SYLLABUS

MANONMANIAM SUNDARANAR UNIVERISTY, TIRUNELVELI-12

PG - COURSES – AFFILIATED COLLEGES

Course Structure for

M.Sc. Botany

(Choice Based Credit System)

(with effect from the academic year 2021- 2022 onwards)

Semester-I				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
III	Core-1	Algology and Bryology	ZBOM11	4
	Core-2	Mycology, Lichenology and Plant Pathology	ZBOM 12	4
	Core-3	Microbiology and Immunology	ZBOM13	4
	Core-4	Phytochemistry	ZBOM14	4
	Core-5 Practical - 1	Algology, Bryology, Mycology, Lichenology and Plant Pathology	ZBOL11	2
	Core-6 Practical – 2	Microbiology, Immunology and Phytochemistry	ZBOL12	2

ALGOLOGY AND BRYOLOGY

Prerequisite:

Basic knowledge in Algology and Bryology gained from Undergraduate programme

Objectives:

- To learn about classification of algae and bryophytes
- To learn about interrelationships of algae and bryophytes with other thallophytes
- To understand the role and importance of lower group plants

Outcome:

- Graduates will learn and understand the features of algae and bryophytes
- Acquisition of knowledge about cultivation of algae
- Wide knowledge of algae and bryophytes impetus new ideas

UNIT- I

General characters and interrelationships of Algae with other thallophytes. Classification of algae (Fritsch, 1935). A comparative study of the major groups – with special reference to their occurrence, thallus structure, reproduction and life-history

of: Cyanophyceae, Chlorophyceae, Xanthophyceae, Bacillariophyceae, Euglenophyaceae, Phaeophyceae and Rhodophyceae.

UNIT- II

Comparative account of pigments, cell wall components, reserve food, flagella, chromatophores, pyrenoids, eyespot and nucleus. Range of thalli diversity- Life-cycle patterns and alternation of generations.

UNIT- III

Physiology and ecology of algae. Economic importance of algae - Role of algae in soil fertility - Laboratory and commercial cultivation of algae - Algal blooms, toxic algae and Fossil algae.

UNIT - IV

General characters of Bryophytes and interrelationships. Classification of Bryophytes (Rothmaler (1951) Smith, G.M). General characters of major orders – Marchantiales, Jungermanniales, Anthocerotales, Sphagnales, Funariales and Polytrichales.

UNIT - V

Life cycle pattern and alternation of generations in Bryophytes. Origin of Bryophytes – Reproduction in Bryophytes. Fossil bryophytes with special reference to Naiadita. Ecological adaptations and economic importance of Bryophytes.

Practicals

Algae

Caulerpa, Ulva, Padina, Dictyota, Turbinaria, Gracillaria, Oscillatoria, Scytonema, and Anabaena.

Bryophytes

Riccia, Plagiochasma, Anthoceros, Funaria

Record

To maintain a record note book for evaluation.

Field Trip

Algal collection trip and submission of 5 Herbarium Sheets.

Reference Books

1. The Algae-Chapman., V.J. & Chapman, D.J. Elbs and Macmillian, London, 1960.
2. Structure and Reproduction of the Algae. Vol. I & II., Fritsh, F.E. Camb. Univ. Press, 1965.
3. The Biology of the Algae., Round, F.W. Edward Arnold Publishers, London, 1973.
4. Text Book of Algae., Sharma, O.P. Tata McGraw Hill Publishing Co., New Delhi, 1986.
5. Introductory Phycology., Kumar, H.D. Affiliated East Press, NewDelhi.
6. The Algae – A review – Prescott, G.W. Bishen Singh & Mahendra Pal Singh, Dehra Dun and Otto Koelta Science Publishers, West Germany, 1969.
7. Text book of Algae – Sharma, O.P. Tata McGraw Hill Publishing Co., New Delhi, 1986.
8. Text Book of Botany, Algae (Revised edition), Pandey B.P., S. Chand & Co., New

Delhi, 2000.
9. Text Book of Algae, Sharma, O.P., Tata McGraw Hill Publ. Co.Ltd., New Delhi, 1992.
10. Introduction to Phycology, South, G.R. & Whittick, A. Blackwell Scientific Publ., Oxford.
11. Botany for Degree students, Algae 9th revised edition, Vashista Sinha B.R., Singh, V.P., 2002, S. Chand & Co. Ltd., New Delhi.
12. . British Mosses and Liverworts – Watson, E.V. Cambridge, 1980.
13. Biology of Bryophytes-Chopra, R.N. and Kumar, P.K.Wiley Eastern Ltd., New Delhi, 1988.
14. Bryophytes – Prem Puri. Atma Ram & Sons, Delhi, 1981.
15. An introduction to Embryophyta Vol. II, Parihar, N.S., Central Book depot, Allahabad, 1967.
16. Series on Diversity of Microbes and Cryptogams : Algae, O.P Sharma, Tata McGraw-Hill education Private Limited, New Delhi, 2011.

Links:

1. https://www.youtube.com/watch?v=Z_4UNFjqILo
2. https://www.youtube.com/watch?v=x-K_2bHOZOk
3. https://www.youtube.com/watch?v=lA8ylWTifYQ
4. https://www.youtube.com/watch?v=sEEVVCQKx68
5. https://www.youtube.com/watch?v=eN5ROvxpx8Q
6. https://www.youtube.com/watch?v=FmBZGx8fkp0
7. https://www.youtube.com/watch?v=5Srv1c-HGXQ

MYCOLOGY, LICHENOLOGY AND PLANT PATHOLOGY

Prerequisite:

Basic knowledge in Mycology lichenology and Plant pathology gained from Undergraduate programme

Objectives:

- To get knowledge about fungi, lichen and pathology in detail
- To learn about role of fungi and lichen in human life
- To gain knowledge about plant diseases

Outcome:

- Accumulation of knowledge about fungi, lichen and plant pathology
- Acquisition of ideas about role of fungi and lichen
- Wide knowledge of plant diseases in food plants

UNIT - I

Classification of fungi proposed by Alexopoulous and Mims (1979). Ultrastructure of fungal cell, Cell wall composition. General characters of fungi of the following: Mastigomycotina - Zygomycotina - Ascomycotina - Basidiomycotina and Deuteromycotina.

UNIT – II

Mode of nutrition - Reproduction and life cycle patterns. Homothallism and Heterothallism in fungi. Homokaryon and Heterokaryon. Parasexuality and heterokaryosis. Economic importance of fungi. Mycorrhizae - Structure and Symbiotic association. Types - Ectotrophic - endotrophic - application of mycorrhizae in agriculture.

UNIT – III

General account of Lichens. Classification of lichens by Miller (1984). Structure, nutrition and reproduction of the three major groups. Economic importance. Lichens as pollution indicators. Microchemical tests for lichens.

UNIT – IV

Plant diseases – definition, classification, causes and symptoms, infection process – host parasite interaction, defense mechanism in plants, disease control methods - Physical, Chemical, Cultural and Biological. Role of enzymes, toxins, growth regulators and phytoalexins in plant disease management.

UNIT- V

General effects, symptoms, casual organisms, disease cycle and control measures of the following diseases : white rust of crucifers, blast of rice, late blight of potato, black rust of wheat, leaf spot disease of groundnut, red rot of sugarcane, citrus canker, mosaic and little leaf of brinjal,.

Practicals

Fungi

Mucor / Pilobolus, Agaricus, Xylaria, Polyporus, Puccinia.

Lichens

Micropreparations of vegetative and reproductive parts of any foliose / fruticose lichens.

Mycorrhizae

Permanent microslides / photographs.

Plant pathology

Etiology of any four plant diseases from the list given in the theory syllabus

Any photographs / slides / phytochemicals relevant to pathology (host - pathogen interactions).

To maintain a record note book for evaluation.

Reference Books

1. Introduction to Fungi. Webster, J. Cambridge University Press London, 1970.
2. Fungi., Srivastava, S., Pradeep Publications, Jalandhar, 1999.
3. The Biology of Lichens., Hale, M.E., Edward Arnold, Mayland. 1983.
4. Botany for Degree Students – Fungi, Vashista, B.R., S.C hand & Co., New Delhi, 1982.
5. College Botany Vol. I Fungi & Pathology, Pandey B.P., 1997.
6. A Text book of Plant Pathology, Bilgrami, K.S. & Dube, H.C., Vikas, New Delhi.
7. Plant diseases. Singh, R.S., Oxford & IBH, New Delhi.
8. A textbook of Fungi, Bacteria and Virus.1978. Dube, H., Vikas Publ.,
9. Mills Dallice et al., 1996. Molecular Aspects of Pathogenicity and Resistance: Requirement for Signal Transduction. APS, St Paul, Minnesota.
10. Parker, J. 2008. Molecular Aspects of plant Diseases Resistance. Blackwell Publ.
11. Gnanamanickam, SS (Eds). 2002. Biological Control of Crop Diseases. CRC Press, Florida.
12. Botany for Degree Students – Fungi, Vashista, B.R., A.K. Sinha, S.Chand & Co., New Delhi, Revised Edition 2014.
13. Mycology and Phytopathology, Sharma, P.D. 2017. Rastogi Publications.
14. Recent advances in Lichenology, Upreti, D.K., Divakar, P.K., Shukla,V., Bajpai, R. 2015. Springer India.

Links

1. https://www.youtube.com/watch?v=VVuYGkk_I8s
2. https://www.youtube.com/watch?v=ma9fooNnvGY
3. https://www.youtube.com/watch?v=XQ_ZY57MY64
4. https://www.youtube.com/watch?v=YhMG3ttCg3o
5. https://www.youtube.com/watch?v=xvvHUHpfQbw

MICROBIOLOGY AND IMMUNOLOGY

Prerequisite:

Basic knowledge in Microbiology and Immunology

Objectives:

- To learn about the role and importance of microbes in various fields
- To acquire ideas about microbiology
- To gain knowledge about immunology

Outcome:

- Acquire knowledge in microbiological techniques
- Acquisition of ideas in food and industrial microbiology
- Gain the concept of immunological systems

UNIT-I

Bacteriology:

Sterilization techniques- Physical and chemical methods- General characteristics - Classification (Bergey`s Manual of Systematic Bacteriology), Ultra structure of Gram positive & Gram negative bacterial cell, Bacterial staining methods-, Isolation, cultivation and preservation of bacterial culture. Bacterial growth- continuous & synchronous culture. Kinetics of growth. Determination of bacterial growth – Direct method: Haemocytometer - Viable plate count - Indirect method: Turbidity.

UNIT - II

Mycoplasma and Virology:

Mycoplasma - structure and classification. Viruses - General characters, Classification, Structure, Multiplication of Caulimovirus. Plant viruses and their symptoms. Viroids and prions. Bacteriophages- classification, - Lytic and lysogenic cycle

UNIT III

Food and Industrial Microbiology:

The role of microorganisms in foods - Spoilage of fruits, vegetables, meats, poultry, eggs, bakery products, dairy products and canned foods - Food preservation - Introduction to industrial microbiology-- Microbiology of fermented milk products (Cheese), beverages, wine and vinegar industry. Production of 1) organic acid- Acetic acid; 2) Enzyme- Amylase.

UNIT - IV

Environment and Agricultural Microbiology:

Microorganisms in soil environments: Rhizosphere and Nonrhizosphere soil microorganisms and their interactions. Microorganisms in various aquatic environments: Freshwater, Brackish-water, Marine - Microbes in the extreme environments and their adaptations. Indicator organisms. Microbial inoculants in agriculture: Rhizobium, Pseudomonas, BGA - Microbial Herbicides- Bt toxins.

UNIT- V

Immunology:

Cells of the Immune System - Innate and Adaptive immunity - Antigens - Antigenicity and immunogenicity - B and T cell epitopes - Immunoglobulin: Structure, Function and Immunoglobulin classes. Antigen-Antibody reaction. ELISA & RT-PCR.

Reference books

1. Pelczar J.M., Chan E.C.S. and Kreig. R.N. 2008. Microbiology. 13th Reprint, Tata Mc Graw Hill Publishing Company Ltd, New Delhi.
2. G. Tortora, B. Funke and C. Case. 1995. Microbiology: An Introduction. 5th ed. Menlo Park, CA: Benjamin/Cummings.
3. J. Ingrahamand C. Ingraham. 1995. Introduction to Microbiology. Belmont, CA: Wadsworth.
4. Mathews, R.E.F., 1957. Plant Virology. Cambridge University Press. London.
5. Atlas, R.M. 2000. Microbiology - Principles of Microbiology. Mosby Year Book Inc, Missouri.
6. Black, J. 2007. Microbiology - Principles and Explorations. 7th Edition, Prentice Hall International, Inc, New York.
7. Brock, T.D. 2000. Biology of Microorganisms. 9th edition, Southern Illinois University, Carbondale.
1. MSU / 2021-22 / PG – Colleges / M.Sc.(Botany) / Semester-I / Ppr.no.3 / Core -3
8. Prescott, L.M., Harley, J.P. and Klein, D.A. 1996. Microbiology.3rd Edition, W.M.C. Brown Publishers, Chicago.
9. Salle, A.J. 1997. Fundamental Principles of Bacteriology. 7th Edition, Tata Mc Graw Hill Publishing Company Ltd, New Delhi.
10. Vijaya Ramesh, K. Food Microbiology, MJP, Chennai Immunology.
11. Kannan,T. Immunology, MJP, Chennai.
12. Mark Wheelis, 2010. Principles of Modern Microbiology, Jones and Bartlett, Cannada.
13. Richard, A., Godsby., Thomas, J., Kundf. Barbare A and Osborne, 2000. Kuby - Immunology W.H. Freemen and Company.
14. Rao C.V. A Text Book of Immunology, 2011. Narosa Publication House, NewDelhi.
15. David Male & Stokes Peebles & Victoria Male Immunology, 9th edition, 2020, Elsevier

Links

1. https://www.youtube.com/watch?v=Didrc3wJ3E8
2. https://www.youtube.com/watch?v=rXuWletgE20
3. https://www.youtube.com/watch?v=T8_y24Wiugc
4. https://www.youtube.com/watch?v=GzuM_nfrXLk
5. https://www.youtube.com/watch?v=6A9JFaeU7Io

Practicals

1. Preparation of culture media agar slant - agar plate.
2. Isolation of microbes by streak and pour plate method.
3. Isolation of soil microbes by serial dilution techniques.
4. Isolation and identification of Bacteria and Fungi from spoiled food.
5. Isolation of microbes from soil and water.
6. Gram staining of Bacteria.
7. Demonstration of bacterial mobility (Hanging drop method).

PHYTOCHEMISTRY

Prerequisite:

Basic knowledge on plant cell chemistry from undergraduate programme.

Objectives:

- To learn about phytochemistry and their components
- To understand the detailed knowledge of secondary metaboilites
- To acquire the importance and the extraction techniques of various metabolites

Outcome:

1. Graduates will learn various extraction techniques
2. Acquisition of knowledge in secondary metabolites
3. Wide ideas about techniques used in phytochemistry

UNIT- I

Phytochemistry – Scope and Importance in pharmaceuticals industry. Preparation of plant extracts - maceration, infusion, digestion, decoction, percolation, sonication, hot continuous extraction, aqueous alcoholic extraction, superficial fluid extraction and counter-current extraction. Parameters for selecting appropriate extraction method.

UNIT - II

Secondary metabolites - definition, classification, distribution in plants and its therapeutic functions. preliminary phytochemical screening by chemical test. Methods for separation and isolation of constituents. Synergy and polyvalent action of phytomedicines.

UNIT- III

Flavonoids: Definition, properties, classification, natural sources and therapeutic applications of flavonoids: Flavones, Flavanones Flavonols, anthocyanins. Alkaloids- Quinine, Ephedrine, Serpentine, Atrophine and Morphine. Carotenoids- Lycopene and β-carotenes

UNIT - IV

Glycosides: Definition, properties, classification, natural sources, pharmacological and toxicological effects of glycosides. Terpenoids- β-Sitosterol, Menthol and Eugenol. Phenolics - Coumarins and Tannins.

UNIT - V

Volatile oils - source, constituents, properties, extraction and utilization of Sandal wood oil, Lemon grass oil, Tulsi oil, Vetiver oil, Clove oil and Eucalyptus oil. Factors affecting volatile components production in plants. Medicinal uses of resins.

Reference Books

1. Gurdeep Chatwal, 1983. Organic Chemistry of Natural Products, Himalaya Publishing House, Mumbai.
2. Jean Bruneton, 1999. Pharmacognosy, Second Edition, Lavoisier Publishers, Inc. USA.

3. Kokate, C.K., Purohit, A. P and Gokhale, S.R. 2004. Pharmacognosy, Nirali Prakashan Publications, Pune.
4. Nitin Suri, 2010. Phytochemical Techniques, Oxford Book Company.
5. Roseline, A. 2011. Pharmacognosy, MJP Publishers, Chennai.
6. Rumit M Shah and Rupesh T Nayak, 2012. Pharmacognosy, Global Academic Publishers, New Delhi. (Part I and Part II).
7. Wallis, T.E. 1985. Text Book of Pharmacognosy, CSB Publishers, New Delhi.
8. William Charles Evans, 2002. Pharmacognosy, Fifteenth edition, Harcourt Brace & Company, Asia Pvt. Ltd.
9. Andrew Pengelly, 2006. The constituents of Medicinal Plants, 2nd edition, Viva-Book Private Limited, NewDelhi
10. Jain Usman, Jadhav, Tanvir 2017 A text book of Phytochemistry, S.Vikas and Company (Pvt.) Jalandhar
11. Preethi Kathirvel, 2021. Secondary Metabolites, Darshan Publishers, Tamilnadu

e-journals

1. Flavor and Fragrance Journal 2008 23:213-226
2. World Journal of Pharmacy and Pharmaceutical Sciences, 2015, 4(1):287-305

Links

1. https://www.youtube.com/watch?v=9VSE3IA8Nxw
2. https://www.youtube.com/watch?v=_7RHYEZ5x9c
3. https://www.youtube.com/watch?v=ufG3UUUHr0M
4. https://www.youtube.com/watch?v=QHs8MMMNZ6c
5. https://www.youtube.com/watch?v=a2DmFPvspeg

Practicals

1. Quantification of Antioxidants in the given samples:
    A. Estimation of flavonoids, B. Estimation of Ascorbic acid, C. Estimation of β-Carotene
2. Preliminary Phytochemical Test:
    A. Alkaloids, B. Tannins, C. Phenols, D. Glycosides and E. Saponins
3. Spotters- Photographs/images of oil extraction, structure of : Ephedrine, Quinine, coumarins, β-Sitosterol, eugenol

ALGOLOGY, BRYOLOGY, MYCOLOGY, LICHENOLOGY AND PLANT PATHOLOGY

Algology and Bryology - Practicals

Algae

Caulerpa, Ulva, Padina, Dictyota, Turbinaria, Gracillaria, Oscillatoria, Scytonema, and Anabaena.

Bryophytes

Riccia, Plagiochasma, Anthoceros, Funaria

Record

To maintain a record note book for evaluation.

Field Trip

Algal collection trip and submission of 5 Herbarium Sheets.

Mycology, Lichenology and Plant Pathology - Practicals

Fungi

Mucor / Pilobolus, Agaricus, Xylaria, Polyporus, Puccinia.

Lichens

Micropreparations of vegetative and reproductive parts of any foliose / fruticose lichens.

Mycorrhizae

Permanent microslides / photographs.

Plant pathology

Etiology of any four plant diseases from the list given in the theory syllabus

Any photographs / slides / phytochemicals relevant to pathology (host - pathogen interactions).

MICROBIOLOGY, IMMUNOLOGY AND PHYTOCHEMISTRY

Microbiology and Immunology - Practicals

1. Preparation of culture media agar slant - agar plate.
2. Isolation of microbes by streak and pour plate method.
3. Isolation of soil microbes by serial dilution techniques.
4. Isolation and identification of Bacteria and Fungi from spoiled food.
5. Isolation of microbes from soil and water.
6. Gram staining of Bacteria.
7. Demonstration of bacterial mobility (Hanging drop method).

To maintain a record note book for evaluation

Phytochemistry - Practicals

1. Quantification of Antioxidants in the given samples:
    A. Estimation of flavonoids,
    B. Estimation of Ascorbic acid
    C. Estimation of β-Carotene
2. Preliminary Phytochemical Test:
    A. Alkaloids, B. Tannins, C. Phenols, D. Glycosides and E. Saponins
3. Spotters
    A. Photographs/images of oil extraction,
    B. Structure of : Ephedrine, Quinine, coumarins, β-Sitosterol, eugenol

To maintain a record note book for evaluation