

**UNIVERSITY OF CALICUT**

**SYLLABUS**

FOR

**UNDER GRADUATE PROGRAMME**

IN

**Botany with Computational Biology**

**(Double Main)**

**2021**

## **UG PROGRAMME IN BOTANY & COMPUTATIONAL BIOLOGY**

### **PREFACE**

The Curriculum for Undergraduate Programme of B.Sc. Botany & Computational Biology (Double main) focuses on imparting knowledge in basic and applied aspects of Botany and Computational Biology. Due importance is given to fundamental and modern aspects of Botany & Computational Biology. Formulation of the syllabubs has been with an understanding that the syllabus is addressing the 'digital native' generation. The syllabus of B.Sc. Botany & Computational Biology (Double Main) has been prepared in a participatory manner, after discussions with experts in the subject and by pooling suggestions from the teaching community. As far as possible, the suggested modifications have been incorporated in the syllabus. During the preparation of the syllabus, the existing syllabus, UGC model curriculum, syllabi of other universities, syllabi of XI<sup>th</sup> & XII<sup>th</sup> standards and M.Sc. Botany M.Sc. Computational Biology syllabi have also been referred to. Care has been taken to ensure that the syllabus is compatible with the syllabi of other universities at the same level.

In addition, the semester-end examinations (total 6 semesters) to be conducted by the university, a system of continuous evaluation through Internal Assessment by the faculty members of the Core, Open and Complementary courses. The distribution of marks is 80% for external evaluation and 20% for internal assessment. The syllabus for the six semesters of B.Sc. Degree Programme with Botany and Computational biology as Core course of study which contain provision for both theory and practical components in all six semesters and complementary courses also contain both theory and practical components in four semesters.

The practical courses offered are designed in such a way that they support the theory topics and also impart the basic skills and techniques required of them. In addition to the items for practical, a Project work forms an integral part of the curriculum during the sixth semester. Field study/study tour to the research institutions and places of biological interest is a compulsory element of the curriculum. Requirement to visit places of importance of elective subject area is also a compulsory element. Attempts have also been made to update the syllabus, considering the needs of the time and conforming to the work load prescribed by the university.

## **AIMS AND OBJECTIVES**

The Outcome Based Education- Choice Based Credit and Semester System for Under Graduate (UG) Curriculum for B.Sc. Botany & Computational Biology (Double main) Programme envisages undergraduate education as a combination of general and specialized education with outcome based, simultaneously introducing the concepts of breadth and depth in learning. Besides recalling information, the learning process is aimed to acquire the ability for problem solving, and critical and creative thinking in students. The present attempt is to prepare the students for lifelong learning by drawing attention to the vast world of knowledge of plants and introducing them to the methodology of systematic academic enquiry. The crew of the syllabus ensures firm footing in fundamental aspects of Botany and Computational Biology and wide exposure to modern branches of Zoology to the students.

The expected outcome of the syllabus:

- To know the scope and importance of Botany and Computational Biology
- To develop scientific temper among students.
- To inculcate interest in nature and living forms and their conservation.
- To make the students eco-friendly by creating a sense of environmental awareness in them.
- To give better exposure to the diversity of life forms.
- To give awareness about natural resources and their importance in sustainable development.
- To study different ecological sites for animals in their natural habitats by field study.
- To provide opportunities for the application of the acquired knowledge in day- to - day life.
- To develop skills in doing experiments, familiarizing equipments and biological specimens.
- To undertake scientific projects which help to develop research aptitude in students.
- To expose students to various fields in digital biological sciences and to develop interest in related disciplines.
- To attain interdisciplinary approach to understand the application of the subject in daily life.
- To familiarize the emerging areas of Botany and computational biology and their applications in various spheres of biological sciences and to appraise the students of its relevance in future studies.

## AN OVERVIEW

### Definitions and Structure

**Title** shall be called “Regulations for Choice Based Credit and Semester System for Under Graduate Curriculum 2019” (CBCSS UG 2019). **Programme** means the entire course of study and examinations lead to the award of a degree. **Duration of programme** means period of time required for the conduct of undergraduate programme i.e. six semesters distributed in a period of 3 years. The odd semesters (1, 3 and 5) shall be from June to October and the even semesters (2, 4 and 6) shall be from November to March. Academic week is a unit of five working days in which distribution of work is organised from Monday to Friday with five contact hours of one-hour duration on each day. A sequence of 18 such academic weeks constitutes a semester. Semester constitute minimum of 18 weeks (16 instructional weeks and 2 weeks for examination).

**Course** means a segment of subject matter to be covered in a semester. The graduate programme includes five types of courses, viz., common, core, complementary, open, audit /ability enhancement and improvement courses. Common course means a course that comes under the category of courses for English and additional language, a selection of both is compulsory for all students undergoing undergraduate programme. Every undergraduate student shall undergo 6 common courses [4 English courses and 2 additional language courses] for completing the programme. Core courses are major (core) courses in a subject related to a particular degree programme. Core courses are offered by the parent department. There are 20 core courses including a project work and field study.

**Complementary course** means a course which is generally related to the core subject. It covers two disciplines in B.Sc. degree programme that are distributed in the first four semesters. There shall be one Open course in the 5th semester. This is a course outside the field of specialisation of the student, which can be opted by his/her choice. Audit course/Ability Enhancement course is a course which is mandatory. There shall be one Audit course each in the first four semesters. These courses are not meant for class room study. The credits of audited courses are not counted for SGPA or CGPA. [Improvement course is a course registered by a student for improving his/her performance.]

Each course shall have certain credits. Credit is a unit of academic input measured in terms of weekly contact hours/course content assigned to a course. Extra Credit is the mandatory additional credit awarded to a student over and above the minimum credits required in a programme, for participating in cocurricular activities and social activities outside the regular class hours, like NCC, NSS and Swatch Bharath. Those students who could not join in any of the above activities have to undergo Calicut University Social Service Programme (CUSSP). Extra credits are not counted for SGPA or CGPA.

**Grade** in a course is a letter symbol (O, A+, A, B+, B, C, P, F, I and Ab). Grade shall mean the prescribed alphabetical grade awarded to a student based on his/her performance in various examinations. Each letter grade is assigned a 'Grade point (G) which is an integer indicating the numerical equivalent of the broad level of performance of a student in a course. Grade Point means point given to a letter grade on 10 points scale. Strike off the roll: A student who is continuously absent for 14 days without sufficient reason and proper intimation to the Principal of the college shall be removed from the roll.

Department means any teaching department in a college offering a course of study approved by the university as per the Statutes and Act of the University. Department Co-ordinator is a teacher nominated by a Dept. Council to coordinate all the works related to CBCSS UG undertaken in that department including continuous evaluation. Department Council means the body of all teachers of a department in a college. Parent Department means the Department which offers a particular degree programme. Course teacher: A teacher nominated by the Head of the Department shall be in charge of a particular course. College Co-ordinator is a teacher nominated by the college council to co-ordinate the effective running of the process of CBCSS including internal evaluation undertaken by various departments within the college. She/he shall be the convener for the college level monitoring committee. College level monitoring committee: A monitoring Committee is to be constituted for CBCSS UG at the college level with Principal as Chairperson, college co-ordinator as convener and department co-ordinators as members. The elected college union chairperson shall be a member of this committee. Faculty Adviser means a teacher from the parent department nominated by the Department Council, who will advise the student in the academic matters and in the choice of open courses.

**Project work & Field study:** Every student of a UG programme shall have to work on a project under the supervision of a faculty member. A field study/study tour for 5 days is compulsory during the tenure of the B.Sc. Botany & Computational Biology (Double main) programme. **Grace Marks:** Grace marks may be awarded to a student for meritorious achievements in co-curricular activities (in Sports /Arts /NSS /NCC / Student Entrepreneurship) carried out besides the regular hours. Such a benefit is applicable and limited to a maximum of 8 courses in an academic year spreading over two semesters. In addition, maximum of 6 marks per semester can be awarded to the students of UG Programme, for participating in the College Fitness Education Programme (COFE).

**Attendance:** A student shall be permitted to appear for the semester examination, only if he/she secures not less than 75% attendance in each semester. Attendance shall be maintained by the Department concerned. A student is required to acquire a minimum of 140 credits for passing the degree programme, of which 120 credits are to be acquired from class room study and shall only be counted for SGPA and CGPA.

**Common courses: 22 credits** (14 for English courses + 8 for Additional languages).

**Core courses: 71 credits** (including 3 credits for project work & field study).

Open course: **3 credits**

Complementary courses: **24 credits** (12 credits each for Chemistry and Zoology)

Audit courses: **16 credits** (4 credits per course in first 4 semesters)

Extra credits: **4 credits** (4 credits in first 4 semesters)

If more Extra credit activities are done by a student that may be mentioned in the Grade card. The credits of audited courses or extra credits are not counted for SGPA or CGPA. The successful completion of all the courses (common, core, complementary and open courses) prescribed for the degree programme with 'P' grade shall be the minimum requirement for the award of degree.

### **CALICUT UNIVERSITY SOCIAL SERVICE PROGRAMME (CUSSP)**

In this programme, a student has to complete 12 days of social service. This has to be completed in the first four semesters; 3 days in each semester. For the regular programme the student has to work in a Panchayat or Local body or in a hospital/ poor home or old age home or in a Pain & palliative centre or any social work assigned by the College authorities. Students who engaged in College Union activities and participate in sports and cultural activities in Zonal level

have to undergo only 6 days of CUSSP during the entire programme. The whole documents regarding the student should be kept in the college and the Principal should give a certificate for the same. The list of students (successfully completed the programme) must be sent to the university before the commencement of the fifth semester examinations. A college level coordinator and a department level coordinator shall be appointed for the smooth conduct of the programme.

### **AUDIT COURSES/ABILITY ENHANCEMENT COURSES**

These are courses which are mandatory for a programme but not counted for the calculation of SGPA or CGPA. There shall be one Audit course each in the first four semesters. These courses are not meant for class room study. The students can attain only pass (Grade P) for these courses. At the end of each semester, there shall be examination conducted by the college from a pool of questions (Question Bank) set by the University. The Question paper shall be of 100 marks of 3 hours duration. The students can also attain these credits through online courses like SWAYAM, MOOC etc. (optional). The list of passed students must be sent to the University from the colleges at least before the fifth semester examination. The lists of courses in each semester with credits are given below.

**Table 1. AUDIT COURSES: CREDITS IN FIRST 4 SEMESTERS**

<b>Sl. No</b>	<b>Semesters</b>	<b>Courses</b>	<b>Credits</b>	<b>Marks</b>	<b>Duration of Exam</b>
1	I	Environmental studies	4	100	3 hrs
2	II	Disaster Management	4	100	3 hrs
3	III	* Human Rights/Intellectual Property Rights/Consumer Protection	4	100	3 hrs
4	IV	*Gender studies/Gerontology	4	100	3 hrs
		<b>Total</b>	<b>16</b>	<b>400</b>	<b>3 hrs</b>

\*College can opt any one of the courses

### **Core course - Botany Papers**

<b>Sem</b>	<b>Course Title</b>	<b>Credits</b>	<b>hours /week</b>
<b>I</b>	<b>Core Course 1:</b> Angiosperm Anatomy, Reproductive Botany & palynology	4	5
<b>II</b>	<b>Core Course 2:</b> Microbiology, Mycology, Lichenology & Plant Pathology	4	5
	<b>Total</b>	<b>8</b>	<b>10</b>



# BOTANY CORE COURSES

## CORE COURSE:1

### ANGIOSPERM ANATOMY, REPRODUCTIVE BOTANY AND PALYNOLOGY

Semester	Course code	Credits	Hrs/wk	Marks (Ext.+Int.)	Duration of exam
1		4	5	80 + 20	2.30 hrs

#### COURSEOUTCOMES (COs)

1. By the end of the course, students are expected to:
2. Demonstrate the ability to differentiate plant organs by observing anatomical features.
3. Understand the non-living inclusions of plants and the insignificance.
4. Differentiate tissues and their functions.
5. Illustrate primary and secondary (normal and anomalous) structures of plant organs.
6. Explain various developmental details of angiosperms.
7. Realize the significance and applications of palynology.

#### DISTRIBUTION OF TEACHING HOURS (18hrs/semester = 1hr/week)

Sl. No	Subject	Theory	Practical	Total
1	Angiosperm Anatomy	28	32	60
2	Reproductive Botany & Palynology	17	13	30
<b>Total</b>		<b>45</b>	<b>45</b>	<b>90</b>

#### QUESTION PAPER PATTERN & SUBJECT WISE DISTRIBUTION OF MARKS

Type of questions	Anatomy	Reproductive Bot. & Palynology	Total
2 marks (total 12)	8	4	Ceiling 20
5 marks (total 10)	6	4	Ceiling 40
10 marks (total 4)	2	2	1x10 = 20
<b>TOTAL</b>			<b>80</b>

## **ANGIOSPERM ANATOMY**

### **Module-I. (6 hrs)**

1. Cell Wall – Structure and development; Growth of Cell wall; cell wall materials.

Types of pits (brief account) **(2hrs)**

2. Non-living inclusions **(4 hrs)**

- Reserve food materials: carbohydrates, proteins, fats & oils. Carbohydrates: sugars & starch; Starch grains- structure, types with examples; Proteins- Aleurone grains with examples; Fats & oils examples.
- Secretory materials
- Waste materials - Nitrogenous – alkaloids, Non-nitrogenous- gums, resins, tannins, organic acids, essential oils; Mineral crystals- Calcium oxalate, Druses, Raphides, Calcium carbonate– cystoliths with examples

### **Module-II (6 hrs)**

1. Tissues: Definition– Types

- Meristematic tissues- classification. **(2 hrs)**

Theories on apical organization- Apical cell theory, Histogen theory, Tunica Corpus theory. Organization of shoot apex and differentiation of tissues (protoderm, procambium and ground meristem). Organization of root apex in dicots- common types with three sets of initials- in monocots: Maize type with four sets of initials

- Mature tissues: definition classification- simple complex and secretory **(4 hrs)**

Simple tissues: structure, occurrence and function. Complex tissues: Xylem & Phloem- structure, origin, phylogeny and function. Secretory tissues: glands, glandular hairs, nectaries, hydathodes, schizogenous and lysigenous ducts, resin ducts, laticifers– articulated and non-articulated

### **Module–III (5 hrs)**

1. Vascular bundles- Origin and types- conjoint, collateral, bi-collateral, open, closed, radial, concentric- amphicribal and amphivasal. **(2hrs)**
2. Primary structure of root, stem & leaf (brief account only) **(3 hrs)**

### **Module-IV (11 hrs)**

1. Normal secondary growth in Dicot stem and Dicot root. Formation of vascular cambial

ring- structure and activity of cambium– storied and non-storied, fusiform and ray initials; Formation of secondary wood, secondary phloem, vascular rays, growth ring, heart wood, sapwood. **(3hrs)**

2. Extrastelar Secondary thickening in stem and root- Periderm formation. Structure- phellogen, phellem, phelloderm, bark, lenticels- structure &function. **(2hrs)**
3. Anomalous secondary growth - general account with special reference to the anomaly in Dicotstem– *Boerhaavia*, *Bignonia*, *Nyctanthes* and Monocot stem- *Dracaena*. **(4 hrs)**
4. Anatomy in relation with taxonomy, wood anatomy (general accounts) **(2hrs)**

### **PRACTICAL (ANGIOSPERM ANATOMY)**

1. Identification at sight the different types of tissues and vascular bundles.
2. Primary structure of stem, root and leaf of Dicots and Monocots
  - Dicot stem: normal –*Eupatorium*, *Centella*; bi-collateral – *Cephalandra*, *Cucurita*
  - Dicot root- Pea
  - Monocot stem- Bamboo, Grass
  - Monocot root- *Musa*, *Colocasia*
  - Dicot leaf- *Ixora*,
  - Monocot leaf- Grass, Rice
3. Secondary structures:
  - Dicot stem - *Vernonia*,
  - Dicot root – *Tinospora*, *Ficus*
4. Anomalous secondary thickening in *Boerhaavia*, *Bignonia*, *Nyctanthes* and *Dracaena*

### **REFERENCES (ANGIOSPERMANATOMY)**

- Cuttler, E.G. (1969). Plant Anatomy- Part I. Cells & Tissue. Edward Arnold Ltd., London.
- Cuttler, E.G. (1971). Plant Anatomy, Part III Organs Edward Arnold Ltd., London.
- Eames, A.J. & L.H. Mac Daniels (1987) An Introduction to Plant Anatomy. Tata Mc Grew Hill Publishing Company Ltd. New Delhi.
- Esau K. (1985) Plant Anatomy (2nded.) Wiley Eastern Ltd. New Delhi.

- Fahn A (2000) Plant Anatomy. Permagon Press.
- Pandey B.P. (2001) Plant Anatomy, S. Chand & Co. Delhi.
- Tayal M.S. (2012) Plant Anatomy. Rastogi Publishers, Meerut.
- Vasishta P.C. (1974) Plant Anatomy, Pradeep Publication, Meerut, UP.

## **REPRODUCTIVE BOTANY & PALYNOLOGY**

1. Introduction to angiosperm embryology with special reference to Indian embryologists. **(1hr)**
2. Microsporogenesis: structure and function of wall layers, development of male gametophyte, dehiscence of anther. **(3hrs)**
3. Megasporogenesis: development of female gametophyte, embryosac-development and types- monosporic: *Polygonum* type, bisporic: *Allium* type, tetrasporic: *Adoxa* type. **(3hrs)**
4. Pollination, fertilization, barriers of fertilization, germination of pollengrains, double fertilization. **(2hrs)**
5. Structure of embryo dicot (*Cypselia*), monocot (*Sagittaria*) and endosperm types **(2hrs)**
6. Palynology: pollen morphology, structure of pollen wall, shape of pollen grains, apertural morphoforms, exine ornamentation; pollen allergy, economic and taxonomic importance **(3hrs)**

## **PRACTICAL (REPRODUCTIVE BOTANY & PALYNOLOGY)**

1. *Datura* anther T.S. (mature).
2. Types of ovules: Orthotropous, Anatropous and Campylotropous (Slides only, drawing not required)
3. Dicot and monocot embryo of Angiosperms (Slides only, drawing not required)
4. Pollen morphology of *Hibiscus*, and pollinia of *Cryptostegia/Calotropis* by acetolytic method
5. Viability test for pollen.
6. *In vitro* germination using sugar solution. (cavity slide method)
7. Tetrazolium test
8. Acetocarmine test (Acetocarmine & Glycerine 1:1)

## REFERENCES (REPRODUCTIVE BOTANY & PALYNOLOGY)

- Agarwal S.B. (1984) Embryology of Angiosperms- a fundamental approach, Sahitya Bhavan, Hospital Road, Agra.
- Bhojwani S.S. & Bhatnagar S.P., Dantu PK (2015) The Embryology of Angiosperms. 6<sup>th</sup> edition, Vikas Publishing House (P) Ltd.
- Davis C.L. (1965) Systematic Embryology of Angiosperms. John Wiley, New York.
- Eames M.S. (1960) Morphology of Angiosperms McGraw Hill, New York.
- Erdtman G. (1952) Pollen Morphology and Plant Taxonomy Part I. Almquist & Wiksell Stockholm
- Erdtman G. (1969) Hand Book of Palynology. National Botanical Gardens Publication, Lucknow.
- Johri B.D. (1984) (ed.) Embryology of Angiosperms Springer- Verlag, Berlin.
- Maheswari P. 1985. Introduction to Embryology of Angiosperms- McGraw Hill, New York.
- Nair P.K.K. (1970). Pollen Morphology of Angiosperms. Vikas Publishing House, Delhi.
- Raghavan, V. (2000). Developmental Biology of Flowering plants, Springer, Netherlands.
- Saxena M.R. (1993). Palynology– Treatise, Oxford, I.B.H. New Delhi
- Shivanna K.R. & Johri B.M. (1985) The Angiosperm Pollen, Structure and Function. John Wiley & Sons Pvt. Ltd.
- Shivanna K.R. & Johri B.M. (1985) Pollen Biology: A Laboratory Manual, Springer Verlag, New York.
- Shivanna, K.R. & Rangaswami N.S. (1993) Pollen Biology Narosa Publishing House, Delhi.
- Singh V., P.C. Pande & D.K. Jain (2001) Embryology of Angiosperms- Rastogi Publications, Gangotri, Sivaji road, Meerut.

**CORE COURSE:2**

**MICROBIOLOGY, MYCOLOGY, LICHENOLOGY AND  
PLANT PATHOLOGY**

<b>Semester</b>	<b>Course code</b>	<b>Credits</b>	<b>Hrs/wk</b>	<b>Marks(Ext.+Int.)</b>	<b>Duration of exam</b>
<b>2</b>		<b>3</b>	<b>4</b>	<b>60 + 15</b>	<b>2hrs</b>

**COURSEOUTCOMES(COs)**

By the end of the course, students are expected to:

1. Understand basics of microbial life and their economic importance.
2. Develop general awareness on the diversity of microorganisms, fungi and lichens.
3. Analyze the ecological role played by bacteria, fungi and lichens
4. Identify plant diseases and find out control measures.
5. Realize the significance of plant diseases as far as crop production is concerned.

**DISTRIBUTION OF TEACHING HOURS (18 hrs/semester= 1hr/week)**

<b>Sl. No.</b>	<b>Subject</b>	<b>Theory</b>	<b>Practical</b>	<b>Total</b>
1	Microbiology	15	13	28
2	Mycology	14	16	30
3	Lichenology	6	6	12
4	Plant Pathology	10	10	20
<b>Total</b>		<b>45</b>	<b>45</b>	<b>90</b>

**QUESTION PAPER PATTERN & SUBJECT WISE DISTRIBUTION OF MARKS**

<b>Type of questions</b>	<b>Microbiology</b>	<b>Mycology</b>	<b>Lichenology</b>	<b>Pathology</b>	<b>Total</b>
2 marks (total 12)	3	4	2	3	Ceiling 20
5 marks (total 10)	3	3	2	2	Ceiling 40
10 marks (total 4)	4				2 x 10 = 20
<b>TOTAL</b>					<b>80</b>

## **MICROBIOLOGY**

1. Introduction to Microbiology **(1 hr)**
2. Bacteria– Classification based on morphology and staining, ultrastructure of bacteria; Bacterial growth, Nutrition, Reproduction. **(6 hrs)**
3. Viruses– Classification, architecture and multiplication; Bacteriophages, TMV, Retroviruses- HIV, Virioids, Prions. **(4 hrs)**
4. Microbial ecology– Rhizosphere and Phyllosphere. **(1 hr)**
5. Industrial microbiology– alcohol, acids, milk products single cell proteins. **(2 hr)**
6. Economic importance of bacteria, Vaccines: importance, mechanism. **(1 hr)**

## **PRACTICAL (MICROBIOLOGY)**

1. Simple staining
2. Gram staining – Curd, root-nodules
3. Culture and isolation of bacteria using nutrient agar medium (demonstration only)

## **REFERENCES (MICROBIOLOGY)**

- Alain Durieux. (2009). Applied Microbiology, Springer International Edition.
- Dubey R.C. & Maheswari D.K. (2000). A Text book of Microbiology, Chand & Co., New Delhi.
- Frazier W.C. (1998) Food Microbiology, Prentice Hall of India, Pvt. Ltd.
- Hansg Schlegel. (2012). General Microbiology- Cambridge University Press. Low Priced Indian Edition, Replica Press Pvt. Ltd.
- Kumar H.D. & S. Kumar. (1998) Modern Concepts of Microbiology, Tata McGraw Hill. Delhi.
- Pelzar M.J., E.C.S. Chan & N.R. Kreig. (1986). Microbiology McGraw Hill, New York.
- Prescott, L.M., Harley J.P., Klein D.A. (2005). Microbiology, McGraw Hill, India. 6<sup>th</sup> edition.
- Rangaswami, R. & C.K.J. Paniker. (1998). Text book of Microbiology, Orient Longman.

- Ross, F.C. (1983) Introductory Microbiology. Charles E. Merrill Publishing Company.
- Schlegel (2008). General Microbiology. Cambridge University press India Pvt. Ltd
- Sharma P.D. (2004). Microbiology and Plant Pathology Rastogi Publication.
- Tortora G.J., Funke B.R., Case C.L. (2007). Microbiology. Pearson Benjamin Cummings, San Francisco, U.S.A. 9th edition.

## **MYCOLOGY**

1. General characters and phylogeny of the kingdom Fungi, the concept of anamorph and teleomorph. **(2 hrs)**
2. General characters, distribution, and biology of the following groups of fungi. **(10 hrs)**
  - Mastigomycotina. Type: *Pythium*
  - Zygomycotina. Type: *Rhizopus*
  - Ascomycotina. Type: *Xylaria, Aspergillus*
  - Basidiomycotina. Types: *Agaricus, Puccinia*
3. Economic importance of fungi: medicinal, industrial, agricultural. Fungi as model organisms for research. **(1 hr)**
4. Ecological importance of fungi: different modes of nutrition (pathogenic/parasitic, saprobic, symbiotic). **(1 hr)**

## **PRACTICAL (MYCOLOGY)**

1. Micropreparation– Lactophenol cotton blue– Slides of the above mentioned types.

## **REFERENCE (MYCOLOGY)**

- Alexopoulos C.J., Mims, C.W. and Black well, M. (1996) Introductory Mycology, 4<sup>th</sup> Edn. John Wiley and Sons, New York.
- Alexopoulos, C.J. and Mims C.W. (1979) Introductory Mycology, 3<sup>rd</sup> Edition, John Wiley and Sons, New York.
- Jim Deacon (2007). Fungal Biology, 4<sup>th</sup> edition, Blackwell publishing, Ane Books Pvt. Ltd
- Mehrotra R.S. and Aneja K.R. (1990). An Introduction to Mycology, Wiley, Eastern



Limited, New Delhi.

- Sethi, I.K. and Walia, S.K. (2011) Text book of Fungi and their Allies, Macmillan Publishers India Ltd.

## **LICHENOLOGY**

1. Introduction: Type of Interaction between the components symbiosis– mutualism. **(2 hrs)**
2. Classification, growth forms, structure, reproduction, economic importance. Type: *Usnea*. **(3 hrs)**
3. Toxicology, Lichens as food, Bioremediation, Ecological indicators, Pollution indicators, Lichen in Soil formation and pioneers of Xerosere. **(1 hr)**

## **PRACTICAL (LICHENOLOGY)**

1. Identification of different forms of Lichens.
2. *Usnea*: structure of thallus, fruiting body

## **REFERENCES (LICHENOLOGY)**

- Gilbert, O. (2004). Lichen Hunters. The Book Guild Ltd. England
- Kershaw, K.A. (1985). Physiological Ecology of Lichen Cambridge University Press.
- Mamatha Rao, (2009). Microbes and Non-flowering plants. Impact and applications. Ane Books, New Delhi.
- Sanders, W.B. (2001). Lichen interface between mycology and plant morphology. Bioscience, 51: 1025-1035.
- <http://www.lichen.com> <http://www.newscientistspace.com>

## **PLANT PATHOLOGY**

1. Introduction– Concepts of plant disease, pathogen, causative agents, symptoms. **(1 hr)**
2. Symptoms of diseases: spots, blights, wilts, rots, galls, canker, gummosis, necrosis, chlorosis, smut, rust, damping off. **(1 hr)**

3. Control measures: Chemical, biological and genetic methods, quarantine measures. **(2 hr)**
4. Brief study of Plant diseases in South India (Name of disease, pathogen, symptom and control measures need to be studied). **(6 hrs)**
  - Citrus Canker
  - Mahali disease of arecanut
  - Blast of paddy
  - Quick wilt of pepper
  - Mosaic disease of tapioca
  - Bunchy top of banana
  - Grey leaf spot of coconut

### **PRACTICAL (PLANT PATHOLOGY)**

1. Identification of the disease, pathogen, symptoms and control measures of the following:  
(drawing not required)
  - Citrus canker
  - Mahali disease
  - Tapioca mosaic disease
  - Blast of Paddy
  - Quick wilt of pepper
  - Bunchy top of banana
  - Grey leaf spot of coconut

### **SUBMISSION (PLANT PATHOLOGY)**

1. Students are expected to submit five properly identified Pathology specimens /herbarium during the practical examination of Paper-I held at the end of 4<sup>th</sup> semester. Diseases mentioned in the syllabus or any locally available common diseases of crop plants can be selected for submission.

## **REFERENCES (PLANT PATHOLOGY)**

- Agros G.N. (1997). Plant Pathology (4<sup>th</sup> ed) Academic Press.
- Bilgrami K.H. & H.C. Dube. (1976). A text book of Modern Plant Pathology. International Book Distributing Co. Lucknow.
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