JAI HIND COLLEGE
BASANTSING INSTITUTE OF SCIENCE
&
J.T.LALVANI COLLEGE OF COMMERCE
(AUTONOMOUS)

"A" Road, Churchgate, Mumbai - 400 020, India.

Affiliated to
University of Mumbai

Program :B.Sc.

Proposed Course : Botany

Semester I

Credit Based Semester and Grading System (CBCS) with effect from the academic year 2020-21

F.Y.B.Sc. Botany Syllabus

Academic year 2020 -2021

Semester I			
Course Code	**Course Title**	**Credits**	**Lectures /Week**
SBOT101	**Algae, Fungi and Lichens**	**2**	**3**
SBOT102	**Genetics, Ecology and Industrial Botany**	**2**	**3**
SBOT1PR	**Practical**	**2**	**6**

Semester I – Theory

Course code: SBOT101	**Algae, Fungi and Lichens** **(Credits : 2 Lectures/Week: 3)**	
	Learning Objectives: • To learn the morphology, structure and importance of the organisms and differentiate between various groups of Algae, Fungi and Lichens. • To learn the life cycles of individuals belonging to Chlorophyta, Cyanophytaand Phycomycetes. • To learn the economic importance of each group. • To study and understand the structure of algae and fungi in an association • To classify lichens on the basis of their habitat, internal structure, fungal partner and thallus morphology. • To study the details about origin, association and relations between the phyco and mycobiont • To learn economic importance and ecological significance of lichens • To study the diseases and parasites on lichens **Learning Outcomes:** Students will be able to • Differentiate and compare between different classes of algae from their syllabus. • Discuss life cycles and systematic position of algae prescribed in the syllabus • Differentiate between different Modes of nutrition in fungi. • Discuss life cycles and systematic position of fungi prescribed in the syllabus • Differentiate between types of lichen thallus on the basis of their internal and external structure. • Assess and understand the economic importance of lichens especially in food and medicine • Grasp the basic understanding of the ecological significance of presence of lichens and appreciate their role in the environment.	
Unit II	**FUNGI AND PLANT PATHOLOGY** • Outline of Classification according to G. M. Smith, General characters, thallus structure, reproduction, economic importance of Phycomycetes, • Structure, life cycle and systematic position *of:* o *Rhizopus* o *Saprolegnia* o *Phytophthora* o *Albugo.* • Modes of nutrition in Fungi (Saprophytism, predation, mutualism and Parasitism)	**15 L**

Unit III	**LICHENS** • History of Lichenology, Origin of Lichen, Present trends in classification, Kinds of Lichens, Development of Lichen Thallus. • Relation between components of Lichen thallus and Nature of lichen thallus (external and internal structure – Foliose, crustose, fruticose) • Psuedolichens, fossil lichens,specialized structure in lichen thallus, Reproduction in lichen • Distribution of Lichen, Habit and Habitat • Economic importance, Ecology of lichens, Diseases of lichens • Microscopy – Principle and working of Simple and Compound Light microscope	**15 L**

References:

- Gangulee, Das &Datta, College Botany, Volume II, New Central Book Agency, 2006
- Vashishta B. R. & Sinha, A. K., Botany for degree students - Algae, S. Chand, 1st Edition, 2010
- Vashishta B. R. & Sinha, A. K., Botany for degree students - Fungi, S. Chand, 1st Edition, 2010
- Smith G. M., Cryptogamic Botany – Algae and Fungi, Vol. I, McGraw Hill Publications, 1955

Course code: SBOT102	Mendelian Genetics, Ecology and Industrial Botany (Credits : 2 Lectures/Week: 3)	
	Learning objectives: • To Remind the basic principles of Mendelian Genetics and further learn a variety of exceptions and extensions of Mendelian principles. These will include multiple alleles, modified dominance relationships, gene interactions leading to modified Mendelian ratios, essential genes and lethal alleles, penetrance and expressivity and dual influence of genes and the environment on phenotypic expression. • To create an in-depth awareness about the different aspects of environment such as different types, components and the flora and fauna involved. • To study the different applications of commercially used plants for different products of use to mankind. **Learning Outcomes:** Students will be able to: • Understand the concept of gene interaction and that genes do not always function independently in determining the phenotypic characteristics. With appropriate examples they will understand the influence of non-allelic genes on the phenotype of the organism. • Understand the concept of penetrance and expressivity as studied for any gene. With appropriate examples covered here, they will realise that penetrance and expressivity for any gene under study depends on the dual effect of genotype of the organism as well its internal and external environmental factors and it may remain constant or be variable. Further, they will be able to understand the multiple internal and external environmental factors influencing the expressivity of many genes. • Gain the theoretical knowledge and learn to apply it for the betterment of the environment. • Provide solutions to plant suitable adaptive plants in their respective area. • Differentiate between primary and secondary metabolites. • Comment upon commercial uses of Primary and Secondary metabolites covered in their syllabus.	
Unit I	**MENDELIAN GENETICS:** • Monohybrid ratio and their modifications- Complete dominance, Incomplete dominance, co-dominance and concept of essential and lethal genes. Test cross, back cross ratios, • Di-hybrid ratios and their modifications. • Gene interactions. • Epitasis: Recessive, Dominant, Duplicate Recessive and Duplicate Dominant epistasis. • Gene expression and environment: Penetrance and expressivity, effects of environment (Age, Sex, Temperature and chemicals). • Concept of multiple alleles.	**15 L**

Unit II	**ECOLOGY:**
	• Energy pyramids, energy flow in an ecosystem, introduction and concepts of succession.
	• Types of ecosystems: aquatic and terrestrial, restoration of degraded ecosystems for eg Marine and aquatic.(Nature based solutions to be discussed)
	• Ecological adaptations in plants (Morphological and Anatomical)
	  ○ Hydrophytes – submerged, floating, rooted.
	  ○ Mesophytes
	  ○ Halophytes – accumulators and excretors
	  ○ Xerophytes – drought resisting and drought enduring
	• Biogeochemical cycles: Carbon, Nitrogen and Water
		15 L

Unit III	**INDUSTRIAL BOTANY**
	• Corn starch: Extraction, Identification and various products from corn starch.
	• Soya Proteins: Separation of Proteins from Soya & its applications
	• Castor oil: Extraction (Solvent extraction), various products from Castor oil.
	• Commercial importance of:
	  ○ Essential oils: *Euclayptus, Rosemary,Zingiber, Mentha*
	  ○ Tannins : Catechu, Myrobalon (*Terminalia chebula*)
	  ○ Resins: Turmeric, Asafoetida, Colophony, Benzoin
	  ○ Alkaloids: *Adhatoda* and *Atropabelladonna*
		15 L

References:

- Russell P. J., iGenetics – A Molecular approach, Pearson Education, Inc., second edition, 2006
- Winchester A. M. Genetics – A survey of Principles of heredity, A. M., Houghton Mifflin Company, 1972
- Santra S. C., Fundamentals of ecology and environmental biology, New Central Book Agency, 2010
- Odum E. P. & Barrett G. W. Fundamentals of Ecology, E. P., Peter Marshall, Fifth edition, 2005
- Kochhar S. L., Economic Botany in the tropics, MacMillan India Limited, 1981
- Hill A., Economic Botany, McGraw Hill Publication, 1937
- Eugene P Odum and Gary W Barett- Fundamentals of Ecology 5th Edition Cengage learning.
- Thomas M Smith and Robert Leo Smith - Elements of Ecology. Pearson; 9th edition 2015
- Manuel C Molles and Anna Sher- Ecology: Concepts and applications.Mc Graw Hill Education; 8th Edition 2018

Course Code: SBOT1PR	Practical	Credits: 02

Learning Objectives:

- To use bright field microscopy for observing Algae, Fungi and Lichens
- To study variation in members of Chlorophyta and Cyanophyta
- To study the morphology and anatomy of primitive fungi Phycomycetes
- To understand economic importance of all the lower forms of life
- To understand Mendel's Laws and modified Mendelian ratios by solving problems.
- Tissue typing using blood as a medium
- To study multiple alleles with the help of laboratory exercises
- To study the plants adapted to different environments as per morphological and anatomical adaptations
- To detect presence of primary and secondary metabolites
- To study statistics with reference to biological problems

Learning Outcomes:

Student will be able to:

- Focus and mount specimens mentioned above on a light microscope.
- Identify the different specimens
- Differentiate between alga
- Give Control measures of harmful fungi
- Ecological and economic significance of all species
- Correlate biological examples with Mendelian and non-Mendelian ratios
- Differentiate between alleles and correlate their interrelationships
- Know the detection, significance and location of both primary and secondary metabolites in plants.
- Extract and identify essential oils, tannins, resins and alkaloids.
- Apply statistical methods to analyse their data.

PRACTICAL PAPER I	
1	Microscopy – study of parts of microscope
2	Study of stages in the life cycle of *Nostoc* from fresh/ preserved material and permanent slide
3	Study of stages in the life cycle of *Oscillatoria* from fresh/ preserved material and permanent slide
4	Study of stages in the life cycle of *Chlamydomonas* from fresh/ preserved material and permanent slide
5	Study of stages in the life cycle of *Spirogyra* from fresh/ preserved material and permanent Slides
6	Economic importance of algae: Ulva (food), *Scenedesmus* and *Chlorella* (Biofuel), *Spirulina* (Nutraceutical)
7	Study of stages in the life cycle of *Rhizopus* from fresh/ preserved material and permanent slides
8	Study of stages in the life cycle of *Saprolegnia* from fresh/ preserved material and permanent slides
9	Study of stages in the life cycle of *Phytophthora* from fresh/ preserved material and permanent slides
10	Study of stages in the life cycle of *Albugo* from material and permanent slides
11	Economic importance of Fungi – Disease causing fungi, useful fungi
12	Identification of Lichens (Permanent slides and specimens).

PRACTICAL PAPER II	
1	Problems on Monohybrid and Dihybrid crosses, probability, multiple alleles and Chi-square
2	Blood typing: ABO groups and Rh factor.
3	Identification of plants adapted to different environmental conditions and internal structure adaptations: o Hydrophytes free floating (*Pistia/Eichhornia*) o Rooted floating (*Nymphaea*) o Submerged (*Hydrilla*) o Mesophytes (any common plant) o Xerophytes *Opuntia*&*Nerium*
4	Qualitative tests forcarbohydrates, proteins and fats
5	Qualitative tests for Essential oils: *Euclayptus, Rosemary,Zingiber, Mentha* Tannins:*Acacia catechu, Terminalia chebula* Resins: *Turmeric,Asafoetida, Colophony, Benzoin* Alkaloids: *Adhatodavasica* and *Atropa belladonna*
6	Calculation of mean, median & mode.
7	Calculation of standard deviation
8	Frequency distribution, geographical representation of data – frequency polygon, histogram, pie chart

Evaluation Scheme:

[A] Evaluation scheme for Theory courses:

I. Continuous Assessment (C.A.) - 40 Marks

(i) C.A.-I: Test/continuous evaluation in given time frame with Surprise test– 20 Marks of 40 mins. duration

(ii) C.A.-II: Assignment/project/quiz/ test/ continuous evaluation in given time frame with Surprise test.

II. Semester End Examination (SEE)- 60 Marks

[B] Evaluation scheme for Practical courses: (SEE – 50 marks)

NOTE:

1. A minimum of ONE field excursion habitat studies are compulsory. Field work of not less than eight hours duration is equivalentto one period per week for a batch of fifteen students.

2. A candidate will be allowed to appear for the practical examinations only if he/she submitsa certified journal of FYBSc Botany and the Field Report or a certificate from the Head of theDepartment/Institute to the effect that the candidate has completed the practical course ofFYBSc Botany as per the minimum requirements.