

**SOLAPUR UNIVERSITY, SOLAPUR.**

**M.Sc. Part- I (Sem-I&II)Botany**

**Revised Syllabus**

**(CBCS pattern.)**

**To be implemented from**

**June 2016-17**

<b>M.Sc.I-Botany C B C S w.e.f.2016-17(REVISED)</b>									
<b>Sem I</b>	<b>Code</b>	<b>Title of the Paper</b>	<b>Semester Exam.</b>			<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
		<b>Hard Core</b>	UA	IA	Total				
<b>BOT</b>	HCT1.1	Biology and diversity of fungi, Bacteria, Viruses and Lichens.	70	30	100	4	----	----	4
	HCT1.2	Biology and diversity of Algae, Bryophytes and Pteridophytes.	70	30	100	4	----	----	4
	HCT1.3	Plant Ecology	70	30	100	4	----	----	4
<b>Soft Core(Any one)</b>									
	SCT1.1	Tools and Techniques in Botany	70	30	100	4	---	----	4
	SCT1.2	Economic Botany and Biotechnology	70	30	100	4	---	----	
		Tutorial			25		1		1
<b>Practical</b>									
	HCP1.1	Practical Course HCP1.1	35	15	50	----	---	2	6
	HCP1.2	Practical Course HCP1.2	35	15	50	----	---	2	
	HCP1.3	Practical Course HCP1.3	35	15	50	----	---	2	
<b>Soft Core (Any one)</b>									
	SCP1.1	<b>Practical Course SCP1.1</b>	35	15	50	----	---	2	2
	SCP1.2	<b>Practical Course SCP1.2</b>	35	15	50	----	---	2	
Total for First Semester			420	180	625	----	---		25
<b>Semester II</b>									
	<b>Code</b>	<b>Title of the Paper</b>	<b>Semester Exam.</b>			<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>BOT</b>		<b>Hard Core</b>	UA	IA	Total				
	HCT2.1	Biology and diversity of Gymnosperms and Palaeobotany.	70	30	100	4	---	---	4
	HCT2.2	Taxonomy of Angiosperms.	70	30	100	4	---	---	4
<b>Soft Core(Any one)</b>									
	SCT2.1	Cell and Molecular Biology of plants	70	30	100	4	---	---	4
	SCT2.2	Analytical Techniques in Plant Sciences	70	30	100	4	---	---	4
<b>Open Elective(Anyone)</b>									
	OET2.1	Advances in Plant Pathology	70	30	100	4	---	---	4
	OET2.2	Research Methodology	70	30	100	4	---	---	
		Tutorial			25	---	1	---	1
<b>Practical</b>									
	HCP2.1	Practical Course HCP2.1	35	15	50	---	---	2	4
	HCP2.2	Practical Course HCP2.2)	35	15	50	---	---	2	
<b>Soft Core(Any one)</b>									
	SCP2.1	Practical Course SCP2.1	35	15	50	---	---	2	2
	SCP2.2	Practical Course SCP2.2	35	15	50	---	---	2	
<b>Open Elective(Anyone)</b>									
	OEP2.1	Practical Course OEP2.1	35	15	50	---	---	2	2
	OEP2.2	Practical Course OPWEP2.2	35	15	50	---	---	2	
Total for Second Semester			420	180	625	---	---	---	25



**Solapur University , Solapur**  
**M.Sc. I Botany**  
**Syllabus to be implemented from June 2016**

**M.Sc. – I**  
**Semester- I**

**Theory Papers:**

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HCT1.1	Biology and diversity of fungi, Bacteria, Viruses and Lichens.
HCT1.2	Biology and diversity of Algae , Bryophytes and Pteridophytes .
HCT1.3	Plant Ecology .
SCT1.1	Tools and Techniques in Botany
SCT1.2	Economic Botany and Biotechnology

**Practicals:**

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HCP1.1	Practical Course HCP1.1
HCP1.2	Practical Course HCP1.2
HCP1.3	Practical Course HCP1.3
SCP1.1	<b>Practical Course SCP1.1</b>
SCP1.2	<b>Practical Course SCP1.2</b>

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**Semester II**

**Theory Papers:**

HCT2.1	Biology and diversity of Gymnosperms and Palaeobotany.
HCT2.2	Taxonomy of Angiosperms.

SCT2.1	Cell and Molecular Biology of plants
SCT2.2	Analytical Techniques in Plant Sciences

OET2.1	Advances in Plant Pathology
OET2.2	Research Methodology

**Practicals:**

HCP2.1	Practical Course HCP2.1
HCP2.2	Practical Course HCP2.2)

SCP2.1	Practical Course SCP2.1
SCP2.2	Practical Course SCP2.2

OEP2.1	Practical Course OEP2.1
OEP2.2	Practical Course OPWEP2.2

## **HCT1.1 Biology and diversity of fungi, Bacteria, Viruses and Lichens.**

**(60 Periods)**

**Unit-1- Fungi** :-General characters and recent trends in classification, Cell ultrastructure and Cell wall composition, nutrition (saprobic, biotrophic,symbiotic ), reproduction ( vegetative , asexual and sexual ), fructification and Spore forming structures, heterothallism, heterokaryosis parasexuality. Economic importance of fungi : - Fungi in industry , medicine and food , Mushroom cultivation , Mycorrhizae , fungi as biocontrol agents , fungal as allergens and human pathogens. **(10)**

**Unit-2-Taxonomical groups** to understand life cycle patterns , growth, reproduction and phylogeny with respect to following major classes upto the level of order ( Ainsworth`s 1973 system to be followed ) **(14)**

<b>Division</b>	<b>Class</b>	<b>Order</b>
<b>A) Myxomycota</b>	1) Myxomycetes 2) Plasmodiophoromycetes	Stemonitales Plasmodiophoromycetales
<b>B) Eumycota</b>		
<b>Sub divisions -</b>		
1) Mastigomycotina	1)Chytridiomycet 2) Oomycetes	Chytridiales Peronosporales
2) Zygomycotina	1) Zygomycetes	Mucorales
3) Ascomycotina	1)Hemiascomycetes 2) Plectomycetes 3)Pyrenomycetes  4)Disomycetes 5) Loculoascomycetes	Taphrinales Eurotiales Meliolales, Xylariales, Claricepitales.  Pezizales Dothideales
<b>Sub divisions-</b>		
4) Basidiomycotina	1)Teliomycetes 2)Hymenomycetes 3)Gastromycetes	Uridinales, Ustilaginales Polyporales, Agaricales , Lycoperiales ,Nidullariales
5) Deuteromycotina	1)Hyphomycetes  2)Coelomycetes	Hypomycetales, Tuberculariales Sphaeropsidales , Melanconiales

**Unit-3-** Archaeobacteria and Eubacteria : - General account , ultrastructure , nutrition and reproduction , nitrogen fixing bacteria and industrial uses. (12)

**Unit-4-** Viruses : - Characteristics , ultrastructure , nutrition isolation and purification ,chemical nature , replication , transmission and economic importance. (12)

**Unit-5-** Lichens-Distribution, in Forms, Biology and Economic importance. (12)

## **HCT1.2 Biology and diversity of Algae, Bryophytes and Pteridophytes**

**(60 Periods)**

**Unit-1** Phycology :- Algae in diversified habitats ( terrestrial , fresh water, marine ), thallus organization , cell ultrastructure , reproduction ( vegetative , asexual and sexual ) , modern trends in classification of algae – criteria – pigments , reserve food , flagella etc. and Systems. **(12)**

**Unit-2** Salient features , inter-relationship and phylogeny of the following classes of algae – Cyanophyceae , Chlorophyceae , Xanthophyceae , Bacillariophyceae , Phaeophyceae , Rhodophyceae **(12)**

**Unit-3-** Bryology :- Diversity in Bryophytes with respect to thallus structure, reproduction , life cycle , modern classification .  
Salient features , phylogeny and inter-relationship of the following orders– Marchantiales , Jungermanniales , Anthocerotales , Sphagnales , Buxbaumiales , Funariales and Polytrichales **(12)**

**Unit-4-** Pteridology : - Diversity in Pteridophytes with respect to morphology, anatomy , reproduction and modern trends in classification , Telome concept and stelar evolution .

Salient features , phylogeny and inter-relationship of the following classes –

Psilopsida – Psilotum, Mesopteris,

Lycopsida - Lycopodium, Selaginella , Isoetes ,

Sphenopsida – Equisetum,

Pteropsida – Ophioglossum, Angiopteris, Gleichenia , Pteris,

Salvinia , Azolla.

**(12)**

**Unit-5-** Isolation , culture , cultivation and preservation of algae Economic importance of Bryophytes .

Current trends of Research in Pteridophytes .

**(12)**

### **HCT1.3 Plant Ecology**

**(60Periods)**

**Unit-1-** Types of ecosystem , Marine and fresh water ecosystems , structural components , relationship between structure and function .

Succession :- Allogenic and autogenic succession , climatic climax , models of plant succession .

**(12)**

**Unit-2-** Wetlands and their characteristics , examples – mangroves and lakes EIA , MAB , Biosphere reserves , IUCN , Environmental awareness programmes,Carbon credit.

**12)**

**Unit-3-**General information on remote sensing technique and its applications particularly in vegetation analysis and wild life management .

**(12)**

**Unit-4-**Pollution ecology :-Effect of air pollution on vegetation, water pollution and water hyacinth , land pollution due to pesticide residue and their effects on soil .

Climate change : - Green house gases ( CO<sub>2</sub> , CH<sub>4</sub> , H<sub>2</sub>O , CFC s ) , Ozone layer and depletion, consequences of climate changes ( CO<sub>2</sub> fertilization , global warming , sea level rise and UV radiation)

**(12)**

**Unit-5-** Environmental toxicology :- Definition , toxic chemicals, factors affecting toxicity , Routes & rate of administration , Biotransformation of toxicants , Bio- accumulation of pollutants / Xenobiotics.

Phytoremediation / Bioremediation : - Definition , Mechanism, Phytoextraction , Rhizofiltration , Phytostabilization , Phytovolatilization.

**(12)**



## **SCT1.1 Tools and Techniques in Botany**

**(60 Periods)**

**Unit-1-** Preparatory techniques :- Standard units of expression , pH and buffers

Biostatistics:- Coefficient of variation , confidence limits , probability, binomial distributions , test of statistical significance , simple correlation and regression , Analysis of variance.

Applications of computer in life sciences , Analysis and presentation of biological data with the help of computer softwares used in Biology. **(12)**

**Unit-2-**Microscopy:- Principles and applications of phase contrast ,fluorescence, Scanning and transmission electron microscopes , Cytophotometry, Immuno fluorescence microscopy and photomicrography.

Separation Techniques :- Principles and application of gel filtration , ion exchange and affinity chromatography , gas chromatography , HPLC, Gel electrophoresis , isoelectric focusing , ultracentrifugation . **(12)**

**Unit-3-** Principles and applications of Colorimetry and spectrophotometry :- Visible , UV , fluorescence , NMR ,ESR spectroscopy , atomic absorption and flame spectrophotometry .

Cytological techniques :- Fixatives , treatments , stains , permanent preparation , banding – O – banding **(15)**

**Unit-4-** Tracer techniques :- Principles and applications in biology , Dosimetry , radioisotopes , half – life of radioisotopes , effect of radiation on biological systems , radioactivity counting systems.(09)

**Unit-5-**Collection and preservation of plant materials :-Herbarium technique preparation significance , important herbaria in India.

Herbarium - A brief account of principles & methodology. **(12)**

HCP1.1	Practical Course HCP1.1
HCP1.2	Practical Course HCP1.2
HCP1.3	Practical Course HCP1.3

### **Practicals based on Practical Course HCP1.1**

- 1) Study of various forms of bacteria , Gram positive and Gram negative technique .
  
- 2) Isolation of plant pathogenic bacteria .
  
- 3) Study of different viral diseases :-
  - a) Bean Mosaic Virus ( BMV )
  - b) Leaf curl of Papaya
  - c) Bunchy top of banana
  - d) Study of TMV (electron microphotograph)

- 4-5). A) Isolation and identification of water , soil , air and host fungi.  
 B) Fungal spore germination.

6-11) Detailed study of following types from each of the following orders :-

<b>Class</b>	<b>Order</b>	<b>Types</b>
Myxomycetes	Stemonitales	Stemonittis
Plasmodiophoromycetes	Plasmodiophorales	Plasmodiophora
Chytridiomycetes	Chytridiales	Physoderma /Synchytrium
Oomycetes	Peronosporales	Albugo / Plasmopara / Bremia
Zygomycetes	Mucorales	Mucor / Rhizopus
Hemiascomycetes	Taphrinales	
Plectomycetes	Eurotiales	Penicillium , Aspergillus
Pyrenomycetes	Meliolales	Meliola
	Erysiphales	Ericyphae , Uncinula
	Clavicipitales	Calviceps
Discomycetes	Pezizales	Peziza
Loculoascomycetes	Dothideales	Capnodium / Asterina
Teliomycetes	Uredinales	Melamospora / Uromyces
	Ustilaginales	
Hymenomycetes	Tremellales	Tremella
	Agaricales	Agaricus
	Polyporales	Polyporus, Ganoderma
Gastromycetes	Lycoperdales	Lycoperdon
	Nidulariales	Cyathus
Deteuromycetes	Hypomycetales	Alternaria
	Melanconiales	Colletotrichum
	Sphaeropsidales	Phoma

12. Lichens: - Types, Classification, Morphology and anatomy.

\* Available plant disease material ( available diseases ) and fungal diseases of local crops .

1. Submission of at least 10 specimens of fungi .
2. Excursion report .

**Practicals based on** Practical Course HCP1.2)

**1-4** Study of algal types as per theory paper

Chlorophyceae, Xanthophyceae , Bacillariophyceae , Phaeophyceae and Rhodophyceae with the help of specimens and slides ( at least available specimens )

**5-7** Morphological, anatomical and reproductive studies of the following members by using specimens and slides : Marchantia , Targionia , Cythodium , Fossom- bronia , Notothyllus , Pogonatum, Polytrichum and Sphagnum .( available specimens )

**8-12** Study of Pteridophytes mentioned against each class as per theory paper  
(specimens / Slides )

Submission of ( at least 10 ) dry and wet specimens/ slides / photographs from each group

Excursion report .

**Practicals based on** Practical Course HCP1.3

1. Study of Phytoplanktons
2. Evaluation of abiotic components of aquatic ecosystems such as pH , Temperature, Transparency .
3. Determination of alkalinity and hardness of water .
4. Determination of phytomass .
5. Study of species diversity index .
6. Study of satellite imagery and interpretation .
7. Determination of texture and field capacity of soil .  
Study of chemical characteristics of the soils .
8. Estimation of primary productivity of an aquatic ecosystem .
9. Growth of water hyacinth in polluted and non – polluted water or seed germination studies in polluted and non – polluted water
10. Heavy metal analysis of different soils .
11. Study of Phytoremediation
12. Ecological report based on tour and /or analysis .

## **Practicals based SCPI.1**

- 1 Preparation of standard solutions stains and buffers.
2. Study of density gradient centrifugation.
3. Isolation and purification of proteins / enzymes.
4. Thin layer /Paper chromatography for lipid or amino acid separation .
5. Verification of Beer and Lambert's law with spectrophotometer.
6. Determination of correlation coefficient.
7. Analysis of variance.
8. Analysis of data with the help of computer  
- Histograms, idiograms etc, e-herbaria .
9. Study of electron micrograph - SEM and TEM.
10. Study of pollens by acetolysis
- 11-12 Study of instruments :-

- 1) Refrigerated centrifuge
- 2) PH meter,
- 3) Autoradiogram
- 4) Conductivity Bridge
- 5) Computerized microscope system
- 6) Gel electrophoresis system
- 7) Spectrophotometer / colorimeter.

### List of reference books for paper- HCT1.1

- 1) Introductory Mycology John Wiley and Sons Inc. by Alexopoulos C.J. , Mims C.W. and Blackwel . M. (1996).
- 2) Introduction to Bacteria McGraw Hill book Co. , New York by Clifton .A.(1958)
- 3) Introductory Phycology Affiliated East – West Press Ltd. , New Delhi by Kumar H.D.(1988)
- 4) Introduction to Plant Viruses Chand and Co. Ltd. , Delhi by Mandahar .C.L.(1978)
  
- 5) An Introduction to Mycology New Age Intermediate Press by Mehrotra R.S. and Aneja R.S. (1998)
- 6) Diseases of crop plants in India Prentice Hall of India Pvt.Ltd. New Delhi by Rangaswamy G. and Mahadevan A.
- 7) Biology of Lichens by Hale M. , Tos . E. Jr. (1967)
- 8) The Fungi Vol. – I, II, III, IV A , IV B by Ainsworth G. E. and A.S. Sussman
- 9) Introduction to Fungi Cambridge University Press , Cambridg by Webster . J. (1985)
- 10) Textbook of fungi by Sharma O.P. (1989)
- 11) Morphology and Taxonomy of fungi by Bessey . E.A.
- 12) College Botany Vol. I by Gangulee H.S. and A.K. Kar (1992)
- 13) The Myxomycetes of India by Thind . K. S. (1977)
- 14) Taxonomy of fungi imperfecti Hypomycetes by Kendrick W.B. (1979)
- 15) Hypomycetes by Subramanian C.V. (1971)
- 16) Illustrated Genera of Rust Fungi by Cummins G.B. (1959)
- 17) The Rust fungi of Cereales , Grasses and Bamboo by Cummins G.B. (1971)
- 18) The Rusts of Leguminaceae & Compositae by Cummins G.B. (1984)
- 19) Ustilaginales of India by Mundkur B.B. & M.J. Tirumalachar (1952)
- 20) Aquatic Phycomycetes by Sparrow F.K. (1960)
- 21) Aquatic fungi of India by Dayal (1995)
- 22) New concepts of kingdoms of Organisms [ Science 163 : 150-160 ] by Whittaker R.H. (1969)
- 23) A Text book of Botany : Fungi S. Chand & Co. Ltd . Ramnagar , New Delhi , pp-416 by Pandey B.P. (1994)
- 24) Biology of the Fungi (first ed.) Satyajeet Prakashan , Pune , pp.67 by Vaidhya J.G. (1995)
- 25) The Fungi Hafner Publ. Co. Ltd. N.Y. by Gaumann G.A. (1952)
- 26) The Fungi Oxford & IBH by Mehrotra B.S. (1976)
- 27) The Fungi [ Vol. I & Vol. II ] John Wiley and Sons , Inc, New York by Wolf F.A. and Wolf F. T.
- 28) Modern topics in Fungi . Ed .D. S. Mukadam. Saraswati press , Aurangabad,
- 29) Microbiology and plant pathology by P.D. Sharma , Rastogi publication , Meerut.

### **List of reference books for paper-HCT1.2**

- 1) Text book of Algae by Kumar H. D. and H. N. Singh (1971)
- 2) Text book of Algae by Sharma O.P. (1986)
- 3) Text book of Botany - Algae by Pandey B.P. (1994)
- 4) Botany for degree students - Algae by Vashishta B.R. (1995)
- 5) College Botany Vol. II by Gangulee H. C. and A.K. Kar (1992)
- 6) Taxonomy and Biology of blue green algae by Desikachary T.V. (1972)
- 7) The structure & reproduction of algae by Fritsch F. E. (1965)
- 8) The algae by Chapman V.J. & Chapman D.J. (1973)
- 9) Algae form and function by Venkataraman et . al. (1974)

### **Journals:**

- 1) Phykos
- 2) Phycologia
- 3) Seaweed Research
- 4) Mahasagar
- 5) Indian Journal of Marine Biology.

### **Bryophytes:**

- 1) Bryophyta by Parihar N. S. (1991)
- 2) Watson E.V. [1964] The structure and life of Bryophytes.
- 3) Bryophytes Atma Ram and Sons , Delhi by Puri . P. (1980)
- 4) Inter relationship of Bryophytes by Cavers F. [1964]
- 5) Liverworts of Western Himalayas & The Punjab plains Part I and II. by Kashyap S.R. [1929]
- 6) Bryology in India by RamU-dar [1976]

### **Pteridophytes:**

- 1) Biology and Morphology of Pteridophytes by Parihar N. S. (1996)
- 2) Bierhorst D.W. [1971] Morphology of vascular plants.
- 3) Jermy A.G. [1973] The Phylogeny and Classification of ferns.
- 4) Rashid A. [1978] An Introduction to Pteridophytes.
- 5) Sporne K. R. [1966] Morphology of Pteridophytes

### **List of reference books for paper-HCT1.3**

- 1) Plant Ecology by R.S. Ambst (1990)
- 2) Environmental Impact Assessment, Technology Assessment by V.T. Covell (1985)
- 3) Environmental Impact Assessment of Govardhan (1993) by Their Dam
- 4) Ecology workbook by R. Misra
- 5) Environmental management of mining operations by B.B. Dhar (1990)
- 6) Progress of plant Ecology in India by R. Misra (1973)
- 7) Ecology: The experimental analysis of distribution and abundance by C.J. Krebs, Harper and Row (1978)
- 8) Ecology of halophytes by R.J. Reimold and W. H. Queens (1974)
- 9) Structure and functioning by A.H.J. Freyden & J.W. Weldendrop (1978)
- 10) Air pollution and forests by W.H. Smith (1981)
- 11) Plant population ecology by A.J. Dary et. al., (1998)
- 12) Plant succession and indicators by F.E. Clements
- 13) Plant ecology by Weaver and Clements
- 14) The Plant community by Hanson & Churchil (1961)
- 15) Principles of environmental biology by P.K. Nair (1979)
- 16) Fundamentals of ecology by E.P. Odum(1996)
- 17) Ecology by E.P. Odum
- 18) Progress of plant ecology [Vol. I] by Ed.R. Misra,et,al(1973)
- 19) Quantitative and dynamic ecology by K.A. Kershaw (1964)
- 20) Patterns of primary production in the biosphere by H.F.H.Lieth (1978)
- 21) Taxonomy and Ecology by V.H. Heywood
- 22) Plant strategies and vegetation process by J.P. Grime
- 23) Manual of plant ecology by K.C. Misra(1989)
- 24) Plant Ecology by Dash
- 25) Plant Ecology by Vasishtha
- 26) Plant Ecology by Varma



#### **List of reference books for paper-HCT1.4**

- 1) Molecular biology of the cell by Bray, Lewis Raff, Roberts and Watson Garland Publ.Inc. New York and London (1983)
- 2) Practical cytology, Applied genetics and Bio- statistics by Goswami H.K. and R. Goswami Himalaya Publ. House, Bombay (1993)
- 3) Methods in plant molecular biology by M.A. Schwer and Zeclinskin Academic Press, New York (1989)
- 4) Plant histochemistry by Jensen.
- 5) Photosynthesis and production in a changing environment A field and laboratory manual by Hall, Scurlik, Bolhar Nordenkampf, Leagood and Long Publ. Common Chapman and Hall (1993)
- 6) Experimental plant physiology by J.Arditti and Dunn, Publ. Academic Press (1970)
- 7) Techniques in Bioproductivity and photosynthesis by Coombs, Hall Long and Scurlock Pergamon Press Oxford (1985)
- 8) Methods in emzymology by Colowick and Kaplan, Academic press
- 9) Handbook of field and herbarium techniques by S.K. Jain and R. R. Rao
- 10) Experiments in microbiology plant pathology and tissue culture BY K.R. Aneja, Vishwa Prakashan (1993)
- 11) Diseases of crop plants in India by Ranga Swamy G. (1979)
- 12) Clinical Plant Pathology by Gangopadhyay S. (1984)
- 13) Plant Microtechniques by Sass
- 14) Molecular Cell Biology by Downe, Bultimore and Ladich Scientific American Publ.
- 15) Practical Biochemistry - principles and Techniques by K. Wilson and J. Walker(2000) Cambridge Publ.
- 16) Introductory Practical Biochemistry by Sawhney
- 17) Analytical Biochemistry by David J.
- 18) Modern Experimental Biochemistry by Boyer Rodney
- 19) Biophysical chemistry by Nath, Upadhay and Naik.

## Semester – II

### **HCT2.1 Biology and Diversity of Gymnosperms and Palaeobotany**

(60 Periods)

- Unit-1**-Diversity of Gymnosperms with respect to morphology, anatomy, reproduction, (12)
- Unit-2**-Modern trends in classification of Gymnosperms and Economic importance (08)
- Unit-3**- Salient features, phylogeny, affinities and inter- relationships of the following orders – Cycadales, Coniferales, Ginkgoales, Taxales, Ephedrales and Welwitschiales. (16)
- Unit-4**- Process of fossilization, types of fossils, techniques used in fossil studies. Indian fossil flora. (08)
- Unit-5**- Studies of morphology, anatomy, and evolutionary trends of following groups of plants – Psilophytales, Filicales, Pteridospermales, Bennettitales, Cycadales, Cordaitales, Coniferales and Angiosperms. (16)

#### **Practical Course HCP2.1**

1-6 Habit, morphology of vegetative parts, external morphology of reproductive parts and anatomy of available [specimens/slides] types for Following---

Cycadales	Zamia
Coniferales	Araucaria, Podocarpus, Cupressus.
Ginkgoales	Ginkgo
Taxales	Taxus
Ephedrales	Ephedra.

#### 7-12 **Practicals on Palaeobotany –**

Types of fossils- Impression, compression, petrification, coal ball

Study of following fossil genera-

Psilophytales-	Rhynia, Astroxylon, Psilophyton
Lepidodendrales-	Lepidodendron, Stigmara, Lepidocarpus.
Calamitales-	Arthropitys, calamostachys, Annularia.
Coenopteridales-	Staraurrpteris, Botryopteris, Etaupteris.
Filicales-	Rodeites, Gleichemites
Pteridosperales-	Lygenopteris, Medullosa, Pachytesta
Coniferales-	Elatocladus, Brachyphyllum
Cycadales-	Ptilophyllum Dictyozamites
Angiosperms-	Palmoxylon, Enigmocarpon, Sahnianthus

Submission of at least 5 slides from gymnosperms.

**Reference books for paper: HCT2.1**

1. Bierhorst D.W. [1971] Morphology of Vascular plants Macmillan and co. New York
2. Chamberlein C.J. [1966] Gymnosperms. Structures and evolution.
3. Coulter & Chamberlein J.M. [1978] Morphology of Gymnosperms Central Book Depot. Allahabad.
4. Foster A. S. & Gifford E. M. [1959] Comparative Morphology of Vascular Plants Vakil, Feffer & Simons Ltd.
5. Ramanujan c. G. K. [1979] Indian Gymnosperms in Time and space. Today & Tommorows Publisher.
6. Sporne K. R. [1967] Morphology of Gymnosperms-Hutchinson vaiv. Lib. London
7. Vashistha, p.C. Gymnosperms [1976]

**Paleobotany-**

1. Arnold C.A. [1972] An Introduction to Paleobotany
2. Andrevs H.N. Studies in Paleobotany [1961]
3. Darroh, W.C. [1960] Principles of Paleobotany
4. Surange K.R. Indian Fossil Pteridophytes

Shukla A. C. and Mishra S.D. [1975] Essentials of Paleobotany

## **HCT2.2 Taxonomy of Angiosperms.**

**(60 Periods)**

**Unit-1-** Taxonomy-Aims, principles and functions.

Types of Taxonomy- numerical, chemotaxonomy, alpha Taxonomy, omega taxonomy. **(08)**

**Unit-2-**General evolutionary trends- Habitat and habit, vegetative and reproductive structures of flowering plants Species concept – classical , modern, typological,non-dimensional, multidimensional

**(08)**

**Unit-3** Nomenclature –ICBN – principles, rules, recommendations, articles, typification,principle of priority, effective and valid publications,citation of authority, transference, rejection of names, synonyms and homonyms.

Systems of classifications- Principles, outlines , merits and demerits of Bessey's and Cronquist's systems. **(15)**

**Unit-4** Biodiversity- Characterization, generation,maintenance,loss , magnitude and distribution, economic value, conservation strategies, floristic diversity of India, hotspots, endemic and genetic diversity of plants, floristic works in Maharashtra.

**(14)**

**Unit-5-** Salient features , morphological diversity interrelationships in following sub classes of Magnoliophyta and studies of plant families as per Cronquist's system of classification.

**(15)**

Class: Magnoliopsida

Subclass: Magnolidae- Magnoliaceae, Piperaceae

Subclass: Hamamelidae- Casuarinaceae, Urticaceae

Subclass; Caryophyllidae- Caryophyllaceae,Polygonaceae

Subclass: Dilleniidae- Tiliaceae, Sapotaceae

Subclass: Rosidae- Myrtaceae, Geraniaceae

Subclass: Asteridae- Scrophulariaceae, Gentianaceae

Class: Liliopsida

Subclass: Alismatidae, Hydrocharitaceae

Subclass: Arecidae- Araceae

Subclass: Commelinadae- Commelinaceae

Subclass: Zingiberidae- Zingiberaceae

Subclass: Liliidae- Oichidaceae

## **Practical Course HCP2.2**

1 Preparation of bracketed / indented dichotomous keys for identification of taxa.

2 Preparation of botanical description of a plant species.

3-11 Study of families as per theory syllabus (available plant families and Bentham and Hooker's system to be followed)

12 Knowledge of identification of common local flowering plants with the help of flora.

Submission- Herbarium sheets preferably of weeds (at least 10)

Excursion report

## **Reference Books for paper HCT2.2**

Ahmedullar, M. and M.P. nayar 1987. Endemic plants of Indian region, Vol.I

Benson, L.1957. Plant classification

Benson, l.1962. Plant Taxonomy

Cronquist, A. 1968 Evolution and Classification of flowering plants.

Cronquist, A. 1981. An integrated system of classification of flowering plants.

Davis, P.H. and V.M. Heywood 1963. principles of Angiosperm taxonomy.

Dahlgren, P.M.T. 1980. A revised system of classification of the Angiosperms Bot.J. Linn.soc. 80;91-124.

Dahlgren, R.M.T. : 1981 Angiosperm classification and phylogeny-A rectifying comment, bot.J.1961. Morphology of Angiosperms.

Hajra, P.K.et.al. 1996. flora of India . Introductory volume (part-I)

Kubitzki, K. 1977.Plant systematics and evolution.

Lawrence, G.H.M. 1951.Taxonomy of vascular plants.

Naik, V.N.1984. Taxonomy of Agiosperms.

Nayar, M.P.1996. Hot spot of endemic plants of India, Nepal and Bhutan.

Quicke, Donald I.J.1993 Principles and Techniques of contemporary tadonomy.

Rao.R.R. 1994. Biodiversity of India (FloristicAspects).

Rendle, A.B. 1925. The classification of flowring plants.

Stace, C.A. 1980. plant taxonomy and biosystematics.

Takhtajan, A.L.1969 Flowering plants: origin and dispersal .

The new global Taxonomy initiatives BOTANY 2000-ASIA Newsletter 5(4) 1996.

Systematics agenda 2000 charting the bosphere: a global initiative to discover, describe, and classify the world's species. Technical report. Published by SA200, New York Botanical Gardnes.

## **SCT2.1 Cell and Molecular Biology of plants**

**(60 Periods)**

**Unit-1-** Plasma membrane - structure, composition, models, function, sites for ATPases, Ion carriers, channels and pumps, receptors.  
Plasmodesmata- structure, role in movement of molecules and macromolecules, comparison with gap junctions. **(15)**

**Unit-2-**Plant vacuole-Tonoplast , ATPases, transporters, as storage organelle.  
Microtubules and microfilaments, endoplasmic reticulum, golgi bodies. - Structure and function **(09)**

**Unit-3-** Mitochondrion- ultrastructure,genome organization, biogenesis.  
Chloroplast- ultrastructure, genome organization, gene expression, RNA editing, nucleochloroplastic interactions. **(15)**

**Unit-4-** Chromosomal organization, nucleosome organization, models of DNA replications, damage and repair of DNA.  
Satellite DNA,selfish DNA,promiscuous DNA,mini and micro satellite DNA-structure, function and methods of detection **(15)**  
Genetic code- Discovery ,concept, properties, contribution of Nirenberg and Khorana.

**Unit-5-** Cell cycle and apoptosis- control mechanisms, role of cyclins and cyclin dependent kinases, retinoblastoma and E2F proteins, cytokinesis and cell plate formation, mechanisms of programmed cell death,P53 protein /gene caspases - Types  
Techniques in cell Biology- Immunotechniques, in situ hybridization to locate transcripts in cell types, FISH,GISH and confocal microscopy. **(15)**

### **Practical Course SCP2.1**

- 1)To study the effect of temperature/chemicals on membrane permeability
- 2)Staining the chromosomes with schiff's reagent .
- 3)Isolation of plant DNA.
- 4)Estimation of plant DNA by colorimetric method
- 5)Isolation of plant RNA.
- 6)Estimation of plant RNA by colorimetric method.
- 7 & 8)Meiotic studies in higher plants.
- 9)Determination of mitotic index
- 10)Detection of mitochondria in plant cells.
- 11)Isolation of mitochondria and the activity of its marker enzyme,succinate dehydrogenase
- 12)Estimation of chlorophylls/ isolation of chloroplasts

### **Reference books for paper SCT2.1**

- Lewin B. 2000 Genes VII Oxford University Press, New York
- Wolfe, S.L. (1993) Molecular and cell Biology - Wadsworth publishing Co. California, U.S.A.
- Krishnamourthy, K.V. (2000) Methods in Cell Wall chemistry. CRC Press, Boca Raton, Florida.
- Buchanan, B.B., Griessman W and Jones, R.L. 2000.  
Biochemistry and Molecular Biology of Plants  
American Society of plant Physiologists, Maryland, U.S.A.
- De, D.N. 2000, Plant cell vacuoles. An introduction, CSIRO publication, Collingwood, Australia.
- Hall, J.L. and Moore A.L. 1983 Isolation of and organelles for plant cells, Academic Press, London.
- Harris, N. and Oparka, K.J. 1994. Plant cell Biology: A Practical Approach, IRL press at Oxford  
university Press, Oxford, U.K.
- Shans, C.H. (1988), Plant Molecular Biology : A Practical Approach , IRL Press,  
Oxford.
- Bruce Alberts et al. (1983) Biology of the Cell. Garland publ. Inc. New York.
- Charlotte J. Avers (1986) : Molecular Cell Biology, Addison Wesley publishing company.
- Sandhya Mitra (1988) Elements of Molecular Biology MacMillan India Limited.
- H.D. Kumar (1983): Molecular Biology and Biotechnology Vikas Publ. House Pvt. Ltd.
- C.B. Powar (1992) : Cell Biology: Himalaya Publ. House.
- De. Robertes et al. (1992) : Cell Biology, Philadelphia W.B. Sanders.
- Watson, J.D. et al. (1987): Molecular Biology of gene (IV Edition) The Benjamin/Commings  
Pub. Co. Inc. Menlo Park California.
- Stumpf P.K. and Conn. E.E. (1981) : Plant biochemistry ; 'The Cell' Comprehensive Treatise,  
Academic Press.
- Darnell J. and D. Baltimore (1986) Lodish : Molecular Cell Biology, Scientific American Books.
- K. Sivarama Sastry. G. Padmanaban and C. Subramanyam (1994) : Text book of Molecular  
Biology, Mac Millan India Ltd.

## **OET2.1 Advances in Plant Pathology**

**(60 Periods)**

**Unit-1-** Introduction, plant diseases- concept and classification of plant diseases, plant pathogens- concept and classification . Importance of plant diseases.

Methods of diagnosis of plant diseases.

Epidemiology- slow and rapid epiphytotic, Disease forecasting, assessment of disease incidence and crop loss **(12)**

**Unit-2-** Principles of plant disease control- Prophylaxis – Exclusion, Eradication, Protection, Immunization- Chemical control, genetic resistance. **(12)**

**Unit-3-** MLO: classification, morphology , characteristics and Identification Techniques

Mechanism of infection – Prepenetration, penetration , post penetration and colonization.

Defense mechanism against pathogen- structural, physiological, genetical and chemical, systematic acquired resistance

Role of environmental factors on disease development **(12)**

**Unit-4-** Plant diseases and disorders- a brief idea of following important diseases. **(12)**

Viral diseases- TMV, BMV

Phytoplasma diseases- Little leaf, GSD

Bacterial diseases- Canker, Blight, Leafspot

MLO Diseases -

Nematodes- Root knot of vegetables

Algal diseases- Red rust

**Unit-5-** Fungal diseases- club root, white rust, Downy mildew , powdery mildew Rusts, smuts Ergot, Leaf spot , fruit rot , study of seed borne pathogens.

Phanerogamic diseases- Total and partial stem and root parasites

**(12)**

### **Practical OEP2.1**

1,2 Study of Fungal diseases

3 Study of bacterial diseases

4 Study of viral diseases

5. Study of Phytoplasma diseases

6. Study of diseases caused by Nematodes

7. Study of phanerogamic total and partial stem and root parasites

8-10 Estimation of chlorophylls, sugars and polyphenols from healthy and infected plant parts

11 study of some fungicides, biopesticides (Demonstration)

12 Demonstration of antibiotics using a bacterial culture and known antibiotics



## **Reference books for OET2.1**

Mehrotra, R.S. (1980)- plant pathology.

Agrios, G.N. (1978)-plant pathology .

Ny vail, R.F.(1979) – Field Crop Diseases Handbook.

Stingh, R.S. (1963) – Plant diseases.

Padoley, S.K. and P.B. Mistry – A manual of plant pathology.

Gangopadhyay,S. (1984)- Clinical plant pathology.

Rangaswami, G.(1979) Diseases of crop plants in India.

Mahadevan A.andR.Sridhar (1982)- Methods in physiological plant pathology.

Aneja, K.R.(1993) – Experiments in Microbiology plant Pathology and Tissue culture.

Gangulee, H.C.&A.K. kar (1992) – College Botany Vol. II.

Cooke, A.A.(1981) – Diseases of Tropical and subtropical field, Fiber and Oil Plants.

Paul Khurana, S.M. (1998) – Pathological problems of Economic Crop plants and their management.

Kuljit,J.(1969)- The Biology of parasitic flowering plants.Univ.of California Press, U.S.A.

Plank, J.E. Van der (1963)- Plant diseases, Epidemics and Control.

Plank, J.E. Van der (1968)- Diseases Resistance in Plants. A.P. London and New York.

Chaube and Pundhir(2005)- Crop diseases and their management

Micobiology and plant pathology by P.D. Sharma . Rastogi publication Shivaji road ,

Meerut.