



**Shiv Chhatrapati Shikshan Sanstha's**  
**Rajarshi Shahu Mahavidyalaya, Latur**



**(Empowered Autonomous Institute)**

NAAC A+ Grade (4<sup>th</sup> Cycle) with 3.49 CGPA,  
UGC-CPE (Phase-III) & DST-FIST Status

**Structure and Curriculum of  
Certificate Course**

**in**

**Bio-inoculant Production**

**(Under PM-USHA)**

**For UG and PG Students**

**Approved by**

**Board of Studies in Microbiology**

**Rajarshi Shahu Mahavidyalaya, Latur**  
**(Empowered Autonomous Institute)**

**w. e. f. December, 2025**



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**Certificate Course under PM- USHA**

**Bioinoculant Production**

**SYLLABUS**

(Free of Cost Certificate Course)

**Credits: 02**

**Max. Marks: 50**

**Lectures: 30 Hrs.**

**Learning Objectives:**

- LO.1 To Understand concept and history of microbial inoculants
- LO.2 To Understand the importance of PGPR
- LO.3 To Understand the Bioremediation of environmental pollution.

**Course Outcomes:**

After completion of course the student will be able to-

- CO.1 Describe the basis of beneficial plant microbe interaction
- CO.2 Describe the nutrient supplement to plants by beneficial soil microorganisms
- CO.3 Describe the microbial process for bioremediation of environmental pollution

Unit No.	Title of Unit & Contents	Hrs.
<b>I</b>	<b>Introduction to Bioinoculants</b>	<b>06</b>
	<ol style="list-style-type: none"><li>History of Bioinoculants</li><li>Concepts and types of Bioinoculants – Bacterial, Fungal, Algal and Actinorhizal.</li><li>Biological nitrogen fixation</li><li>Importance of biofertilizers</li></ol>	
	<b>Unit outcomes:</b> Students will be able to <b>UT 1:</b> Understand concept of microbial inoculants <b>UT 2:</b> Understand Importance of bioinoculants in agricultural development	
<b>II</b>	<b>PGPR</b>	<b>4</b>
	<ol style="list-style-type: none"><li>Introduction for Fermenter</li><li>Characteristics of <i>Rhizobium</i>, <i>Azospirillum</i> and <i>Azotobacter</i>.</li><li>Studies on <i>Pseudomonas</i>.</li><li><i>Rhizobium</i> legume symbiosis- nodule formation and N<sub>2</sub> fixation</li><li>Mechanism of Nitrogen fixation – biochemistry of Nitrogen fixation.</li><li>Mycorrhizae- types of mycorrhizae mechanisms of 'P' mobilizers</li><li>P solubilizes Phosphobacterial – Mechanism of 'P' solubilization</li></ol>	
	<b>Unit outcomes:</b> Students will be able to <b>UT 1:</b> Understand importance of PGPR in sustainable agricultural development <b>UT 2:</b> Understand various Plant Growth Promoting mechanisms	
<b>III</b>	<b>Bioinoculants for Remediation of environmental pollution</b>	<b>3</b>
	<ol style="list-style-type: none"><li>Microbial remediation and its importance</li><li>Remediation of organic pollutants, dyes, polycyclic aromatic hydrocarbons and pesticides</li><li>Microbial detoxification of inorganic pollutants: Heavy metals</li></ol>	
	<b>Unit outcomes:</b> Students will be able to	

Unit No.	Title of Unit & Contents	Hrs.
	<b>UT 1:</b> Understand importance of environmental pollution cleanliness <b>UT 2:</b> Understand environmental Bioremediation processes	
<b>IV</b>	<b>Lab Course</b>	<b>20</b>
	1. Isolation of <i>Rhizobium</i> from legume root nodules 2. Isolation of <i>Azotobacter</i> 3. Isolation of Potassium mobilizing bacteria 4. Isolation of Phosphate solubilizing bacteria 5. Isolation of dye degrading microorganisms 6. Fermentative production of bioinoculants and packaging	

### Learning Resources:

1. Adhya, T.K., Lal, B., Mohapatra, B., Paul, D. and Das, S. Advances in Soil Microbiology; Recent Trends and Future Prospects. Springer Publi., UK.
2. Barabara. E., Schulz Christein J.C. Boyle Thomas N. Sieber (Eds.) 2006. Microbial Root Endophytes. Springer publications, germany.
3. Coyne, M.S. 2000. Soil Microbiology, CBS Publications, New Delhi.
4. Dixon, G.R., Tilston, Emma L. (Eds.) 2010 Soil Microbiology and Sustainable Crop Production, Springer publisher.
5. Eldor paul, 2015. Soil Microbiology, Ecology and Biochemistry, fourth edition, acadmic press, wyman St. Waltham.
6. Mukerji, K.G., C. Manoharachary and J. Singh (Eds.) 2006. Microbial Activity in the Rhizosphere Sereies: Soil Biology, Vol. 7XVI, 349 p. 35 illus, UK.
7. Paul E.A and F.E. Clark 1996. Soil Microbiology and Biochemistry, Academic Press. California.
8. Stephane Declerck, D. and G. Strullu. 2005. In Vitro Culture of Mycorrhizas. Springer Science and Business Media.
9. Subba Rao, N.S 2001. Soil Microbiology, Oxford and IBH publishing House. India
10. Varma, Ajit, Kharkwal and Amit C. (Eds). 2008. Symbiotic Fungi. Springer Publi., UK

**Dr. Deepak Vedpathak**  
Chairman

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**Dr. Mahadev Gavhane**  
Principal

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