



**List of Courses Focus on Employability/ Entrepreneurship/
Skill Development**

Department : Botany

Programme Name : Integrated UG/PG Honours

Academic Year : 2016-17

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	LBC504EL1	Plant Tissue Culture Technology
02.	LBC504EL2	Microbial Technology
03.	LBC504EL3	Medicinal Plants Technology
04.	LBC504EL7	Mushroom Cultivation Technology
05.	LBC907(i)	Microbial Fermentation Technology
06.	LBC907(ii)	Microbial Technology and IPR

Scheme and Syllabus Attached

Signature & Seal of HoD

विभागाध्यक्ष

Head

वनस्पति शास्त्र विभाग

Department of Botany

गुरु घासीदास विश्वविद्यालय (केंद्रीय वि.वि.) बिलासपुर (छ.ग.)
Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur (C.G.)

Department of Botany, GGV, Bilaspur proposed syllabus based on choice based credit system 2015-16

**Proposed syllabus
for
Integrated UG/PG (Hon's)
based on
CBCS system
(Five year/ten semesters)**

BOTANY

To be implemented from the academic session 2015-2016

Department of Botany
School of Life Science
GURU GHASIDAS VISHWAVIDYALAYA
Koni, Bilaspur (CG)
Integrated UG-PG (Botany Honours)

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Department of Botany, GGV, Bilaspur proposed syllabus based on choice based credit system 2015-16

(Total Credit) 136

SM	Course	Subjects	Hours/semester	Hours/week	Credits	End Semester marks	Internal marks	Marks allotted
Semester I	Core course I	Plant Diversity I (Virus, Bacteria, Algae & Fungi) LBC 101	26	2	2	30	20	50
		Plant Diversity II (Bryophytes, Pteridophytes Gymnosperms) LBC 102	26	2	2	30	20	50
	Practical I	Laboratory Exercises based on LBC 101 & LBC 102	52	4	2	30	20	50
	Core course II	Chemistry I	26	2	2	30	20	50
		Chemistry II	26	2	2	30	20	50
	Practical II	Laboratory Exercises based on Chemistry I & II	52	4	2	30	20	50
	Elective course (Zool / Forensic)	Elective I	26	2	2	30	20	50
		Elective II	26	2	2	30	20	50
	Practical III	Laboratory Exercises based on Elective paper I & II	52	4	2	30	20	50
	Ability enhancement course	Hindi I	26	2	2	30	20	50
		English I	26	2	2	30	20	50
	Total					22		
Semester II	Core course I	Taxonomy and Embryology of Angiosperms LBC 201	26	2	2	30	20	50
		Cell & Molecular Biology LBC 202	26	2	2	30	20	50

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Department of Botany, GGV, Bilaspur proposed syllabus based on choice based credit system 2015-16

	Practical I	Laboratory Exercises based on LBC 201 & LBC 202	52	4	2	30	20	50
	Core course II	Chemistry I	26	2	2	30	20	50
		Chemistry II	26	2	2	30	20	50
	Practical II	Laboratory Exercises based on Chemistry I & II	52	4	2	30	20	50
	Elective course (Zool / Forensic)	Elective I	26	2	2	30	20	50
		Elective II	26	2	2	30	20	50
	Practical III	Laboratory Exercises based on Elective paper I & II	52	4	2	30	20	50
	Ability enhancement course	Hindi II	26	2	2	30	20	50
		English II	26	2	2	30	20	50
					22			550
Semester III	Core course I	Plant Physiology LBC 301	26	2	2	30	20	50
		Genetics & Biostatistics LBC 302	26	2	2	30	20	50
	Practical I	Laboratory Exercises based on LBC 301 & LBC 302	52	4	2	30	20	50
	Core course II	Chemistry I	26	2	2	30	20	50
		Chemistry II	26	2	2	30	20	50
	Practical II	Laboratory Exercises based on Chemistry I & II	52	4	2	30	20	50
	Elective course (Zool / Forensic)	Elective I	26	2	2	30	20	50
Elective II		26	2	2	30	20	50	

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Department of Botany, GGV, Bilaspur proposed syllabus based on choice based credit system 2015-16

	Practical III	Laboratory Exercises based on Elective paper I & II	52	4	2	30	20	50
	Skill Enhancement course II	Environmental Science I	26	2	2	30	20	50
					20			
Semester IV	Core course I	General Microbiology LBC 401	26	2	2	30	20	50
		Plant Pathology LBC 402	26	2	2	30	20	50
	Practical I	Laboratory Exercises based on LBC 401 & LBC 402	52	4	2	30	20	50
	Core course II	Chemistry I	26	2	2	30	20	50
		Chemistry II	26	2	2	30	20	50
	Practical II	Laboratory Exercises based on Chemistry I & II	52	4	2	30	20	50
	Elective course (Zool / Forensic)	Elective I	26	2	2	30	20	50
		Elective II	26	2	2	30	20	50
	Practical III	Laboratory Exercises based on Elective paper I & II	52	4	2	30	20	50
	Skill Enhancement course II	Environmental Science II	26	2	2	30	20	50
					20			
Semester V	Core course I	Plant Anatomy LBC 501	54	3	3	30	20	50
	Core Course II	Plant Developmental Biology LBC 502	54	3	3	30	20	50
	Practical I	Laboratory Exercises based on LBC 501 & 502	78	6	3	30	20	50
	IDLS	Analytical Techniques in	54	3	3	30	20	50

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Department of Botany, GGV, Bilaspur proposed syllabus based on choice based credit system 2015-16

	(Interdisciplinary Life Science)	plant science LBC 503						
	Elective Paper	Paper VI (Elective) LBC 504						
		EL1: Plant Tissue Culture technology LBC 504(a)						
		EL2: Microbial Technology LBC 504(b) ✓						
		EL3: Medicinal plants Technology & Ethno botany LBC 504(c)						
		EL4: Bioinformatics LBC 504(d) EL5: Reproductive Plant Biology LBC 504(e) EL6: Intellectual Property Right Technology LBC 504 (f) ✓ EL7: Mushroom cultivation Technology LBC 50 (g)	54	3	3	30	20	50
	Practical II	Laboratory Exercises based on LBC 503 & 504 & seminar from IDLS topic) 2+1	78	6	3	30	20	50
	Seminar	Based on the proposed project topic	26	2	2			
					20			
Semester VI	Core course I	Plant Ecology LBC 601	54	3	3	30	20	50
	Core course II	Plant Biochemistry LBC 602	54	3	3	30	20	50
	Core course III	Biodiversity & Conservation LBC 603	54	3	3	30	20	50
	Practical I	Laboratory Exercises based on based on LBC	78	6	3	30	20	50

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Department of Botany, GGV, Bilaspur proposed syllabus based on choice based credit system 2015-16

	601, LBC 602 & LBC 603						
Elective	Paper VI (Elective) LBC 604						
	EL1: Environmental Biology & Pollution LBC 604(a)						
	EL2: Microbial Genetics LBC 604 (b)						
	EL3: Genetic Engineering in Plant improvement LBC 604(c)	54	3	3	30	20	50
	EL4: Environmental Biotechnology LBC 604(d)						
	EL5: Computational Biology LBC 604(e)						
	EL6: Biostatistics LBC 604(f)						
Project/ Dissertation	Based on major elective course	216	12	7	30	20	50
				22			
				126			
<p>Project/Field work will be based on major elective papers(s) opted by the student, in consultation with the faculty concerned and on recommendation of the HOD, Botany.</p> <p>After the successful completion of IV semester students will have flexibility of changing of core honors as per their interest and availability of the seats in the department.</p>							

Note:

- 5 credit for sports and 5 credits for extra curriculum activity (Model /exhibition /presentation /participation /NSS/ NCC others etc.)
- Total credit $126 + 10 = 136$
- Total Hours in one semester 450 (5 day week with 90 working days).
- Total hours including internal examination, end semester examination / Class test / preparation of examination, educational tour etc.

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Elective courses I (LBC 504)

LBC 504 (a) PLANT TISSUE CULTURE TECHNOLOGY

Unit 1:

Definition and scope of biotechnology, Introduction and history of Plant Tissue cultures.

Unit II

Media preparation and their composition. Growth regulator and their use in tissue culture. Sterilization process for tissue culture technology. Sterilization of explants. Instruments used in tissue culture technology.

Unit III

Callus culture, Single cell culture, suspension culture, Factors affecting cell culture; Importance of tissue culture. Micropropagation and their application.

Unit IV

Protoplast isolation, culture. Somatic hybridization, Somaclonal variation and their selection,

Suggested reading:

1. Bhojwani S S and Rajdan, 2002. Plant Tissue Culture, Science Publisher New Delhi
2. Gamborg, O.L and Philips G.C. (Eds.) 1995. Plant Cell, Tissue and Organ Culture, Fundamental Methods. Narosa Publishing House, New Delhi.
3. Gupta, P.K. 1996. Elementary Biotechnology. Rastogi & Company, Meerut.
4. Hammond, J., Megary, P. 2000. Plant Biotechnology. Springer-Verlag, Germany
5. Mantel, S. H, Mathew, J.A. 1985 An introduction to Genetic Engineering in plants. Springer, Germany

Practicals

1. Preparation of MS medium and organ culture with suitable explants
2. Experimental demonstration of Liquid culture
3. Experimental demonstration of callus induction
4. Experimental demonstration of artificial seeds synthesis

Elective courses I (LBC 504)

LBC 504 (b) MICROBIAL TECHNOLOGY

- Unit I:** Sources and characters of industrial microbes, their isolation, purification & maintenance. Screening of useful strains: primary screening & secondary screening. Strain improvement through random mutation (random & rational selection), Role of genetic recombination & genetic engineering in strain improvement.
- Unit II:** Fermentation technology: microbial growth kinetics in batch, continuous & fed-batch fermentation process. Stirred aerobic bioreactor: principles & designing. Other types of bioreactors. Raw materials used in fermentation media and upstream processes. Solid state fermentation & submerged fermentation: Downstream Processing (product recovery).
- Unit III:** Bioremediation: Applicability of bioremediation: Intrinsic bioremediation, Biostimulation, Bioaugmentation. Applications of bioremediation to various contaminants.
- Unit IV:** Biofuels: From organic residue (ethanol), biogas production, fuel from algae. Production of bioethanol from molasses, starchy and cellulosic materials.

Suggested Reading:

1. Reed G (1997). Industrial Microbiology. CBS Publishers (AVI Publishing Co.)
2. Stanbury PF, Whitekar A. and Hall (1995). Principles of Fermentation Technology. Pergaman, McNeul and Harvey.
3. Rehm and Reed (1983). Biotechnology. Verlag Chemie.
4. Bhosh, Fiechter and Blakebrough (1999). Advances in Biochemical Engineering. Springer Verlag Publications.
5. Creuger and Creuger (2001). Biotechnology- A textbook of Industrial Microbiology, Sinaeur Associates.
6. Casida LE (1997). Industrial Microbiology, Wiley Eastern.
7. Agrios, GN (1997). Plant Pathology. Academic Press, San Diego.
8. Cook RJ and Baker KF (1983). The Nature and practice of Biological Control of plant pathogens. Amereca Phytopathological Society Press, St. Paul, MN.
9. Bult, TM, Jackson CW and Magan N (2001). Fungi as Biocontrol agent. CABI Publishing, UK.
10. Maier RM, Pepper IL and Gerba CP (2000). Environmental Microbiology. Academic Press. USA.

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Elective courses I (LBC 504)
LBC 504 (c) ETHNO BOTANY AND MEDICINAL PLANT TECHNOLOGY

Unit I:

Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context; Major and minor ethnic groups or Tribals of India, and their life styles. Plants used by the tribals: a) Food plants b) intoxicants and beverages c) Resins and oils and miscellaneous uses.

Unit II: Methodology of Ethnobotanical studies: a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and sacred places.

Unit III: Role of ethnobotany in modern Medicine: Medico-ethnobotanical sources in India; Significance of the following plants in ethno botanical practices (along with their habitat and morphology) a) *Azadirachta indica* b) *Ocimum sanctum* c) *Vitex negundo*. d) *Gloriosa superba* e) *Tribulus terrestris* f) *Pongamia pinnata* g) *Cassia auriculata* h) *Indigofera tinctoria*. Role of ethnobotany in modern medicine with special example *Rauvolfia serpentina*, *Trichopus zeylanicus*, *Artemisia*, *Withania*. Role of ethnic groups in conservation of plant genetic resources. Endangered taxa and forest management (participatory forest management).

Unit IV: Conservation of endangered and endemic medicinal plants. Definition: endemic and endangered medicinal plants, Red list criteria; In situ & ex situ conservation, Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.

Suggested Readings

- 1) S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995.
- 2) S.K. Jain (ed.) Glimpses of Indian. Ethnobotny, Oxford and I B H, New Delhi – 1981
- 3) Lone et al., Palaeoethnobotany
- 4) S.K. Jain (ed.) 1989. Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.
- 5) S.K. Jain, 1990. Contributions of Indian ethnobotny. Scientific publishers, Jodhpur.
- 6) Colton C.M. 1997. Ethnobotany – Principles and applications. John Wiley and sons – Chichester
- 7) Rama Ro, N and A.N. Henry (1996). The Ethnobotany of Eastern Ghats in Andhra
- 8) Pradesh, India. Botanical Survey of India. Howrah. 8) Rajiv K. Sinha – Ethnobotany The
- 9) Renaissance of Traditional Herbal Medicine – INA –SHREE Publishers, Jaipur-1996)

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Elective courses I (LBC 504)

LBC 504 (g) MUSHROOM CULTIVATION TECHNOLOGY

Unit I:

Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India - *Volvariella volvacea*, *Pleurotus sajourcaju*, *Agaricus bisporus*.

Unit II:

Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation. Low cost technology, Composting technology in mushroom production.

Unit III:

Cultivation Technology of *Volvariella volvacea*, *Pleurotus sajourcaju*, *Agaricus bisporus*.



Unit IV:

Food Preparation_: Types of foods prepared from mushroom. Research Centres -National level and Regional level. Cost benefit ratio - Marketing in India and abroad, Export Value.

Suggested Readings

1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
2. Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
3. Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
4. Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.

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CBCS

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Department of Botany, GGV, Bilaspur proposed syllabus based on choice based credit system 2015-16

**Proposed syllabus
for
Integrated UG/PG (Hon's)
based on
CBCS system
(Five year/ten semesters)**

BOTANY

To be implemented from the academic session 2015-2016



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Department of Botany
School of Life Science
GURU GHASIDAS VISHWAVIDYALAYA
Koni, Bilaspur (CG)

M.Sc Botany

(Total Credit) 92

Semester	Course	Subjects	Hours/semester	Hours/week	Credits	End Semester marks	Internal marks	Marks allotted
Semester I	Hard Course I	Diversity and Biology of Bacteria, Fungi and Viruses LBC 701 / LBT 101	39	3	3	60	40	100
	Hard Course II	Algae, Bryophytes and Pteridophytes LBC 702/ LBT 102	39	3	3	60	40	100
	Botany Practical	Lab exercise based on LBT 101 and LBT 102	78	6	3	60	40	100
	Hard Course III	Diversity and Biology of Gymnosperms and Anatomy of Angiosperms LBC 703/ LBT 103	39	3	3	60	40	100
	Hard Course IV	Angiosperm Taxonomy and Phytogeography LBC 704 / LBT 104	39	3	3	60	40	100
	Botany Practical	Lab. exercise based on LBT 103 and LBT 104	78	6	3	60	40	100
	Soft skill course I	Biofertilizer and biopesticides Technology	39	3	3	60	40	100
					21			
Semester II	Hard Course I	Computational Biology LBC 801 /LBT 201	39	3	3	60	40	100
	Hard Course II	Ecology and Environment LBC 802/LBT 202	39	3	3	60	40	100
	Botany Practical	Lab. exercise based on LBT201 and LBT 202	78	6	3	60	40	100
	Hard Course III	Plant Physiology and Metabolism LBC 803 / LBT 203	39	3	3	60	40	100
	Hard Course IV	Floral Morphology and Embryology of Angiosperm LBC 804 / LBT 204	39	3	3	60	40	100
	Botany Practical	Lab. exercise based on LBT 203 and LBT 204	78	6	3	60	40	100
	Seminar	Seminar based on any relevant topic taught from the course	36	2	2			
				20				
Semester III	Hard Course I	Cell Biology and Biochemistry LBC 901 / LBT 301	39	3	3	60	40	100
	Hard Course II	Genetics and Breeding	39	3	3	60	40	100

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	LBC 902 / LBT 302						
Practical I	Lab. exercise based on LBT 301 and LBT 302	78	6	3	60	40	100
(Elective)	<p>EL1: Environmental Biology LBC 903 / LBT 303</p> <p>Paper I: Air Pollution and Climate Change LBC 903 / LBT 303(i)</p> <p>Paper II: Water Pollution Management LBC 903 / LBT 303(ii)</p> <p>EL2: Functional Plant Biology LBC 904 / LBT 304</p> <p>Paper I: Plant Metabolism LBC 904 / LBT 304(i)</p> <p>Paper II: Stress Physiology of Plants LBC 904 / LBT 304(ii)</p> <p>EL3: Ethno-botany and Plant Resource Utilization LBC 905/ LBT 305</p> <p>Paper I: Ethnobotany and Pharmacognosy LBC 905/ LBT 305(i)</p> <p>Paper II: Plant Resource Utilization and Conservation LBC 905/ LBT 305(ii)</p> <p>EL4: Plant Molecular Biology LBC 906/ LBT 306</p> <p>Paper I: Genetic Engineering LBC 906/ LBT 306(i)</p> <p>Paper II: Bioinformatics and Genome Analysis LBC 906/ LBT 306(ii)</p> <p>EL4: Microbial Technology, IPR and Patent LBC 907/ LBT 307</p> <p>Paper I: Microbial fermentation technology LBC 907/ LBT 307(i)</p> <p>Paper II: Applied application of Microbial technology LBC 907/ LBT 307(ii)</p>	39+ 39	3 + 3	3 + 3			
					60 + 60	40 + 40	100 + 100
Practical II	Lab. exercise based on Elective papers I and II	78	6	3	60	40	100
Seminar (For deciding the project topic)	Seminar based on research interest	36	2	2			

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Department of Botany, GGV, Bilaspur proposed syllabus based on choice based credit system 2015-16

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Semester IV	Hard Course I	Plant Pathology LBC 1001/ LBT 401	39	3	3	60	40	100
	Hard Course II	Plant Biotechnology and Genetic Engineering LBC 1002/ LBT402	39	3	3	60	40	100
	Practical I	Lab. exercise based on LBT 1001 and LBT 1002	78	6	3	60	40	100
	Project/ Dissertation & project evaluation	Research interest (3 credit should be from internal evaluation and 3 from external)	39	12	6 + 3	60	40	100
	Soft skill Course II	Plant Diversity and Human Welfare	39	3	3	60	40	100
					21			
					82			

Each student will able opt any one out of five electives; each elective will have a set off 2 theory papers and corresponding laboratory exercise.

The project work/dissertation will be carried out in the field of respective major electives opted by the students, in consultation with the faculty concerned and on recommendation of the Department.

- 5 credit for sports and 5 credits for extra curriculum activity (Model /exhibition /presentation /participation /NSS/ NCC others etc.)
- Total credit $82 + 10 = 92$
- Total Hours in one semester 450 (5 day week with 90 working days).
- Total hours including internal examination, end semester examination / Class test / preparation of examination, educational tour etc.

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**Elective course 5
Microbial Technology, IPR and Patent (LBC 907/LBT 307)**

LBC 907/LBT 307(i) Microbial fermentation technology	
Unit I	sources and characters of industrially potent microbes; their isolation, purification & maintenance; Screening of useful strains; primary screening & secondary screening; Strain improvement through random mutation (random & rational selection), genetic recombination & genetic engineering; Microbial growth kinetics in batch, continuous & fed-batch fermentation process
Unit II	Aerobic bioreactor: principles & designing; types of bioreactors; Raw materials used in industrial fermentation media. Solid state fermentation & submerged fermentation: their advantages & disadvantages. Microbial transformations with special reference to steroids & alkaloids. Primary & secondary metabolites
Unit III	Microbiology & production of alcoholic beverages; Malt beverages, distilled beverages, wine & champagne; Commercial production of organic acids like acetic, lactic, citric, & gluconic acids; Commercial production of important amino acids
Unit IV	Immobilization of microbial enzymes and whole cells and their applications in industries; Downstream processing
Unit V	Industrial enzymes production; Cellulases, Xylanases, Pectinases, Amylases, Lipases & Proteases and their applications

Suggested Readings:

1.	Aneja K.R., Jain P. & Aneja R. 2008. A text book of Basic & Applied Microbiology, New Age Int. Publ. New Delhi
2.	Reed G. 1997. Industrial Microbiology. CBS Publishers (AVI Publishing Co.)
3.	Stanbury PF, Whitekar A. and Hall. 1995. Principles of Fermentation Technology. Pergaman. McNeul and Harvey.
4.	Bhosh, Fiechter and Blakebrough 1999. Advances in Biochemical Engineering. Springer Verlag Publications.
5.	Creuger and Creuger. 2001. Biotechnology- A Textbook of Industrial Microbiology, Sinaeur Associates.
6.	Casida LE. 1997. Industrial Microbiology, Wiley Eastern



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LBC 907/LBT 307(ii) Microbial technology and IPR	
Unit I	Bioremediation: biodegradability of Petroleum hydrocarbons, Halocarbons, Chlorophenols, Nitroaromatics; Applicability of bioremediation: Intrinsic bioremediation, Biostimulation, Bioaugmentation. Applications of bioremediation to various contaminants & sites: Hydrocarbon-contaminated soils & aquifers, Halocarbon-contaminated soils & aquifers, Marine oil spills & Metal-contaminated soils; Carbon sequestration
Unit II	Microorganisms as biofertilizers (<i>Rhizobium</i> , <i>Azospirillum</i> , <i>Azotobacter</i> , <i>Acetobacter</i> , Cyanobacteria, Mycorrhiza, Actinorrhiza and Phosphate solubilising microorganisms)
Unit III	Microorganisms as biopesticides (<i>Trichoderma</i> , <i>Beauveria</i> , <i>Metarhizium</i> , <i>Nomuraea</i> and <i>Bacillus thuringiensis</i>); Commercial production of biofertilizers and biopesticides; Their applications and limitations for Indian agriculture. Principles and mechanism of biological control. Bioherbicide and weed control, their role in agriculture.
Unit IV	Biofuels: From organic residue (ethanol), biogas production, fuel from algae. Production of bioethanol from molasses, starchy and cellulosic materials.
Unit V	Intellectual Property Rights (IPR), Patents, Trademarks, Copyrights. Introduction to Patenting of Microbiological materials and GMO, implication of patenting, current issues, patenting of genes and DNA sequences.

Suggested Readings:

1.	Agrios, GN (1997). Plant Pathology. Academic Press, San Diego.
2.	Reed G. 1997. Industrial Microbiology. CBS Publishers (AVI Publishing Co.)
3.	Stanbury PF, Whitekar A. and Hall. 1995. Principles of Fermentation Technology. Pergaman. McNeul and Harvey.
4.	Bhosh, Fiechter and Blakebrough 1999. Advances in Biochemical Engineering. Springer Verlag Publications.
5.	Creuger and Creuger. 2001. Biotechnology- A Textbook of Industrial Microbiology, Sinaeur Associates.
6.	Casida LE. 1997. Industrial Microbiology, Wiley Eastern
7.	Maier RM, Pepper IL and Gerba CP (2000). Environmental Microbiology. Academic Press. USA
8.	Pepper IL, Gerba CP and Brusseau ML (2006). Environmental and Pollution Science. Academic Press. USA
9.	Baker KH and Herson DS (1994). Bioremediation. MacGraw Hill Inc. N.Y.
10.	Cook RJ and Baker KF (1983). The Nature and practice of Biological Control of plant pathogens. Amereca Phytopathological Society Press, St. Paul, MN.

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