

#### B.Sc. I Year (Semester I) Botany Core Paper 1

## Certificate Course in Microbial Technology & Classical Botany (Theory) Programme/Class: Certificate Semester: 1

1 Togrammer	Class. Certificate	Year:	1		50	inester. I
Subject: Bot	any					
Course Code: <b>B040101T</b> Course Title: <b>Microbiology &amp; Plant P</b>					lant Pa	thology
<b>Course outco</b> will be able to	mes: After the com	pletion of the co	ourse the stu	Idents	Bloom's	Taxonomy
<b>CO1</b> . Develop different microl economic impo	understanding about bes including viruse ortance.	ut the classifications, Algae, Fungi	ion and dive & Lichens	ersity of & their		K1, K3
CO2. Develop microbes, patho	conceptual skill ab gens,biofertilizers &	out identifying & lichens.				K2, K4
CO3. Gain kno microbial produ	owledge about deve ucts.	loping commerc	ial enterpris	se of		K3, K4
CO4. Learn ho	ost –pathogen relatio	onship and disea	se managen	nent.		K2, K5
CO5. Learn Pr usage of compu	resentation skills (or ater of computer &n	esentation skills (oral & writing) in life sciences by K3, K6 K3, K6			K3, K6	
<b>CO6</b> . Gain Knowledge about uses of microbes in various fields.				K1, K4		
<b>CO7</b> . Understand the structure and reproduction of certain selected bacteria algae, fungi and lichens				K2,K6		
<b>CO8</b> . Gain Kn group of plant o	owledge about the e community.	economic values	of this low	er		K3,K5
Credits: 4			Core Con	npulsory		
Max. Marks:	25+75		Min. Pass	sing Mark	ks: 33 %	
Total No. of	Lectures= 60					
Unit		Торі	cs			Total No. of Lectures (60)
Ι	<ul> <li>A. Introduction</li> <li>Botany and con</li> <li>with the holistic</li> <li>technology, has</li> <li>class interaction</li> <li>under Continuou</li> <li>B. Microbial Teo</li> <li>Microscopy – Li</li> <li>transmission eleo</li> <li>light microscopy</li> <li>microscopy. Com</li> <li>principle of thei</li> </ul>	to Indian an atribution of In ic development to be taught, j n/ assignments us Internal Eva chniques & inst ght, phase cont ctron microscop py, sample nmon equipment r working – at	cient, Vedi dian Botan t of mode practiced a s / self st luation (Cl crumentation rast, electro py, staining preparation its of micro utoclave. of	ic and h nists, in rn scien and asses udy me (E). (D) (E). (D) (E). (D) (E) (C) (C) (C) (C) (C) (C) (C) (C) (C) (C	ing and ues for electron lab and inar air	8

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	flow, centrifuge. Colorimetry and spectrophotometry,	
	immobilization methods, fermentation and fermenters.	
	Microbial world	
Π	Cell structure of Eukaryotic and prokaryotic cells, Gram	8
	positive and Gram negative bacteria, Structure of a bacteria;	
	Bacterial Chemotaxis and Quorum sensing, Bacterial Growth	
	curve, factors affecting growth of microbes; measurement of	
	growth: Batch culture, fed batch culture and continuous	
	culture: Synchronous growth of microbes: Sporulation and	
	reproduction and recombination in bacteria:	
	Viruses general characteristics viral culture Structure of	
	viruses Bacterionhages Structure of T4 & $\lambda$ -nhage. Lytic	
	and Lysogenic cycles viroids Prions & mycol	
	nhytonlasma Actinomycetes & plasmids and their economic	
	phytopiasina, Actinomycetes & plasinids and then economic	
	Dhycology	
	Pange of thallus organization in Algae Digments Deserve	7
	food <b>Deproduction</b> Classification and life evaluation	1
III	Noston Chloralla Valuar Ordaganium Charas Sargasaum	
	Nosioc, Chiorena, Volvox, Oedogonium, Chara, Sargassum,	
	Ectocarpus, Polysipnoma.	
	Economic importance of algae - Role of algae in soil fertility-	
	biofertilizer- Nitrogen fixation- Symbiosis ;Commercial	
	products of algae- biofuel, Agar.	
	Mycology	_
IV	General characteristics, nutrition, life cycle, Economic	7
	importance of Fungi, Classification upto class.	
	Distinguishing characters of Myxomycotina- General	
	characters. Zygomycotina – Rhizopus , Ascomycotina -	
	Saccharomyces, Penicillium, Peziza , Basidiomycotina-	
	Ustilago, Puccinia, Agaricus; Deuteromycotina – Fusarium,	
	Alternaria , Heterothallism, Physiological specialization,	
	Heterokaryosis & Parasexuality	
V	Mushroom Cultivation, Lichenology & Mycorrihza	
	Mushroom cultivation.	7
	General account of lichens, reproduction and significance;	
	Mycorrhiza: ectomycorrhiza and endomycorrhiza and their	
	significance.	
VI	Plant Pathology	
	Disease concept, Symptoms, Etiology & causal complex,	8
	Primary and secondary inoculum, Infection, Pathogenicity	
	and pathogenesis, Koch's Postulates. Mechanism of infection	
	(Brief idea about Pre-penetration, Penetration and Post-	
	penetration), Disease cycle (monocyclic, polycyclic and	
	polyetic). Defense mechanism with special reference to	
	Phytoalexin, Resistance- Systemic acquired and Induced	
	systemic, fungicides- Bordeaux mixture Lime sulphur	
	Tobacco decoction. Neem cake & oil	



VII	Diseases and Control	8
	Symptoms, Causal organism, Disease cycle and Control	
	measures of - Early & Late blight of Potato, Brown spot of	
	rice, Black stem rust of wheat, Stem rot of Mustard, Red rot	
	of Sugarcane, Wilting of Arhar, mosaic diseases on tobacco	
	and cucumber, yellow vein mosaic of bhindi; citrus canker,	
	little leaf of brinjal; damping off of seedlings, Disease	
	management: - Quarantine, Chemical, Biological, Integrated	
	pest disease management	
VIII	Applied Microbiology	8
	Food fermentations and food produced by microbes, amino	
	acids, Production of antibiotics, enzymes, vitamins, alcoholic	
	beverages, organic acid & genetic recombinant vaccines.	
	Mass production of bacterial biofertilizers, blue green algae,	
	Azolla and mycorrhiza. Plant growth promoting rhizobacteria	
	& biopesticides—Trichoderma sp. and Pseudomonas, Single	
	cell proteins, Organic framing inputs, Microbiology of water,	
	Bioploymers, Bioindicators, biosensors, Bioremediation,	
	Production of biofuels, biodegradation of pollutants and	
	biodeterioration of materials& Cultural Property	
Suggested Rea	aings:	
Course Books pu	blished in Hindi may be prescribed by the Universities	
्ठवा३८ छ००८३ pa १ तनस्पति ततत्रान	्संपार्ग भौताल कृतक लाडकेन जीतारः तत्रारः बार्योफाइटा दे	भेरिदोफादटा तत्त्रमोस्गार्ग
1.4 रिपीरी रावसा । िशा मनिताः तन्य	((1) प्रभा) राषारा, क्रयक, रार्च्स, गांदे व जैन एकाणन, िम्मिगेर्टा, र	গন হ জন হ িন্দ
ापा पुार्णा- पगर २ जन्म नेपनकी क	नात तपशान . तखफ - तति , पाउ प जन प्रफारान. ित्ति जन प्रफा जन्म पर्व पाउप ि जेप जन्मज निर्वेगी फ्राइन्फ्रा पर्व शजन्मि	
2. सूद्ध् जतपर्यंग क २. महिन्मगुन्ह गा	ימט פמ עובע ווויז ממזוח וממבו צוצוויו פמ מחוט toa publisi דיר לאיז הביביר בד אינטאי בה דל לדירל בד זרף בה דל	ner 2019
3. पारंचयात्र्यं पारं नंतराज्य	देप । ाग तपंशान डा आशाष कुर्ा। तपाठा डा सान कुर्ा।	ातपाठा 2018 एप्राषापास
इतडया पतललाश ४ जन्म ि जेम न		
4. पादप िाग तल	1शान : तजया लाल यादव 2012 	<u> </u>
5. डा आशाष क <u>ु</u> र्	ााः तिपाठा डा सान कुर्ााः तिपाठा २०१८. पारचयात्र्क पादप ा	ाग तवज्ञान एग्राबायास
इतडया पतललोश		
6. िीिंा वर्ा <sup>1</sup>	ग 2020. सूक्षू जैतवकी, कृवक एव पादप ्रिंग तवज्ञान	
७. प्राजल आयण २	020. पादप िोग: उत्पति प्रसारि एव तनयरिर्	
8. Microbiology	Fundamental And Applications (hindi) (pb)	
9. ISBN : $9/8818$	38826230Edition : 03 Year : 2016Author : Dr. Purohit SS, Dr. J	Deo PPPublisher :
Student Edition I		
10. ੫lᢏ੫ i្ <u></u> ា•	। तवज्ञान परिभाषा-काश: Definitional Dictionary of Plant	Pathology. Publisher
Commission for	Scientific and Technical Terminology.	2010A (1 D
11. Modern Mic	robiology (hindi) (hb) ISBN : $9/881//543599$ Edition : 1Ye	ear : $2018$ Author : Dr.
Puronit SS, Dr. S	Singh I Publisher : Agrobios (India)	
12. Unit I A.		
UIIII-I A. i https://indianou	ultura gov in/rarabooks/aconomia botany india	
https://www.infi	nuic.gov.iii/iacoooks/ccononiic-oolariy-iiiula nityfoundation.com/mandala/t_as/t_as_tiwar_botany_framosot	htm
ii https://www.11111	myroundation.com/mandata/t_cs/t_cs_tiwat_botatty_frameset.	Sages knowl
edge of botany	and medicinal plants since Vedic period was much older	than the ne
riod of Theophr	astus A case study- who was the actual father of botany	_man_me_pe
iii. https://www.s	cribd.com/presentation/81269920/Botanv-of-Ancient-India	



iv. https://insa.nic.in/writereaddata/UpLoadedFiles/IJHS/Vol17\_2\_17\_PKBhattacharyya.pdf v. http://wgbis.ces.iisc.ernet.in/biodiversity/sahyadri/wgbis\_info/botany\_history.pdf

vi Ancient Botany (Sciences of Antiquity) Paperback – 1 October 2015by Gavin Hardy (Author), Laurence Totelin (Author)

UNIT-I B.

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. 10<sup>th</sup> 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, NewDelhi.

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. Desikachari, T. V. 1959. Cyanophyta, ICAR, New Delhi.

10. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., NewDelhi.

11. Fritsch, R. E. 1977. Structure and Reproduction of Algae, Cambridge University Press, London.

12. Kodo, C.I. and Agarwal, H.O.1972. Principles and techniques in Plant Virology, Van Nostrand, Reinhold Company, New York.

13. Agrios, G.N. (1997). Plant Pathology, 4th edition. Cambridge, U.K.: Academic Press.

14. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, 4th edition. Singapore, Singapore: John Wiley & Sons.

15. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies. Noida, U.P.: Macmillan Publishers India Ltd.

16. Reven, F.H., Evert, R. F., Eichhorn, S.E. (1992). Biology of Plants. New York, NY: W.H. Freeman and Company.

17. Sharma, P.D. (2011). Plant Pathology. Meerut, U.P.: Rastogi Publication.

18. Webster, J., Weber, R. (2007). Introduction to Fungi, 3rd edition. Cambridge, U.K.: Cambridge University Press..

19. Pandey B.P. 2001. College Botany Volume 1, S Chand & Company Pvt.Ltd, New Delhi.

20. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.

- 21. Pelzar, 1963. Microbiology, Tata Mc Graw Hill, New Delhi
- 22. Rangaswamy, G. 2009, Disease of Crop Plants in India, Prientice Hall of India, New Delhi.

23. Sambamurty. A.V.S.S. 2006, A Text book of Algae, I. K. International Publishing House, Pvt. Ltd., New Delhi.

24. Sharma, P. D. 2012, Microbiology and Plant Pathology, Rastogi Publication Pvt Ltd., Meerut, India.

25. Singh, R. P. 2007. Microbial Taxonomy and Culture Techniques, Kalyani Publication, New Delhi.

26. Smith. G. M. 1996. Cryptogamic Botany Volume I, Tata Mc Graw Hill, New Delhi.

27. Sundar Rajan. S. 2010.College Botany Volume I, Himalaya Publications, Mumbai.

28. Vashishta, B.R. Sinha, A.K. and Singh, V. P. 1991. Algae, S. Chand and Company, Pvt. Ltd., New Delhi



This course can be opted as an elective by the students of following subjects: Open to all but special for B.Sc. Biotech, B.Sc. Microbiology, B.Sc. Agriculture, B.A. (Curators), B.A. Archaeology, B.A. Geology, BAMS.

Suggested Continuous Evaluation Methods:

- Seminar/ Presentation on any topic of the above syllabus
- Test with multiple choice questions/ short and long answer questionsAttendance Further Suggestions:

It widens the scope for students to join Government and Non-Government organization up skillingthe people at different levels as per their socio-economic structure.

At the End of the whole syllabus any remarks/ suggestions:

Suggested equivalent online courses:

https://www.coursera.org/courses?query=plants

http://egyankosh.ac.in/handle/123456789/53530

https://www.classcentral.com/tag/microbiology

https://www.edx.org/learn/microbiology

https://www.mooc-list.com/tags/microbiology

https://www.udemy.com/topic/microbiology/

https://ucmp.berkeley.edu/bacteria/bacteria.html

https://www.livescience.com/53272-what-is-a-virus.html

https://gclambathach.in/lms/Economic%20importance%20of%20Algae.pdf

https://www.slideshare.net/sardar1109/algae-notes-1

https://www.onlinebiologynotes.com/algae-general-characteristics-classification/

https://www.sciencedirect.com/topics/immunology-and-microbiology/fungus

https://ucmp.berkeley.edu/fungi/fungi.html

https://agrimoon.com/wp-content/uploads/Mashroom-culture.pdf

http://ecoursesonline.iasri.res.in/mod/page/view.php?id=11293

http://www.hillagric.ac.in/edu/coa/ppath/lect/plpath111/Lect.%201%20%20Introduction-

Pl%20Path%20111.pdf

http://www.jnkvv.org/PDF/11042020102651plant\_pathology.pdf

https://www.apsnet.org/edcenter/disimpactmngmnt/topc/EpidemiologyTemporal/Pages/ManagementStrategies.

aspx

https://learn.saylor.org/course/view.php?id=23&sectionid=6821

https://www.sciencedirect.com/topics/earth-and-planetary-sciences/microscopy

http://physics.fe.uni-lj.si/students/predavanja/Microscopy\_Kulkarni.pdf

https://lipidnanostructuresgroup.weebly.com/

https://zoology4civilservices.wordpress.com/2016/06/18/65/

https://microbenotes.com/laminar-flow-hood/



B.Sc. I Year (Semester I) Botany Paper 2

#### **CERTIFICATE COURSE IN MICROBIAL TECHNOLOGY & CLASSICAL BOTANY (Practical)**

Programme/Cl	ass: Certificate	Year:	1		S	emester: 1		
Subject: Botany								
Course Code: <b>B0</b>	ourse Code: B040102PCourse Title: Techniques in Microbiology & Plant Pathology							
<b>Course outcom</b> will be able:	<b>Course outcomes:</b> After the completion of the course the students will be able:							
CO1. Understa	nd the instrument	ts, techniques,	lab etiquett	es and				
good lab practic	es for working in	a						
microbiology la	boratory.							
CO2. Develop	skills for identify	ing microbes an	nd using th	em for				
Industrial, Agric	culture and Enviro	nment						
purposes.								
CO3. Practical	skills in the fiel	d and laborato	ry experime	ents in				
Microbiology &	Pathology.	1 1 1	1	1				
CO4. learn to 1	identify Algae, Li	chens and plan	t pathogens	along				
with their Symb	notic and Parasitic							
<b>CO5</b> Can initia	te his own Plant &	v Seed Diagnost	ic Clinic					
<b>CO6</b> Can start	own enterprise on	microbial produ						
COU. Cuil Start	own enterprise on	interoolar produ						
Credits: 2 Core Compulsory								
Max. Marks: 2	5+75		Min. Pass	sing Marks:	40 %			
Total No. of L	ab Periods/Practic	cal= 30 (60 hou	ırs)					
Unit		Торі	CS			Total No. of Lectures (60)		
Ι	<ol> <li>INSTRUMENTS</li> <li>Laboratory safe</li> <li>Principles an microscope, incul autoclave, centrifi</li> <li>Buffer preparation</li> <li>Cleaning and S</li> <li>Preparation of</li> <li>Inoculation and nutrient broth</li> <li>Preparation of</li> <li>Preparation of</li> <li>Phenol Coef</li> <li>disinfectants</li> </ol>	& TECHNIQU ety and good lab d application of pator, uge, LAF, filtration terilization of g media- Nutrient d culturing of b agar slant, stab, ficient method	ES poratory pra of Laborato tion unit, sh lasswares Agar and E acteria in N agar plate to test	ctices ory instrum aker, pH me Broth Jutrient agan the efficacy	ents- ter. and y of	07		



	BACTERIAL IDENTIFICATION	
п	1. Isolation of bacteria.	08
	2. Identification of bacteria.	
	3. Staining techniques: Gram's, Negative, Endospore,	
	Capsule and Cell Wall.	
	4. Cultural characteristics of bacteria on NA.	
	5. Pure culture techniques (Types of streaking).	
	6. Biochemical characterization :	
	IMViC, Carbohydrate fermentation test, Mannitol motility	
	test, Gelatin liquefaction test,	
	Urease test, Nitrate reduction test, Catalase test, Oxidase test,	
	Starch hydrolysis, Casein	
	hvdrolvsis.	
	MYCOLOGICAL STUDY:	
	1. Isolation of different fungi: Saprophytic, Coprophilous,	08
	Keratinophilic.	00
III	2. Identification of fungi by lactophenol cotton blue method.	
	Rhizopus	
	Saccharomyces, Penicillium, Peziza, Ustilago, Puccinia;	
	Fusarium, Curvularia,	
	Alternaria.	
	3. Agaricus: Specimens of button stage and full grown	
	mushroom; Sectioning of gills	
	of Agaricus.	
	4. Lichens: crustose, foliose and fruticose specimens.	
	PHYCOLOGY:	
IV	1. Type study of algae and Cyanobacteria – Spirullina,	07
	Nostoc.	
	Chlorophyceae - Chlorella, Volvox, Oedogonium,	
	Cladophora, and Chara;	
	Xanthophyceae – Vaucheria ;Bacillariophyceae – Pinnularia	
	Phaeophyceae – Sargassum	
	Rhodophyceae - Polysiphonia	
$\mathbf{V}$	EXPERIMENTAL PLANT PATHOLOGY	08
	1. Preparation of fungal media (PDA) & Sterilization process.	
	2. Isolation of pathogen from diseased leaf.	
	Identification: Pathological specimens of Brown spot of rice,	
	Bacterial blight of rice, Loose	
	smut of wheat, Stem rot of mustard, Late blight of potato;	
	Slides of uredial, telial, pycnial	
	& aecial stages of Puccinia ,Few viral and bacterial plant	
	diseases.	
VI	PRACTICALS IN APPLIED MICROBIOLOGY-1	08
	1. Isolation of nitrogen fixing bacteria from root nodules of	
	legumes.	
	2. Enumeration of rhizosphere to non rhizosphere population	
	of bacteria.	
	3. Isolation of antagonistic Pseudomonas from soil.	
	4. Microscopic observations of root colonization by VAM	
	tungi.	



	5. Isolation of Azospirillum sp. from the roots of grasses.	
	6. Isolation of phyllosphere microflora.	
	7. Isolation of P solubilizing microorganisms.	
VII	PRACTICALS IN APPLIED MICROBIOLOGY-2	08
	1. Wine production.	
	2. Isolation of lactic acid bacteria from curd.	
	5. Isolation of inpolytic organisms from butter of cheese.	
	4. Immobilized bacterial cells for production of hydrolytic	
	5 Enzyme production and assay cellulase protease and	
	amplase	
	6 Immobilization of yeast	
	7 Isolation of cellulolytic and anaerobic sulphate reducing	
	hacteria	
	8. Isolation and characterization of acidophilic, alkalophilic	
	and halophilic bacteria.	
VIII	1. Cultivation of Spirulina, & Chlorella in lab for biofuel	06
	2. Visit to NBAIM, Mau, Varanasi (Kashi)/IMT, Chandigarh	
	for viewing Culture	
	Repository	
	3. Visit to biofertilizers and biopesticides unit to understand	
	about the Unit operation procedures	
	4. Mushroom cultivation for Protein	
S I.D.	5. Alcohol production. from Sugarcane Juice.	
Suggested Read	<b>iings:</b>	
	uonsned in rindrinay be presended by the Universities.	ਤ ਿਸ਼ਹਿਰੇਸੀ ਸੁਣਾਗਤ
1. ਸਥਾ॥ <i>ਸ</i> ਾ ਪਾ। ਹ <b>ੇ</b> ਨਿਸ	પાલ લવશાન માન 1 લેखેળ બેસાળ થંદ્ર િવા બેસાળ વુરડ્ોાં પ્રવગર	। । । त्। । । । प्रकारान
र्ाा २ गाणोनगाक बन		0140 (07.0 (5. DDD
2. אויותיויף ייי Dublishing	Run nuqiin-1 Dhankar - Sharma – Trivedi ISBN Code: 9/8-81	-8142-697-0 65, KBD
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2 IIIII all N	nagar Civil Lines, Jaipur - 502000 ( Rajastilair )	ाताल गाग्ट कागानी
	સ્વાલ લવશાને બા. હસ-સા-1 હસ બા ઝપ્રવાલ પ્રવગરાળ : લરાવલાલ ઝપ્ 2019	ग्वाल एण्ड कम्पना
4 Practical Rote	2018 Dry (Dort I) ISBN #181-201-0008-8 Sunil D Durchit Cotom K	Kukda & Anomika
4. Tractical Dota Singhyi		Kukua & Anannika
Edition:2013 At	bex Publishing House Durga Nursery Road, Udaipur, Rajastha	n (bilingual)
5. Modern Mush	room Cultivation And Recipes (hindi) (hb)ISBN : 978817754	5180Edition : 01Year :
2017Author : Si	ngh Riti, Singh UCPublisher : Agrobios (India)	
6. Biofertilizer I	Production Manual (hindi) (hb) ISBN : 9788177541274Edition	: 01Year : 2014Author
: Gehlot		
D Publisher : Ag	grobios (India)Language : Hindi	
1. Aneja, K. R.	1993. Experiments in Microbiology, Pathology and Tissue Cul	ture, Vishwa
Prakashan,		
New Delhi.		
2. Dubey, R. C.	and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand	l & Company, Pvt.
Ltd.,		
3 Kodo C L on	d Agarwal HO 1972 Principles and techniques in Plant Virol	ogy Van Nostrond
Reinhold Comp	any New York	ogy, van nosuallu,
Kennow Comp	uny, new 101K.	



4. Madhavee Latha, P. 2012, A Textbook of Immunology, S. Chand & Company Pvt. Ltd., New Delhi.

5. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.

6. Sambamurty. A.V.S.S. 2006, A Text book of Algae, I. K. International Publishing House, Pvt. Ltd.,

7. Singh, R. P. 2007. Microbial Taxonomy and Culture Techniques, Kalyani Publication, New Delhi.

8. https://agrimoon.com/wp-content/uploads/Mashroom-culture.pdf

9. http://nhb.gov.in/pdf/Cultivation.pdf

10. https://www.k-state.edu/fungi/Greeting/Publications\_files/2006%20Handbook.pdf

11. Sen, Surjit, Acharya, Krishnendu, Rai, Manjula 2019 IBSN - 978-93-88347-23-5 - Biofertilizers and

Biopesticides .Technoworld,kolkatta

12. http://www.kvkkendrapara.org/pdf/Bio%20Fertilizer%20Production%20and%20marketing.pdf 13. http://www.gbv.de/dms/tib-ub-hannover/751302945.pdf

14. Hochman, Gal, Zilberman, David 2014 IBSN-1461493285-Algae Farming and Its Bio-Products Springer

18. Gokare A. Ravishankar , Ranga Rao Ambati 2019 Handbook of Algal Technologies and Phytochemicals

Volume II: Phycoremediation, Biofuels and Global Biomass Production Print ISBN: 9780367178192 19. Amos Richmond Ph.D., Prof. Emeritus, Qiang Hu Ph.D 2013. Handbook of Microalgal Culture: Applied

Phycology and Biotechnology, Second Edition Print ISBN:9780470673898



### ख्वाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत)

Khwaja Moinuddin Chishti Language University, Lucknow, U.P. (India) U.P. STATE GOVERNMENT UNIVERSITY,

(Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE)

This course can be opted as an elective by the students of following subjects: Open to all but special for B.Sc. Biotech, B.Sc. Microbiology, B.Sc. Agriculture, B.A. (Curators), B.A. Archaeology, B.A. Geology, BAMS.

Suggested Continuous Evaluation Methods:

- Seminar/ Presentation on any topic of the above syllabus
- Test with multiple choice questions/ short and long answer questionsAttendance

Further Suggestions:

It widens the scope for students to join Government and Non-Government organization up skillingthe people at different levels as per their socio-economic structure.

At the End of the whole syllabus any remarks/ suggestions:

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#### Suggested equivalent online courses:

https://community.plantae.org/tags/mooc futurelearn.com/courses/teaching-biology-inspiring-students-with-plants-in-science https://microbiologysociety.org/publication/education-outreach-resources/basic-practicalmicrobiology-a-manual.html https://microbiologyonline.org/file/7926d7789d8a2f7b2075109f68c3175e.pdf http://allaboutalgae.com/benefits/ https://repository.cimmyt.org/xmlui/bitstream/handle/10883/3219/64331.pdf https://www.mooc-list.com/tags/microbiology http://www.agrifs.ir/sites/default/files/A%20text%20book%20of%20practical%20botany%201%20%7 BAshok%20Bendre%7 D%20%5B8171339239%5D%20%281984%29.pdf https://www.coursera.org/courses?query=plants http://egyankosh.ac.in/handle/123456789/53530 https://www.classcentral.com/tag/microbiology https://www.edx.org/learn/microbiology https://www.mooc-list.com/tags/microbiology https://www.udemy.com/topic/microbiology/



#### B.Sc. – BOTANY (1st Year, Semester-I or II)

(GE 1 or 2/Minor Elective)

#### **Plant Nutrition and Biomolecules**

#### (Session-2022-2023)

Programme/Class	s: Certificate	Year: First		Semester: First or Second			
Subject:BOTAN	Y						
Course Code: B(	)40103T	Course Title: Plant Nutrition and Biomolecules					
				1			
Course Outcome	s:						
The student at the	completion of the	e course will be able to	):				
СО1-То	o understand the b	iology of plant cell.					
СО2-То	b learn and unders	stand the nutrition of p	lant				
СОЗТо	understand the va	rious mode of plant li	fe.				
СО4То	gain knowledge o	of various methods of	plant conserv	vation			
			-				
Credits: 4			GE 1or 2/	Minor Elective			
Max. Marks: 25-	Max. Marks: 25+75 Min. Passing marks: as per rules						
Total No. of Lectu	ıres-60						
Unit		Тор	pics		Total No. of		
					Lectures/		
					Hours (60)		



-		• 0
I	Biomolecules	20
	<ul> <li>Carbohydrates: Nomenclature and classification; Role of Monosaccharides ,Disaccharides, Oligosaccharides and Polysaccharides (structural-cellulose, hemicelluloses, pectin, chitin, mucilage; storage – starch, inulin).</li> <li>Lipids: Fatty acids structure and functions, Structural lipids, Storage lipids,</li> <li>Proteins: Structure of amino acids; Peptide bonds; Levels of protein structure-primary, secondary, ,tertiary and quarternary, biological roles of proteins</li> <li>Enzymes: Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), enzyme inhibition and factors affecting enzyme activity</li> <li>Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleic acids, DNA and RNA</li> </ul>	
II	Plant Cell Biology	15
	<ul> <li>Cell ( the unit of life)- Cell theory, Difference Prokaryotic and eukaryotic cells; Difference between plant and Animal cells,</li> <li>Plant cell Organelles and their function ((Chloroplast, Mitochondria, Nucleus, Plant Vacuole, Endoplasmic reticulum and Golgi bodies, Ribosomes )</li> </ul>	



### रूवाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत)

Khwaja Moinuddin Chishti Language University, Lucknow, U.P. (India) U.P. STATE GOVERNMENT UNIVERSITY, (Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE)

III	Plant Mineral nutrition	15
	Composition of plant ash,	
	• Essential elements (macro and micronutrients) and their role in plant and	
	deficiency symptoms, Biological Nitrogen fixation	
	• Critical elements and Leibig,s law of minimum.	
IV	Specific Mode of Nutrition in Plants	10
	Autotrophic and heterotrophic plant	
	Obligate and Facultative root and stem parasite plant	
	Saprophytic, symbiotic and insectivorous plant	
Suggested Re	eadings:	
1. Hopkins, W	V.G. & Hiiner, N.P. Introduction to Plant Physiology (3rd ed.) 2004, John Wiley & Sons.	
2. Jain, V.K. Fu	undamental of Plant Physiology (7th ed.) 2004. S. Chand and Company.	
3. Salisbury, F.	B. & Ross, C.W. Plant Physiology (4th ed.), 19992, Wadsoworth Publishing Company.	
4. Panday, S.N.	. & Sinha, B.K. Plant Physiology (4th ed.), 2006, Vikas Publishing House Pvt. Ltd.	
5. Mukherjee, S	S. & Ghosh, A. Plant Physiology (2nd ed.), 2005, New Central Book Agency.	
<ol><li>Chaudhuri, I</li></ol>	D., Kar, D.K., and Halder, S.A. Handbook of Plant Biosynthetic Pthways 2008, New Central	
Book. Agencie	S.	
7. Lehninger l	Principles of Biochemistry. Sixth Edition. 2013. David L. Nelson, Michael M. Cox. Freeman,	Macmillan.
8. Srivastava	, HN. 2006. Pradeep's Botany Vol. V. Pradeep Publications, Jalandhar.	
9. Verma, SK	. Plant Physiology and Biochemistry. S. Chand & Sons, New Delhi.	
10. Gurevitch,	J. (et al.)., The Ecology of plants, 2002, Sinauer Associates.	
Í Í		

11. Kimar, U. & Asija, M.J. Bio-diversity: Principles & Conservation, 2005, Student Edition, Agrobios (India)

12. Krishnamurthy, K.V. An Advanced Text Book on Biodiversity, 2003, Oxford & IBH Publishing Co. Ltd.



#### रूवाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत) Khwaja Moinuddin Chishti Language University, Lucknow, U.P. (India)

U.P. STATE GOVERNMENT UNIVERSITY, (Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE)

**This course can be opted as an elective by the students of following subjects**: Open for all The eligibility for this paper is 10+2 with any subject

**Suggested Continuous Evaluation Methods:** • Seminar/ Presentation on any topic of the above syllabus • Test with multiple choice questions/ short and long answer questions Attendance

**Course prerequisites**: To study this course, a student must have had the subject ALL in class12th. The eligibility for this paper is 10+2 with any subject

**Further Suggestions:** It widens the scope for students to join Government and Non-Government organization upskilling the people at different levels as per their socio-economic structure.

At the End of the whole syllabus any remarks/ suggestions:



### रूवाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत)

Khwaja Moinuddin Chishti Language University, Lucknow, U.P. (India) U.P. STATE GOVERNMENT UNIVERSITY, (Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE)

#### I Year (Semester I) BOTANY

#### (SEC 1/Vocational Course) Plants

#### in Human welfare

Programme/	Class: Certificate	Year: First		Semester: First	
Subject: BO	ΓΑΝΥ				
Course Code	e: B040104T	Course Title: Plants i	in Human w	velfare	
Course Outc	omes:				
The student a	t the completion of the	e course will be able to	:		
CO	<b>1-</b> To understand the i	mportance of Plants in	medicine,.		
CO vari	<b>2-</b> To understand, lear ous medicinal drug from the second	n and gain skill of isola om plant	ation of		
CO kno plar	<b>3-</b> To enable the stude wledge in principles a nts indifferent field of	nts to get sufficient nd applications of vario human welfare.	ous		
CO emp sect	<b>4-</b> After completing the bloyment and entrepre ors	is course, students will neurship in different ap	have get		
Credits: 3			SEC 1/V	ocational Course	
Max. Marks	: 60+40		Min. Passi	ing marks: as per rules	
I otal No. of	Lectures-60	Toni	20		Total No. of
Umi		тори	.8		Lectures/ Hours (60)
Ι	<ul> <li>Horticulture</li> <li>Introduction</li> <li>Types of hor</li> <li>Difference b</li> <li>Advantage a</li> </ul>	; Basic concept of hort ticulture etween Horticulture an nd Scope of Horticultu	iculture Id Agricultu Ire	re	15
Π	<ul> <li>Role of plants in me</li> <li>A variety of</li> <li>Common me (Tinospora, A)</li> <li>Mechanism disease.</li> </ul>	edical field medicinal plant of indi edicinal plants and thei Acorus, Ocimum, <u>Turm</u> of action of different pl	a r role heric and <u>Al</u> lant originat	<u>oe</u> ) ted drugs in various human	20
III	Floriculture <ul> <li>Ornamental</li> <li>Ornamental</li> <li>Maintenance</li> </ul>	Plants: Flowering annu bulbous and foliage pla e and Advantages of flo	als; herbace ants; Cacti a priculture.	eous, perennials and succulents.	15



### रूवाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत)

Khwaja Moinuddin Chishti Language University, Lucknow, U.P. (India) U.P. STATE GOVERNMENT UNIVERSITY, (Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE)

IV	Entrepreneurship in Development of hydroponics nutrient	10
	solutions & running models for cultivation of fodder	
Suggested R	eadings:	
1-Raychudhur	i, S.P., 1991. (Ed.) Recent advances in Medicinal aromatic and spice crops. Vol.1,T	`oday&
Tomorrow's	printers and publishers, New Delhi.	
2-Sambamurth Delhi.	ny, AVSS & Subrahmanyam, NS (2000). Economic Botany of Crop Plants. Asiatech	h Publishers. New
3-Singh, D.K a 4-Plant Ecolog	and K.V. Peter. 2014. Protected cultivation of horticultural crops. New India Publish gy And Economic Botany by Dhankar - Sharma - Trivedi, RBD Publication	hing Agency



ख्वाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत) Khwaja Moinuddin Chishti Language University, Lucknow, U.P. (India)

U.P. STATE GOVERNMENT UNIVERSITY, (Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE)

**This course can be opted as an elective by the students of following subjects**: Open for all The eligibility for this paper is 10+2 with any subject

**Suggested Continuous Evaluation Methods:** • Seminar/ Presentation on any topic of the above syllabus • Test with multiple choice questions/ short and long answer questions Attendance

**Course prerequisites:** To study this course, a student must have had the subject ALL in class12th. The eligibility for this paper is 10+2 with any subject

**Further Suggestions:** It widens the scope for students to join Government and Non-Government organization upskilling the people at different levels as per their socio-economic structure.

At the End of the whole syllabus any remarks/ suggestions:





#### **B.Sc I Year (Semester II) Botany Core Paper 1**

### **Certificate Course In Microbial Technology & Classical Botany**

Programme/Cl	ass: Certificate	Year:	1	S	emester: 2
Subject: Botar	ny				
Course Code: B0	40201T	Course Title: $\mathbf{A}$	rchegoni	ates and Plant	Architecture
Course outcomes:Bloom'sAfter the completion of the course the students will be ableto:				Bloom's Taxon	omy
<b>CO1.</b> Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms					K1, K3
<b>CO2</b> . Understant to land habitat.	ding of plant evol	ution and their t	ransition		K2, K4
<b>CO3</b> . Understand morphology, anatomy, reproduction and developmental changes therein through typological study and create a knowledge base in understanding the basis of plant diversity, economic values & taxonomy of plants					K3, K4
CO4. Understand the details of external and internal structures of flowering plants.				K2, K5	
Credits: 4			Core Cor	npulsory	
Max. Marks: 25	5+75		Min. Pas	sing Marks: 33 %	
Total No. of Le	ectures= 60				
Unit		Торі	CS		Total No. of Lectures (60)
I	Introduction to Archegoniates & Bryophytes Unique features of archegoniates, Bryophytes: General characteristics, adaptations to land habit, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of Riccia, Marchantia , Anthoceros and Sphagnum. (Developmental details not to be included). economic importance of bryophytes.			7	
п	Pteridophytes         II       General characteristics, Early land plants (Rhynia).         Classification (up to family) with examples, Heterospory and seed habit, stelar evolution, economic importance of Pteridophytes.			8	
					8



ख्वाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत) Khwaja Moinuddin Chishti Language University, Lucknow, U.P. (India)

U.P. STATE GOVERNMENT UNIVERSITY, (Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE)

	Gymnosperms	
	Classification and distribution of gymnosperms; Salient	
III	features of Cycadales, Ginkgoales,	
	Coniferales and Gnetales, their examples, structure and	
	reproduction; economic importance	
	Palaeobotany	
IV	General account of Cycadofilicales, Bennettitales and	8
	Cordaitales; Geological time scale;	
	Brief account of process of fossilization & types of fossils and	
	study techniques; Contribution of Birbal Sahni	
V	Angiosperm Morphology (Stem, Roots, Leaves &	
	Flowers, Inflorescence)	7
	Morphology and modifications of roots; Stem, leaf and bud.	
	Types of inflorescences; flowers, flower parts, fruits and	
	types of placentation; Definition and types of seeds.	
VI	Plant Anatomy: Meristematic and permanent tissues, Organs	
	(root, stem and leaf). Apical	7
	meristems & theories on apical organization - Apical cell	
	theory, Histogen theory, Tunica -	
	Corpus theory. Secondary growth - Root and stem- cambium	
	(structure and function) annular rings, Anomalous secondary	
	growth - Bignonia, Boerhaavia, Dracaena,Nyctanthus	
VII	Reproductive Botany	8
	Plant Embryology, Structure of microsporangium,	
	microsporogenesis,, Structure of	
	megasporangium and its types, megasporogenesis, Structure	
	and types of female gametophyte,	
	types of pollination, Methods of pollination, Germination of	
	pollen grain, structure of male	
	gametophyte, Fertilization, structure of dicot and monocot	
	embryo, Endosperm, Double fertilization, Apomixis and	
	polyembryony.	
VIII	Palynology: Pollen structure, pollen morphology, pollen	7
	allergy , Applied Palynology:	
	Basic concepts, Palaeopalynology, Aeropalynology, Forensic	
	palynology, Role in taxonomic	
	evidences.	

#### **Suggested Readings:**

Course Books published in Hindi may be prescribed by the Universities.

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. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

4. Rashid A (1999) An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd. New Delhi.

5. Sharma OP (1990) Textbook of Pteridophyta. MacMillan India Ltd. Delhi.

6. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Pteridophyta, S. Chand and Company,

7. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Gymnosperms, S. Chand and

8. Parihar NS (1976) Biology and Morphology of Pteridophytes. Central Book Depot.

9. Bhatnagar SP (1996) Gymnosperms, New Age International Publisher.

10. Pandey BP (2010) College Botany Vol II S. Chand and Company, New Delhi

11. Maheswari, P. 1971. An Introduction to Embryology of Angiosperms. McGraw Hill Book Co., London

12. Bhattacharya et. al. 2007. A textbook of Palynology, Central, New Delhi.



- 13. Bhojwani, S.S. and S. P. Bhatnagar. 2000. The Embryology of Angiosperms (4th Ed.), Vikas Publishing House,.
- 14. P.K.K. Nair- A textbook of Palynology.
- 15. Johri, B. M. 1984. Embryology of Angiosperms. Springer-Verleg, Berlin.
- 16. Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.
- 17. E.J.Eames . Morphology of Vascular Plants, Standard University Press.
- 18. Dickinson, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA.
- 19. Fahn, A. (1974). Plant Anatomy. Pergmon Press, USA.
- 20. Evert, R.F. (2006) Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc.

Suggested Continuous Evaluation Methods:

- Seminar/ Presentation on any topic of the above syllabus
- Test with multiple choice questions/ short and long answer questionsAttendance
- Further Suggestions:

It widens the scope for students to join Government and Non-Government organization up skillingthe people at different levels as per their socio-economic structure.

At the End of the whole syllabus any remarks/ suggestions:

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#### B.Sc. I Year (Semester 2) Botany Paper 2 Land Plants Architecture (Practical)

Programme/Class: Certificate		Year: 1		Semester: 2		
Subject: Botan	ny					
Course Code: B040202P Course Title: Land Plants Architecture						
Course outcomes:       Bloom's Taxone         After the completion of the course the students will be able to:       Bloom's Taxone					omy	
<b>CO1</b> -aware of the group of plants that have given rise to land habit and the flowering plants. Through field study they will be able to see these plants grow in nature and become familiar with the biodiversity.			K1, K3			
CO2- Students would learn to create their small digital reports where they can capture the zoomed in and zoomed out pictures as well as videos in case they are able to find some rare structure or phenomenon related to these plants.			K2, K4			
<b>CO3</b> - Develop an understanding by observation and table study of representative members of phylogenetically important groups to learn the process of evolution in a broad sense.				K3, K4		
<b>CO4</b> - Understand morphology, anatomy, reproduction and developmental changes therein through typological study and create a knowledge base in understanding plant diversity, economic values & taxonomy of lower group of plants			K2, K5			
CO5- Understand the composition, modifications, internal structure       K2,K3         &architecture of flowering plants for becoming a Botanist.       Botanist.			K2,K3			
Credits: 2 Core: Compulsory			ory			
Max. Marks: 25+75 Min. Passing Ma		Iarks: 40 %				
Total No. of La	ab Periods/Practic	cal= 30 (60 hou	urs)			
Unit		То	Topics		Total No. of Lab Periods	
Ι	Bryophytes: Marchantia- morphology of thallus, W.M. rhizoids and scales, V.S. thallus through Gemma cup, W.M. gemmae (all temporary slides), V.S. antheridiophore, archegoniophore, L.S. sporophyte (all permanent slides). Sphagnum- morphology, W.M. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, L.S. capsule and protonema.			08		
Π	Pteridophytes: Lycopodium : Habit, stem T. S. , stobilus V. S., Selaginella : Habit , rhizophore T. S , stem T . S, axis with strobilus, V .S. of strobilus, Megasporophyll and microsporophyll. Equisetum - Habit, rhizome and stem T .S. and V. S. of strobilus. Azolla – Habitat & its structure			07		



	Gymnosperms	08
ттт	1. Cycas – seedling, coralloid root and coralloid root T. S., T. S.	
111	of leaflet and Rachis, micro and mega sporophyll, male cone V	
	S micro sporophyll T S entire and V S of ovule Pinus -	
	Branch of indefinite growth spur shoot T S of old stem	
	and needle D. J. S and T. J. S. of stem male and female some	
	and needle R . L .S and I. L. S. of stem, male and female cone,	
	V.S. of male and female cone.	
	Ephedra & Thuja -: Habit, stem T. S (young and mature), leaf T.	
	S, male and female strobilus, V. S. of male and female cone,	
	ovule V. S. and seed.	
	Palaeobotany & Palynology	
IV	1. Morphology of Rhynia and fossils gymnosperms & other groups	06
	2. Visit to Birbal Sahni Institute of Palaeobotany or virtual	
	conference with their	
	constitute to loorn fossilization	
	2. Mark and know show Indian and marking little rich in plant	
	5. Mark and know about indian geographical sites fich in plant	
	TOSSIIS	
V	Angiosperm Morphology	08
	1. To study of diversity in leaf shape, size and other foliar features.	
	2. To study monopodial and sympodial branching.	
	3. Morphology of Fruits	
	4. Inflorescence types- study from fresh/ preserved specimens	
	5. Flowers- study of different types from fresh/ preserved	
	specimens	
	6 Fruits- study from different types from fresh/preserved	
	specimens	
	Specificits	
	7. Study of ovules (permanent sides/ specimens/photographs)-	
	types (anatropous,	
	orthotropous, amphitropous and campylotropous)	
	8. Modifications in Roots, stems, leaves and inflorescences	
VI	Plant Anatomy:	08
	Normal & Anomalous secondary thickening - Bignonia, Dracaena,	
	Boerhavia diffusa,Nyctanthus	
	Study of primary and secondary growth in root and stem of	
	monocots and dicots by section cutting and permanent slides.	
	Study of internal structure of dicot and monocot leaves	
	Study of internal structure of stomata	
N/TT	Depreductive Deterry	00
V II	1 Structure of onthen microspore series and neller areing	08
	1. Structure of anther, microsporogenesis and polien grains	
	2. Structure of ovule and embryo sac development (through slides).	
	3. Study of embryo development in monocots and dicots.	
	4. Vegetative propagation by means of cutting, budding and	
	grafting exercises.	
	5. Study of seed germination.	
	6. Study of pollen morphology of the following plants – <i>Hibiscus</i> .	
	Vinca, Balsam, Ixora.	
	Crotalaria, Bougainvillea by microscopic observation	
	7 Calculation of pollen viability percentage using in vitro pollen	
	armination to ponen viability percentage using in vitro ponen	
	germination techniques.	



VIII	Commercial Uses and Production technology	07
	1. Azolla production	
	2. Production technology of Resins	
	3. Production and propagation of Ornamental Pteris, Cycadales,	
	Coniferales for landscaping.	
	4. Lab method for qualitative testing/ extraction of Ephedrine	
	,Taxol and Thuja oil.	

#### **Suggested Readings:**

Course Books published in Hindi may be prescribed by the Universities.

Pandey, BP and Trivedi, P.S. 1997. Botany Vol. I(10th edition). Vikas Publishing House.

Pandey, BP; Misra; Trivedi, P.S. 1997. Botany Vol. II. Vikas Publishing House.

Pandey, BP and Chadha. 1997. Botany Vol. III. Vikas Publishing House.

Santra, SC and Chatterjee. 2005. College Botany Practical Vol. I. New Central Book Agency (P) Ltd.

Kumar, S and Kashyap. 2003. Manual of Practical Algae. Campus Books International, New Delhi Bendre and Kumar A text book of Practical Botany. Vol I,II., Rastogi Pub. Meerut.

Suresh Kumar, Amar Singh Kashyap Manual of Practical Algae.. Campus Books Internet, New Delhi.

Santra, SC. 2005. College Botany Practical Vol. II. New Central Book Agency (P) Ltd.



#### I Year (Semester 2) BOTANY (SEC 2/Vocational Course) **Organic farming**

Programme/Class: Certificate		Year: First	Semester: Second	
Subject: BOT	ΓΑΝΥ			
Course Code: B040204T Course Title: Organic farm		<b>Course Title:</b> Organic farming	2	
<b>Course Outco</b>	omes:		Bloom's Taxonomy	
The student at	t the completion of the	he course will be able to:		
CO1	<b>CO1-</b> Upon completion the students will learn about the role			. K3
	-Assimilate knowled	lae about organic farming		,
	-7 (SSIIIIIate Kilowiec	ige about organic farming.	KZ	2, K4
CO3	CO3-Learn about various method and application of organic			
farmi	ng		K	), K4
CO4	-Will get sufficient l	knowledge regarding organic	K	, к5
Tarmi	ng			, 110
<u> </u>				
Credits: 3				
Max. Marks: 60+40     Ivin. Passing marks: as per rules       Total No. of Logtures 60				
Unit Topics			Total No. of	
Omt	Topics			Lectures/
				Hours (60)
Ι	I Concept of organic farming			20
	Introductio	n: organic farming		
	Concept and development of organic farming.			
	Basic requi	rements in organic farming		
II	Principles and typ	e of organic farming,		15
	Basic princ			
	Different ty			
	Biodynami	c farming.		
III	III Benefits and Scope of organic farming			
	Various Be			
	• Need for or	ganic farming,		
	National an	d International status		
IV	Entrepreneurship in listing of method employed in organic farming			10
	Bio-fertilizers- types, methods of application, advantages and disadvantages,			
1				1



### रूवाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत)

Khwaja Moinuddin Chishti Language University, Lucknow, U.P. (India)

U.P. STATE GOVERNMENT UNIVERSITY, (Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE)

#### Suggested Readings:

- 1. Palaniappan SP & Anandurai K. 1999. Organic Farming–Theory and Practice. Scientific Publishers, Jodhpur
- 2. Joshi, M. 2014. New Vistas of Organic Farming 2nd Ed. Scientific Publishers, Jodhpur.
- 3. Farming system : Theory and Practice S.A.Solaimalai
- 4. Organic Farming: Theory and Practice- S.P.Palaniappan and K.A. Annadurai
- 5. A hand book of Organic Farming by A.K.Sharma