

Total Hours : 60

BHB201 : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

Instructions for the paper setter:

- 1) There will be a total of 9 questions of which five are to be attempted.
- 2) Question 1 will be compulsory and will be of 5 short answer type (One mark each).
- 3) The remaining 8 questions shall include two questions from each unit. Candidate shall be required to attempt 4 questions, one from each unit. All questions shall have equal marks (8 marks each). Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives:

CO-1	Students will get insight on general characteristics, lifecycle, ecology of different members of each group of fungi; importance of mushroom; symbiotic association in lichen; applied mycology which deals with importance of fungi in agriculture, pharmaceutical and other industries.
CO-2	Students will learn about the etiology and symptomology of several fungal diseases in plants. Prevention and control of plant diseases.
CO-3	After studying phytopathology students get complete understanding of disease causing factors and simultaneous preventive controls for the several plant diseases.

UNIT-I

1. Characteristic features and classification of fungi.
2. Economic importance of fungi.
3. General account of the following groups of fungi with the help of genera mentioned against each group and emphasis on diseases caused.

MYXOMYCOTA : *Physarum*

OOMYCOTA : *Pythium, Phytophthora, Peronosclerospora, Albugo.*

UNIT-II

4. General account of the following groups of fungi with the help of genera mentioned against each group and emphasis on diseases caused.

CHYTRIDIOMYCOTA : *Synchytrium*

ZYGOMYCOTA : *Rhizopus*

ASCOMYCOTA : *Saccharomyces, Erysiphe, Aspergillus, Penicillium, Peziza*

UNIT-III

5. General account of the following groups of fungi with the help of genera mentioned against each group and emphasis on diseases caused.

BASIDIOMYCOTA : *Agaricus, Polyporus, Lycoperdon, Puccinia, Ustilago*
MITOSPORIC FUNGI : *Cercospora, Pyricularia, Colletotrichum, Alternaria.*

UNIT – IV

6. Principles of Plant pathology: Terms and concepts; General symptoms; Etiology; Host-Pathogen relationships; Disease cycle and environmental relation; Plant defense mechanisms; prevention and control of plant diseases; role of quarantine.

Suggested Readings

1. Agrios, G.N. (1997) Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopolous, C.J. Mims, C.W. and Blackwell, M. *Introductory Mycology*, John Wiley and Sons, New York, 1996.
3. Bilgrami, K.S. and Verma, R.N. *Physiology of Fungi*, Vikas Publishing House, New Delhi, 1978.
Burnett, J.H. *Fundamentals of Mycology*, Edward Arnold, London, 1976.
4. Carlile, M.J., Watkinson, S.C. and Gooday, G.W. *The Fungi*. Academic Press, New York.
5. Hale, M.E., 1983 *The Biology of Lichens*, Arnold, London, 2001.
6. Ingold, C.T. *Fungal Spores, Their Liberation and Dispersal*, Clarendon Press, Oxford, 1971.
7. Kendrick, B. *The Fifth Kingdom*. Focus Publishing, Newburyport, M.A. U.S.A., 2000.
8. Kirk, P.M., Cannon, P.F., Minter, D.W. and Stalpers, J.A. *Dictionary of the Fungi*. 10th Edition, CAB International, U.K., 2008.
9. Moore, L. *Fundamentals of the Fungi*, Prentice Hall, New York, 1972.
10. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.
11. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.

Course Outcomes:

CO-1	To understand the usage of IT and computer applications in developing the subjects according to the recent trends.
CO-2	To identify the taxonomic position of plants, analyse the non-reported flora and their taxonomic treatment as per the basic principles and rules of plant nomenclature.
CO-3	To understand the effect of plant diversity on environment sustainability.
CO-4	To understand the applicability of the subject in the daily routine life.
CO-5	To develop the skills as a field botanist.

Programme: B.Sc. (Hons.) Botany SEMESTER–II
Course Code: BHB 207
Course Title: Lab I: Fungi & Plant Pathology

Credit Hours (Per Week): 4

Total Hours : 60

BHB : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

Course Objectives:

CO-1	Students will get insight on general characteristics, lifecycle, ecology of different members of each group of fungi; importance of mushroom; symbiotic association in lichen; applied mycology which deals with importance of fungi in agriculture, pharmaceutical and other industries
CO-2	Students will learn about the etiology and symptomatology of several bacterial and viral diseases in plants. Prevention and control of plant diseases
CO-3	Students can learn about the role of fungi in biotechnology, food industry, agriculture and production of biological controls

Practicals

1. To work out the histopathology of the following:

- (a) White rust of Crucifers
- (b) Late blight of potato
- (c) Downy mildew of sorghum/bajra
- (d) Die back of pea
- (e) Powdery mildew
- (f) Wheat rust
- (g) Smut diseases of wheat and barley
- (h) Red rot of sugarcane
- (i) Tikka disease of groundnut
- (j) Early blight of tomato/ Potato
- (k) Red rot of sugarcane

2. To make permanent preparations:

- (a) V.S. of an apothecium – *Peziza* (tissue study).
- (b) V.S. Gill of mushroom

3. To make temporary mount: A study of the fungi viz. *Rhizopus*, *Penicillium*, *Aspergillus*, *Cercospora*, *Alternaria* and *Pyricularia*.

4. General survey (morphology) of other specimens of Myxomycota, Zygomycota, Ascomycota and Basidiomycota.

Course Outcomes:

CO-1	Comprehend the diversity of lower cryptogams <i>i.e.</i> , Fungi. Collection and study of fungi from different localities, Identification up to generic level.
CO-2	Recognition of the morphology, anatomy, physiology, reproduction, life cycle pattern and causative agent for different plant diseases.
CO-3	Distinguish between the harmful and beneficial fungal genera.
CO-4	After studying phytopathology, students get vast understanding of disease causing factors and simultaneous preventive controls for the several plant diseases.

Programme: B.Sc. (Hons.) Botany SEMESTER-II

Course Code: BHB 202
Course Title: Non-Chordates-II

Credit Hours (Per Week): 4

Total Hours : 60
BHB202 : 37 Marks
Internal Assessment : 13 Marks
Total : 50 Marks

Instructions for the paper setter:

- 1) There will be a total of 9 questions of which five are to be attempted.
- 2) Question 1 will be compulsory and will be of 5 short answer type (One mark each).
- 3) The remaining 8 questions shall include two questions from each unit. Candidate shall be required to attempt 4 questions, one from each unit. All questions shall have equal marks (8 marks each). Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives: The paper aims to:

CO-1	Understand the animal kingdom.
CO-2	Understand the taxonomic position of arthropods to hemichordates.
CO-3	Understand the general characteristics of animals belonging to arthropods up to hemichordates.
CO-4	Understand the body organization of phylum from arthropods to hemichordates.
CO-5	Understand the origin and evolutionary relationship of different phylum from arthropods to hemichordates.

UNIT-I

- Arthropoda: Type study
 - *Periplaneta Americana*
- Onychophora: (General characteristics and evolutionary significance)

UNIT-II

- Mollusca: Type study
 - *Pila*
- Significance of Torsion in Molluscs

UNIT-III

- Echinodermata: Type study
 - *Asterias*
- Study of Echinoderm larvae

UNIT-IV

- Hemichordata: Type study
 - *Balanoglossus*
- Affinities of Hemichordates with non chordates and chordates.

Books Recommended

1. Barnes, A., Invertebrate Zoology, Harcourt Publishers, International Company, 2001.
2. Chaudhry, S., Fundamental Invertebrate Zoology, S. Vikas & Co. Fatehpura, Jalandhar, 2003
3. Dhama, P.S. and Dhama, J.K., Invertebrate Zoology, 5th ed., R. Chand & Co., New Delhi, 2004. 2012
4. Kotpal, R.L., Modern Text Book of Zoology, Invertebrates, 10th ed., Rastogi Publications, Meerut.
5. Parker, T.J. and Haswell, W.A., Text book of Zoology, Invertebrates, 7th ed., Vol. I (eds. A.J. Marshall & W.D. Williams), CBS Publishers & Distributors, Delhi, 1992.

Course Outcomes:

CO-1	The subject of non chordates helps the students to know about the structural aspects of different animals.
CO-2	Students also gain knowledge about the taxonomies and evolutionary aspects of Zoology.
CO-3	To study faunal diversity and learn to implement conservation measures to save biodiversity
CO-4	The students get in depth knowledge about various animal phyla (Arthropoda to Hemichordata)
CO-5	Detailed type studies of representative organisms of each phyla.
CO-6	This course also provides detailed knowledge about evolutionary relationships between Non-Chordates, Hemichordates & Chordates.

Programme: B.Sc. (Hons.) Botany SEMESTER-II

Course Code: BHB 208

Course Title: Lab 2: Non-Chordates-II

Credit Hours (Per Week): 4

Total Hours : 60

BHB208 : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

Course Objectives: The paper aims to

CO-1	Classify the organisms up to orders with their ecological notes and economic importance.
CO-2	Understand the permanent stained slides of insects and mollusk.
CO-3	Understand digestive and nervous system of <i>Periplaneta</i> and <i>Pila</i> .

I Classification up to order and study of the specimens mentioned against each phylum with ecological note and economic importance if any

Arthropoda: *Palaemon, Lobster, Cancer, Sacculina, Eupagurus, Lepas, Cyclops, Daphnia, Peripatus, Lepisma, Periplaneta, Gryllus, Mantis, Forficula, Dragonfly, Cimex, Bombyx, Polistes, Apis, Pediculus, Julus, Scolopendra, Palamnaeus, Aranea, Limulus*

Mollusca: *Mytilus, Pholas, Pecten, Aplysia, Limax, Pila, Sepia, Octopus, Nautilus*

Echinodermata: *Asterias, Ophiothrix, Echinus, Antedon*

II. Study of Permanent slides

Arthropoda Trachea and mouthparts of Cockroach

Mollusca Radula of *Pila*

Echinodermata T.S. of Star-fish arm

III. Study of systems through charts/models

Periplaneta americana: Digestive and Nervous system

Pila: Digestive and Nervous system

Guidelines to conduct Practical Examination:-

1.	Identify and classify the specimen upto order. Write a note on their habit, habitat, special features and economic importance if any.	15
2.	Identify the slides and give at least two reasons for their identification.	9
3.	Identify the organ systems by using models.	4
4.	Preparation of Temporary mount	4
5.	Assignment	3
6.	Viva-voce & Practical file.	5

*Minor changes can be done as per the availability of materials.

Course Outcomes:

CO-1	Differentiate invertebrates on the basis of morphological characteristics
CO-2	Understand the comparative structure of invertebrates
CO-3	Have an insight about the internal systems of different invertebrates
CO-4	Have a knowledge about different phyla of invertebrates

Programme: B.Sc. (Hons.) Botany SEMESTER–II

Course Code: PHU-121
Course Title: Modern Physics

Credit Hours (Per Week): 4

Total Hours : 60

BHB203 : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

Instructions for the paper setter:

- 1) There will be a total of 9 questions of which five are to be attempted.
- 2) Question 1 will be compulsory and will be of 5 short answer type (One mark each).
- 3) The remaining 8 questions shall include two questions from each unit. Candidate shall be required to attempt 4 questions, one from each unit. All questions shall have equal marks (8 marks each). Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives:

CO-1	To attain a comprehensive understanding of the fundamental aspects of modern physics.
CO-2	Understand the basic ideas of quantum Physics through concepts and theories of 20 th century such as Photoelectric effect, Compton effect, uncertainty principle.
CO-3	The discovery of radioactivity its applications and detailed knowledge and classification of elementary and composite matter particles that exist in universe.

UNIT-I

Atomic Structure: Structure of Atom, Rutherford Scattering, Impact parameter, Distance of closest approach, Nucleus and its properties, The Bohr model of atom, Electron orbits, Energy levels and Hydrogen spectra, Bohr's correspondence principle, Atomic excitation, Franck Hertz experiment, Introduction to Lasers, Einsteins coefficients, He-Ne Laser.

UNIT-II

Radioisotopes and their Application: Radioactivity, Radioactive decay laws, Uranium and Carbon dating, α , β and γ decays and their properties, Radioisotopes, their production and separation, Uses of radioisotopes in medicine, agriculture and geology, Radiation doses and their units, Biological effects of radiation.

UNIT-III

Dual Nature of Matter and Radiation: Planck's quantum hypothesis, de Broglie's hypothesis, Electron diffraction experiments of Davisson and Germer, Wave group and particle velocities, Heisenberg's uncertainty principle, Principle of the electron microscope, Diffraction of X-rays from crystals, Bragg's law of diffraction.

UNIT-IV

Elementary Particles: Classification of elementary particles and their properties, Antiparticles, Conservation laws (qualitative only), Uses of ionization chamber, G.M. Counter, Scintillation counter and Photographic emulsions as detectors, Origin and general characterization of cosmic rays (Primary and Secondary).

Reference Books:

1. Concepts of Modern Physics: A. Beiser.
2. Essentials of Modern Physics: V. Acosta and C. L. Grown
3. Fundamentals of Modern Physics: B. D. Duggal and C. L. Chhabra.

Course Outcomes:

On completing the course, the student will be able to:

CO-1	Attain a comprehensive knowledge and understanding of the main Physical concepts and theories of the 20 th century.
CO-2	Understand the basic ideas of Quantum Physics through concepts of Photoelectric effect, Compton effect, uncertainty principle and concept of wave packet.
CO-3	Understand the basics of crystallography and X-ray diffraction.
CO-4	Gain an in depth understanding about the process of Radioactivity and its biological effects and Applications.
CO-5	Understand the concepts related to particle Physics and will attain knowledge about the classification and properties of different particles.

Programme: B.Sc. (Hons.) Botany SEMESTER–II
Course Code: PHU-122
Course Title: Lab 3: Modern Physics

Credit Hours (Per Week): 4

Total Hours : 60

BHB209 : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

General Guidelines for Practical Examination

I. The distribution of marks is as follows: **Max. Marks: 37+13(Internal Assessment)**

i) One experiment **15 Marks**

ii) Brief Theory **5 Marks**

iii) Viva–Voce **10Marks**

iv) Record (Practical file) **7 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

Course Objectives:

CO-1	To understand the basic concepts of Modern Physics such as particle nature of light, decay of atomic nucleus, atomic and molecular spectra of elements and molecules and knowledge of semiconductor devices through experiments on Photoelectric effect, Geiger muller counter, analysis of molecular spectrum of iodine and PN junction.
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Course Contents:

1. To study the gas discharge spectrum of hydrogen.
2. To study the absorption spectra of iodine vapours.
3. To determine the ionization potential of mercury.
4. To study the photoelectric effect and determine the value of Planck's constant.
5. Study of variation of light intensity with distance using photovoltaic cell (Inverse Square Law).
6. To draw the plateau of a GM counter and find the operating voltage of GM tube.
7. To find the dead time of GM counter.
8. To study the absorption coefficient beta particles in aluminium using GM counter and find the absorption coefficients.
9. To study the statistical fluctuations and end point energy of beta particles using GM counter.
10. Measurement of reverse saturation current in pn junction diode at various temperatures and find the approximate value of the band gap.
11. To determine the wavelength of He-Ne laser using plane diffraction grating.

Reference Books:

Practical Physics Vol.II, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications
Practical Physics, C.L. Arora, S. Chand & Co.

Course Outcomes:

On completing the course, the student will be able to:

CO-1	Understand the basic experiments of Modern Physics.
CO-2	Understand and verify the particle nature of light through experiments on Photoelectric effect.
CO-3	Gain knowledge about the construction and working of gas filled radiation detectors.
CO-4	Understand the concept of molecular spectra.
CO-5	Learn the working of a PN junction and comprehend the concept of band gap.

Programme: B.Sc. (Hons.) Botany SEMESTER-II

Course code: MAB-124

Course Title: Maths-II

Credit Hours (Per Week): 4

Total Hours : 60

BHB204 : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

Medium - English

Time - 3 hrs

Note for Paper setters/examiners:In Unit-I, Set 6 questions from section A. Students are to attempt any five. Each question carries 2 marks. In Unit-II, Set 6 questions from section B. Students are to attempt any four. Each question carries 3 marks. In Unit –III, Set any 5 questions from section A&B. Students are to attempt any 3. Each question carries 5 marks.

Course Objectives:

CO-1	To enable the students understand the basic concept of integration & differentiation.
CO-2	To help the students to acquit with the statistical techniques.
CO-3	To make the students aware about the differential equations.
CO-4	To correlate mathematical concepts with the botany.

Section -A

Integration: As inverse of differentiation. Indefinite integral of standard forms. Integration by parts. Integration by substitution.

Integration using method of partial fractions (of algebraic rational functions).

Definite integral and application in finding the area under simple curves, especially lines, arcs of circles (in standard form only).

Section-B

Statistics: Concept of Probability, Random Experiments: outcomes, sample spaces (Set Representation), Additive and Multiplication law of Probability, Independent Events, Conditional probability. Permutations and Combinations, standard deviation and skewness.

Differential Equations: Definition, Solution of differential equations of first order and first degree (Variable separable, homogeneous equations, linear equations and equations reducible to the linear form). Applications of first order differential equations to biology.

Recommended books:

1. Gupta S.P. (2000): Statistical methods. Sultan Chand and Company, New Delhi.
2. Kapoor V.K. and Gupta S.C. (2000): Fundamentals of Mathematical Statistics. Sultan Chand and Company, New Delhi.

3. Bailey, N.T.J.(1995): Statistical Methods in Biology, Cambridge University Press.
4. Shanti Naryan and P.K. Mittal(2011): Integral Calculus, S.Chand and Co. (New Delhi)

Course Outcomes:

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

CO-1	Understand the basic concept of integration & differentiation.
CO-2	To acquit with the statistical techniques.
CO-3	Solve the problems related to the differential equations.
CO-4	Find out the maximum and minimum value of a function using derivatives.
CO-5	Correlate mathematical concepts with the botany.

Practicals:

Graphs of simple curves, circles, lines. Experiments on probability theory, random experiments:- outcomes, sample space along with practical examples.

B.Sc. (Hons.) Botany SEMESTER-II

Course Code: BHPB-1201

ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ

ਸਮਾਂ : 3 ਘੰਟੇ
ਕੁੱਲ ਘੰਟੇ : 60

ਕ੍ਰੈਡਿਟ ਪ੍ਰਤੀ ਹਫ਼ਤਾ : 04
ਥਿਊਰੀ ਅੰਕ : 37, ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ : 13, ਕੁੱਲ ਅੰਕ : 50

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ। ਪਹਿਲੇ ਚਾਰ ਭਾਗਾਂ ਵਿਚ 02-02 ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰੇਕ ਭਾਗ ਵਿਚੋਂ 01-01 ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੋਵੇਗਾ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ (08) ਅੰਕ ਹੋਣਗੇ। ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਪੰਜਵੇਂ ਭਾਗ ਵਿਚ ਸਾਰੇ ਸਿਲੇਬਸ ਵਿਚੋਂ 01-01 ਅੰਕ ਦੇ ਛੇ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ, ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ 05 ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ ਦੇਣਾ ਲਾਜ਼ਮੀ ਹੋਵੇਗਾ। ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ 13 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵੱਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਥਿਊਰੀ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ $37+13 = 50$ ਹਨ।

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective

CO-1	ਵਿਦਿਆਰਥੀਆਂ ਵਿਚ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪੈਦਾ ਕਰਨਾ।
CO-2	ਆਲੋਚਨਾਤਮਕ ਰੁਚੀਆਂ ਨੂੰ ਵਿਕਸਤ ਕਰਨਾ।
CO-3	ਭਾਸ਼ਾਈ ਗਿਆਨ ਵਿਚ ਵਾਧਾ ਕਰਨਾ।

ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)

CO-1	ਵਿਦਿਆਰਥੀ ਦੀ ਸੋਚ-ਸਮਝ ਵਿਕਸਤ ਹੋਵੇਗੀ।
CO-2	ਉਸ ਅੰਦਰ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪ੍ਰਫੁੱਲਿਤ ਹੋਣਗੀਆਂ।
CO-3	ਉਸ ਅੰਦਰ ਸਾਹਿਤ ਸਿਰਜਣਾ ਦੀ ਸੰਭਾਵਨਾ ਵਧੇਗੀ।
CO-4	ਉਹ ਸੰਬੰਧਿਤ ਵਿਸ਼ੇ ਦਾ ਗਹਿਨ ਅਧਿਐਨ ਕਰਨ ਦੇ ਸੁਯੋਗ ਹੋਵੇਗਾ।
CO-5	ਉਹ ਭਾਸ਼ਾਈ ਬਣਤਰ ਤੋਂ ਜਾਣੂ ਹੋਵੇਗਾ।

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਸਾਹਿਤ ਦੇ ਰੰਗ, ਡਾ. ਮਹਿਲ ਸਿੰਘ (ਸੰਪਾ.), ਰਵੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।

ਭਾਗ ਦੂਜਾ - ਵਾਰਤਕ ਅਤੇ ਰੇਖਾ-ਚਿੱਤਰ, ਡਾ. ਪਰਮਿੰਦਰ ਸਿੰਘ, ਡਾ. ਭੁਪਿੰਦਰ ਸਿੰਘ ਅਤੇ ਡਾ.ਕੁਲਦੀਪ ਸਿੰਘ ਵਿੱਲੋਂ (ਸਹਿ ਸੰਪਾ.)

(ਵਾਰਤਕ ਭਾਗ ਵਿਚੋਂ ਸਾਰ/ਵਿਸ਼ਾ-ਵਸਤੂ। ਰੇਖਾ-ਚਿੱਤਰ ਭਾਗ ਵਿਚੋਂ ਸਾਰ/ਨਾਇਕ ਬਿੰਬ)

ਭਾਗ-ਦੂਜਾ

ਇਤਿਹਾਸਿਕ ਯਾਦਾਂ

ਸ. ਸ. ਅਮੋਲ (ਸੰਪਾ.), ਪੰਜਾਬੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।

(ਨਿਬੰਧ 7 ਤੋਂ 12 ਤਕ ਸਾਰ/ ਵਿਸ਼ਾ-ਵਸਤੂ/ਸ਼ੈਲੀ)

ਭਾਗ-ਤੀਜਾ

(ੳ) ਦਫ਼ਤਰੀ ਚਿੱਠੀ ਪੱਤਰ

(ਅ) ਮੁਹਾਵਰੇ ਅਤੇ ਅਖਾਣ

ਭਾਗ-ਚੌਥਾ

(ੳ) ਸ਼ਬਦ-ਬਣਤਰ ਅਤੇ ਸ਼ਬਦ-ਰਚਨਾ - ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਮੁੱਢਲੇ ਸੰਕਲਪ

(ਅ) ਸ਼ਬਦ-ਸ਼੍ਰੇਣੀਆਂ

Programme: B.Sc. (Hons.) Botany SEMESTER-II

Course Code: BHB 205

Course Title: ਪੰਜਾਬੀ (ਮੁੱਢਲੀ ਪੰਜਾਬੀ)-II

Credit Hours (Per Week): 4

Total Hours : 60

BHB : 37 Marks

Internal Assessment : 13 Marks

Total : 50 Marks

ਪਾਠ-ਕ੍ਰਮ ਅਤੇ ਪਾਠ-ਪੁਸਤਕਾਂ

1. **ਪੰਜਾਬੀ ਸਬਦ ਬਣਤਰ** : ਧਾਤੂ, ਵਧੇਤਰ (ਅਗੇਤਰ, ਮਧੇਤਰ, ਪਿਛੇਤਰ), ਪੰਜਾਬੀ ਕੋਸ਼ਗਤ ਸਬਦ ਅਤੇ ਵਿਆਕਰਣਿਕ ਸਬਦ **15 ਅੰਕ**
2. **ਪੰਜਾਬੀ ਸਬਦ ਪ੍ਰਕਾਰ** :
ੳ) ਸੰਯੁਕਤ ਸਬਦ, ਸਮਾਸੀ ਸਬਦ, ਦੋਜਾਤੀ ਸਬਦ, ਦੋਹਰੇ/ਦੁਹਰੁਕਤੀ ਸਬਦ ਅਤੇ ਮਿਸਰਤ ਸਬਦ
ਅ) ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ **10 ਅੰਕ**
3. **ਪੰਜਾਬੀ ਸਬਦ ਰਚਨਾ** :
ੳ) ਇੱਕ-ਵਚਨ ਬਹੁ-ਵਚਨ, ਲਿੰਗ-ਪੁਲਿੰਗ, ਬਹੁ-ਅਰਥਕ ਸਬਦ, ਸਮਾਨ-ਅਰਥਕ ਸਬਦ, ਬਹੁਤੇ ਸਬਦਾਂ ਲਈ ਇੱਕ ਸਬਦ, ਸਬਦ ਜੋੜ, ਵਿਰੋਧਆਰਥਕ ਸਬਦ
ਅ) ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸਬਦਾਵਲੀ : ਖਾਣ-ਪੀਣ, ਸਾਕਾਦਾਰੀ, ਰੁੱਤਾਂ, ਮਹੀਨਿਆਂ, ਗਿਣਤੀ, ਮੌਸਮ, ਮਾਰਕੀਟ/ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਧੰਦਿਆਂ ਨਾਲ ਸੰਬੰਧਿਤ। **10+5=15 ਅੰਕ**

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਭਾਗ ਪਹਿਲਾਂ ਵਿਚੋਂ ਚਾਰ ਪ੍ਰਸਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸਨਾਂ ਦਾ ਉੱਤਰ ਦੇਣਾ ਲਾਜ਼ਮੀ ਹਨ। ਹਰ ਪ੍ਰਸਨ ਦੇ ਪੰਜ-ਪੰਜ ਨੰਬਰ ਹਨ। **15 ਅੰਕ**
2. ਭਾਗ ਦੂਸਰਾ ਵਿਚੋਂ ਦੋ-ਦੋ ਨੰਬਰ ਦੇ ਪੰਜ ਪ੍ਰਸਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਸਾਰੇ ਪ੍ਰਸਨ ਲਾਜ਼ਮੀ ਹਨ। **10 ਅੰਕ**
3. ਭਾਗ ਤੀਸਰਾ ਦੇ (ੳ) ਭਾਗ ਵਿਚੋਂ ਦੋ ਸਵਾਲ ਅਤੇ (ਅ) ਭਾਗ ਵਿਚੋਂ ਇੱਕ ਸਵਾਲ ਪੁੱਛਿਆ ਜਾਵੇਗਾ। ਹਰ ਪ੍ਰਸਨ ਦੇ ਪੰਜ-ਪੰਜ ਅੰਕ ਹਨ। **10+5=15 ਅੰਕ**

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ 10 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਇਨ੍ਹਾਂ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁਲ ਅੰਕ 40+10 = 50 ਹਨ।

Programme: B.Sc. (Hons.) Botany SEMESTER-II

Course Code: BCEN-1223

Course Title: Communicative English-II

TIME: 3 Hrs

Credit Hours(Per Week):4

Total Hours: 60

Max. Marks: 50

Theory: 37

Internal Assessment: 13

Suggested paper pattern:-

1. Practical Question on Essay Writing with internal choice as prescribed in *The Written Word*. **(8 marks)**
2. Short answer type questions from Unit 3 and 4 of *Making Connections: A Strategic Approach To Academic Reading* **(12 marks)**
3. Essay type question with internal choice from Unit 3 and 4 of *Making Connections: A strategic Approach to Academic Reading* **(8 marks)**
4. Practical Question on Report Writing from *The Written Word* **(5 marks)**
5. The question will carry 4 Prefixes and 4 Suffixes (from the list given above) from the book *The Written Word*. The students will attempt any four (4) out of eight (8) **(4 marks)**

Course Objectives:

CO-1	To develop competence in oral and visual communication.
CO-2	To inculcate innovative and critical thinking among the students.
CO-3	To enable them to grasp the application of communication theories.
CO-4	To acquire the knowledge of latest technology related with communication skills.
CO-5	To provide knowledge of multifarious opportunities in the field of this programme

Course Contents:

1. Reading and Comprehension Skills:

Students will be required to read and comprehend the essays in Unit 3 and 4 of the book *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Third Edition. They will be required to answer the questions given after each essay.

2. Developing Vocabulary and using it in the right context:

Students will be required to study 'prefix' and 'suffix' from the chapter "vocabulary" in the book *The Written Word*. The question will be set from the following words:

Prefixes:- a-, anti-, auto-, bi-, dia-, di-, dis-, homo-, Hyper-, hypo-, mis-, non-, semi-, un-, pre-

Suffixes:- -able, -al, -cy, -dom, -fy, -hood, -ious, -ist, -ment, -ness, -ship, -some, -y, -logy.

3. Writing Skills

Students will be required to learn Essay writing, Report Writing and Letter Writing as in the book *The Written Word* by Vandana R. Singh, Oxford University Press, New Delhi.

Course Outcomes:

The completion of this course enables students to:

CO-1	Identify common errors in language and rectify them.
CO-2	Develop and expand writing skills through controlled and guided activities.
CO-3	Develop coherence, cohesion and competence in oral discourse through intelligible pronunciation.
CO-4	Develop the ability to handle the interview process confidently and learn the subtle nuances of an effective group discourse.
CO-5	Communicate contextually in specific and professional situations with courtesy.