

Part A: Introduction			
Program: Certificate course in Microbial Techniques and Archaeogoniate identification		Class: B.Sc.I Year	Year: 2022 Session: 2022-2023
1.	Course Code	BOT-1T	
2.	Course Title	Microbial Diversity and Plant Pathology	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	NO	
5.	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to</p> <ul style="list-style-type: none"> • Understand the Viruses, Bacteria, Phycology, Mycology and Plant pathology • Learn microbial techniques which will be beneficial for agriculture and industry. • Learn life cycles of selected genera of different groups • Understand etiology of plant diseases • Apply their knowledge in the crop fields to eradicate or avoid the diseases • Apply different biofertilizers to enhance productivity 	
6.	Credit Value	Theory: 4	
7.	Total Marks	Max. Marks: 50	Min Passing Marks: 17

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Period
I	Microbial Techniques & instrumentation: Microscopy – Light, phase contrast, scanning and transmission electron microscopy, staining techniques for light microscopy. Common equipment of microbiology lab and principle of their working – autoclave, oven, laminar air flow, centrifuge, colorimetry, spectrophotometry, electrophoresis, immobilization methods, fermentation and fermenters.	12
II	Microbial world: Cell structure of Eukaryotic and prokaryotic cells, Gram positive and Gram-negative bacteria, Structure of bacteria; Bacterial Growth curve, factors affecting growth of microbes; Sporulation, reproduction, recombination in bacteria. Viruses, general characteristics, Structure of viruses, Bacteriophages and TMV; Lytic and Lysogenic cycles, viroid, Prions & mycoplasma, phytoplasma, actinomycetes and their economic uses. Applied Microbiology: Food fermentations and food produced by microbes, Production of antibiotics, enzymes, alcoholic beverages, Lactic acid and Acetic acid production. Antigen, antibody and production of monoclonal antibodies (Hybridoma techniques).	12
III	Phycology: General characteristic features, classification and range of thallus organization. Classification and life cycle of – <i>Volvox</i> , <i>Oedogonium</i> , <i>Chara</i> , <i>Vaucheria</i> , <i>Ectocarpus</i> and <i>Polysiphonia</i> . Economic importance of algae - Role of algae in soil fertility, algae as biofertilizer, blue green algae and nitrogen economy of soil; algae as biofuel	12

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IV	<p>Mycology , Mushroom Cultivation, Lichenology & Mycorrhiza: General characteristic features, Economic importance and Classification of Fungi. Distinguishing characters of Myxomycota: General characters of Mastigomycota: <i>Phytophthora</i> and <i>Albugo</i>, Zygomycota: <i>Rhizopus</i> and <i>Mucor</i>, Ascomycota: <i>Saccharomyces</i>, <i>Penicillium</i>, <i>Peziza</i>. Basidiomycota: <i>Ustilago</i>, <i>Puccinia</i>, <i>Agaricus</i>; Deuteromycota: <i>Colletotrichum</i>, <i>Fusarium</i>, <i>Alternaria</i>. Heterothallism, Physiological specialization, Heterokaryosis & Parasexuality, Mushroom cultivation- Button and Oyster mushroom General account of lichens, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.</p>	12
V	<p>Plant Pathology: Disease concept, Symptoms, Etiology, Primary and secondary inoculum, pathogenesis, Koch's Postulates. Mechanism of infection and predisposing factors. Disease reoccurrence, Defence mechanism : physical and biochemical, Disease Resistance, Systemic fungicides, Organomercurials and sulphur containing fungicides</p> <p>Diseases and Control: Symptoms, Causal organism, Disease cycle and Control measures of – Early & Late Blight of Potato, Damping of seedlings, False Smut of Rice/ Brown spot of rice, Black Stem Rust of Wheat, <i>Alternaria</i> spot and White rust of Crucifers, Red Rot of Sugarcane, Wilting of Arhar, Mosaic diseases on tobacco and cucumber, yellow vein mosaic of bhindi; Citrus Canker, Little leaf of brinjal; Disease management: Quarantine organization and Integrated plant disease management, Biological control</p>	12
<p>Keywords: Microbial techniques, Mushroom cultivation, Mycology, Lichenology & Mycorrhiza, Plant diseases</p>		

Part C - Learning Resources

Suggested Readings:

1. Microbiology Fundamental and Applications (hindi) (pb) 9. ISBN: 9788188826230 Edition: 03 Year : 2016 Author : Dr. Purohit SS , Dr. Deo Publisher : Student Edition Language : Hindi
2. Modern Microbiology (hindi) (hb) ISBN: 9788177543599 Edition : 1 Year : 2018 Author : Dr. Purohit SS , Dr. Singh T Publisher : Agrobios (India)
3. Plant pathology by R.S. Mehrotra, Tata McGraw-Hill Publication

Text Books:

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Aggarwal, S. K. 2009. Foundation Course in Biology, A one books Pvt. Ltd., New Delhi.
5. Aneja, K. R. 1993. Experiments in Microbiology, Pathology and Tissue Culture, Vishwa Prakashan, New Delhi.
6. Annie Ragland, 2012. Algae and Bryophytes, Saras Publication, Kanyakumari, India.
7. Basu, A. N. 1993. Essentials of Plant Viruses, Vectors and Plant diseases, New Age International, New Delhi.
8. Chopra. G. L. 1984. A text book of Algae, Rastogi publications, Meerut, India.
9. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., New Delhi.
10. Fritsch, R. E. 1977. Structure and Reproduction of Algae, Cambridge University Press, London.
11. Sharma, P.D. (2011). Plant Pathology. Meerut, U.P.: Rastogi Publication.
12. Webster, J., Weber, R. (2007). Introduction to Fungi, 3rd edition. Cambridge, U.K.: Cambridge University Press.
13. Pandey B.P. 2001. College Botany Volume 1, S Chand & Company Pvt. Ltd, New Delhi.
14. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.
15. Pelzar, 1963. Microbiology, Tata Mc Graw Hill, New Delhi
16. Rangaswamy, G. 2009, Disease of Crop Plants in India, Prientice Hall of India, New Delhi.

Online Resources

- i. <https://indianculture.gov.in/rarebooks/economic-botany-india>

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- ii. https://www.infinityfoundation.com/mandala/t_es/t_es_tiwari_botany_frameset.htm
- iii. https://www.researchgate.net/publication/335715457_Ancient_Indian_rishi's_Sages_knowledge_of_botany_and_medicinal_plants_since_Vedic_period_was_much_older_than_the_period_of_Theophrastus_A_case_study_who_was_the_actual_father_of_botany
- iv. <https://www.scribd.com/presentation/81269920/Botany-of-Ancient-India>
- v. https://insa.nic.in/writereaddata/UpLoadedFiles/IJHS/Vol17_2_17_PKBhattacharyya.pdf

Suggested equivalent online courses:

1. <https://indianculture.gov.in/rarebooks/economic-botany-india>
2. <https://community.plantae.org/tags/mooc> futurelearn.com/courses/teaching-biology-inspiring-students-with-plants-in-science
3. <https://www.coursera.org/courses?query=plants>
4. <http://egyankosh.ac.in/handle/123456789/53530>
5. <https://www.classcentral.com/tag/microbiology>
6. <https://www.edx.org/learn/microbiology>
7. <https://www.mooc-list.com/tags/microbiology>
8. <https://www.udemy.com/topic/microbiology/> <https://ucmp.berkeley.edu/bacteria/bacteria.html>
9. <https://www.livescience.com/53272-what-is-a-virus.html>
10. <https://gclambathach.in/lms/Economic%20importance%20of%20Algae.pdf>
11. <https://www.slideshare.net/sardar1109/algae-notes-1>
12. <https://www.onlinebiologynotes.com/algae-general-characteristics-classification/>
13. <https://www.sciencedirect.com/topics/immunology-and-microbiology/fungus>
14. <https://ucmp.berkeley.edu/fungi/fungi.html>
15. <https://agrimoon.com/wp-content/uploads/Mashroom-culture.pdf>
16. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=11293>
17. <http://www.hillagric.ac.in/edu/coa/pplpath/lect/plpath111/Lect.%201%20%20Introduction-Pl%20Path%20111.pdf>
18. http://www.jnkvv.org/PDF/11042020102651plant_pathology.pdf
19. <https://www.apsnet.org/edcenter/disimpactmngmnt/topc/EpidemiologyTemporal/Pages/ManagementStrategies.aspx>
20. <https://learn.saylor.org/course/view.php?id=23§ionid=6821>
21. <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/microscopy>
22. http://physics.fe.uni-lj.si/students/predavanja/Microscopy_Kulkarni.pdf
23. <https://lipidnanostructuresgroup.weebly.com/>
24. <https://zoology4civilservices.wordpress.com/2016/06/18/65/>
25. <https://microbenotes.com/laminar-flow-hood>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50

Continuous Comprehensive Evaluation (CCE): As per rule

University Exam(UE): 50Marks

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Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Botany) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

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| 10. Manisha Gupta | - | Member | Member |

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Part A: Introduction			
Program: Certificate course in Microbial techniques and Archeogoniate identification		Class: B.Sc. I Year	Year: 2022 Session: 2022-2023
1.	Course Code	BOT-2T	
2.	Course Title	Archeogoniateae and Plant Architecture	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	NO	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to <ul style="list-style-type: none"> • Understand the General characteristics and affinities of Bryophytes, Pteridophytes and Gymnosperms • Phylogenetic relationships with the help of Palaeobotanical studies • Learn morphology, and- flower architecture of angiosperms 	
6.	Credit Value	Theory: 4	
7.	Total Marks	Max. Marks: 50	Min Passing Marks: 17

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Period
I	Introduction to Archeogoniateae & Bryophytes: Unique features of archeogoniateae, Bryophytes: General characteristic features and Affinities, adaptations to land habit, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of <i>Riccia</i> , <i>Marchantia</i> , <i>Anthoceros</i> and <i>Sphagnum</i> . (Developmental details not to be included). Economic importance of bryophytes.	12
II	Pteridophytes: General characteristic features and affinities, Classification (up to family) with examples, Heterospory and seed habit, stelar evolution, economic importance of Pteridophytes, Morphology, anatomy and life cycle of <i>Psilotum</i> , <i>Lycopodium</i> , <i>Selaginella</i> , <i>Equisetum</i> , <i>Pteris</i> and <i>Marselia</i> .	12
III	Gymnosperms: Classification and distribution of gymnosperms; Salient features of Cycadales, Ginkgoales, Coniferales and Gnetales, their examples, structure and reproduction; economic importance, Morphology, anatomy and life cycle of <i>Cycas</i> , <i>Pinus</i> and <i>Ephedra</i> .	12
IV	Palaeobotany: General account, Geological time scale; Brief account of process of fossilization & types of fossils and their study techniques; Fossil plants: <i>Rhynia</i> , <i>Williamsonia</i> , <i>Cycadeoidea</i> . Contribution of Prof. Birbal Sahni	12
V	Angiosperm Morphology (Stem, Roots, Leaves, Flowers and Inflorescence: Morphology and modifications of root; Stem, leaf and bud. Types of inflorescences; flowers, flower parts, fruits and types of placentation; Definition	12

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and types of seeds.

Keywords: Archaeogniatae, Bryophyta, *Rhynia*, Heterospory, Angiosperms, Fossil

Part C -Learning Resources

1. Gangulee H. S. and K. Kar 1992. College Botany Vol. I and II. (New Central Book Agency)
2. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
3. Pandey S.K. (2012). Quick Concept of Botany. Publisher LAP LAMBERT Academic Publishing GmbH & Co. KG, Germany (ISBN: 978-3-8484-3104-5).
4. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.
5. Rashid A (1999) An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd. New Delhi.
6. Sharma OP (1990) Textbook of Pteridophyta. MacMillan India Ltd. Delhi.
7. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Pteridophyta, S. Chand and Company,
8. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Gymnosperms, S. Chand and
9. Parihar NS (1976) Biology and Morphology of Pteridophytes. Central Book Depot.
10. Bhatnagar SP (1996) Gymnosperms, New Age International Publisher.
11. Pandey BP (2010) College Botany Vol II S. Chand and Company, New Delhi .

Online Resources

1. <https://www.anbg.gov.au/bryophyte/what-is-bryophyte>.
2. <https://pteridoportal.org/portal/index.php>
3. <https://www.conifers.org/zz/gymnosperms.php>
4. <http://www.mobot.org/MOBOT/research/APweb/>
5. <https://milneorchid.weebly.com/plant-id-for-beginners>
6. <http://webapp1.dlib.indiana.edu/inauthors/view?docId=VAC0868&doc.view=print>
7. <https://palynology.org/>
8. <http://www2.estrellamountain.edu/faculty/farabee/biobk/Biobookflowers.html>
9. <https://www.sciencelearn.org.nz/resources/100-plant-reproduction>
10. <https://palaeobotany.org>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50




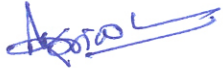

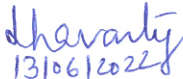

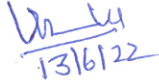

Continuous Comprehensive Evaluation (CCE):As per rule

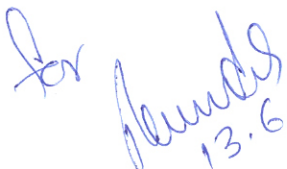
University Exam(UE): 50Marks

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Declaration

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7. Dr. Rupinder Diwan
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Part A : Introduction			
Programme: Certificate		Class B.Sc.-I	Year: 2022
		Session: 2022-23	
1.	Course Code	BOT-1P	
2.	Course Title	Microbial Techniques and Archegoniate identification	
3.	Course Type	Practical	
4.	Pre-requisite (if any)	No	
5.	Course outcomes:	<p>After the completion of the course the students will be able to:</p> <ul style="list-style-type: none"> • Understand the instruments, techniques and good lab practices for working in a microbiology laboratory. • Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes. • Practical skills in the field and laboratory experiments in Microbiology & Pathology. • learn to identify Algae, Lichens and plant pathogens along with their Symbiotic and Parasitic associations. • Can initiate his own Plant & Seed Diagnostic Clinic • Can start own enterprise on microbial products 	
6.	Credit Value	2	
7.	Total Marks	Max. Marks: 50	Min. Passing Marks:17
Part B : Content of the Course			
Total No. of Periods – 30			
Tentative Practical List	Topic * (Minimum Any three from each unit depending on facilities and syllabus. 20% for spotting, 10% each for viva and sessional and rest 60 % marks equally in each unit.)		
	INSTRUMENTS & TECHNIQUES: 1. Laboratory safety and good laboratory practices. 2. Principles and application of Laboratory instruments-microscope, incubator, autoclave, centrifuge, Laminar air flow, filtration unit, shaker, pH meter. 3. Buffer preparation & titration 4. Cleaning and Sterilization of glassware 5. Preparation of media- PDA and NAM 6. Inoculation and culturing of Fungi and bacteria BACTERIAL IDENTIFICATION: 1. Isolation of bacteria. 2. Staining techniques: Gram's, staining		
	MYCOLOGY: 1. Study/ Slide preparation and . Staining of fungi. <i>Rhizopus, Saccharomyces, Penicillium, Peziza, Ustilago, Puccinia; Fusarium, Alternaria. Agaricus:</i>		

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2. . Lichens: crustose, foliose and fruticose specimens.

PHYCOLOGY:

1. Study / Slide preparation and Staining of algae –
Volvox, Oedogonium and *Chara; Vaucheria; Ectocarpus Polysiphonia*

EXPERIMENTAL PLANT PATHOLOGY

Isolation of pathogen from diseased leaf.

Identification: Pathological specimens of Brown spot of rice, Bacterial blight of rice, Loose smut of wheat, , red rot of sugar cane, Tikka disease of ground nut, Slides of uredial, telial, pycnial & aecial stages of *Puccinia*, Few viral and bacterial plant diseases. like- Leaf curl of Papaya, Citrus canker

PRACTICALS IN APPLIED MICROBIOLOGY

1. Isolation of rhizosphere to non rhizosphere population of bacteria.
2. Isolation of phyllosphere microflora.
3. Alcohol production from grapes in anaerobic condition
4. Isolation of lactic acid bacteria from curd.
5. Enzyme production and assay – catalase, protease and amylase.

Bryophyta:

Study of morphology and anatomy of :

1. *Riccia*
2. *Marchantia*
3. *Anthoceros*
4. *Sphagnum*

Pteridophyta:

Study of morphology and anatomy of :

1. *Lycopodium*
2. *Selaginella*
3. *Equisetum*
4. *Pteris*
5. *Marselia*

Gymnosperm:

Study of morphology and anatomy of :

1. *Cycas*
2. *Pinus*
3. *Ephedra*

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Practical Botany (Part I) ISBN #:81-301-0008-8 Sunil D Purohit, Gotam K Kukda & Anamika Singhvi Edition:2013 Apex Publishing House Durga Nursery Road, Udaipur, Rajasthan (bilingual).
2. Pandey S.K. (2012). Quick Concept of Botany. Publisher LAP LAMBERT Academic Publishing GmbH & Co. KG, Germany (ISBN: 978-3-8484-3104-5).
3. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., New Delhi.
4. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.

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E-learning Resources:

5. <https://community.plantae.org/tags/mooc>
6. futurelearn.com/courses/teaching-biology-inspiring-students-with-plants-in-science
7. <https://microbiologysociety.org/publication/education-outreach-resources/basic-practical-microbiology-a-manual.html>
8. <https://microbiologyonline.org/file/7926d7789d8a2f7b2075109f68c3175e.pdf>
9. <http://allaboutalgae.com/benefits/>
10. <https://repository.cimmyt.org/xmlui/bitstream/handle/10883/3219/64331.pdf>
11. <https://www.mooc-list.com/tags/microbiology>
12. <http://www.agrifs.ir/sites/default/files/A%20text%20book%20of%20practical%20botany%201%20%7BAshok%20Bendre%7D%20%5B8%20%281984%29.pdf>
13. <https://www.coursera.org/courses?query=plants>
14. <http://egyankosh.ac.in/handle/123456789/53530>
15. <https://www.classcentral.com/tag/microbiology>
16. <https://www.edx.org/learn/microbiology>
17. <https://www.mooc-list.com/tags/microbiology>
18. <https://www.mooc-list.com/tags/microbiology>
19. <https://www.udemy.com/topic/microbiology/>

Part D – Assessment and Evaluation**Suggested Continuous Evaluation Methods:**

Maximum Marks: 50

Continuous Comprehensive Evaluation (CCE): Not Applicable

University Exam(UE): 50 Marks

Internal Assessment:Continuous Comprehensive
Evaluation (CCE)





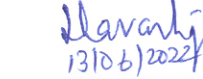

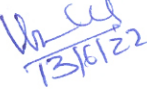
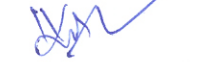

Class Test/Assignment/Presentation

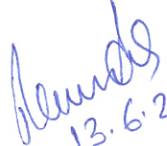
As per rules

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Asst. Prof.
Govt. V.B. Singh Dev Girls College, Jashpur - Member 
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Govt. D.T. P.G. College, Utai, Durg - Member 
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Govt. J.Y. Chhattisgarh College, Raipur - Member 
7. Dr. Rupinder Diwan
Professor
Govt. Nagarjun P.G. College of Science, Raipur - Member 
8. Dr. Usha Chandel
Asst. Prof.
Govt. Dr. W.W. Patankar Girls P.G. College, Durg - Member 
9. Mr. Kaushal Kishor
Asst. Prof.
Govt. Pt. Shyamacharan Shukla College, Dharsiwa,
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