



**GOVT. M.H. COLLEGE OF HOME
SCIENCE AND SCIENCE FOR WOMEN
(AUTO.), JABALPUR (M.P.)**

Department of Biotechnology (Major)

Paper I&II Group(A)

B.Sc. III Year

2023-24

Part A - Introduction			
Program : Degree		Class: B.Sc.	Year: III Year
Session :2023-24			
Subject: Biotechnology			
1.	Course Code	S3-BTEC1D	
2.	Course Title	Industrial Biotechnology	
3.	Course Type (Core Course/Discipline Specific Elective/ Elective/ Generic Elective /Vocational/....)	Discipline Specific Elective 1 (Theory) (Group A Paper I)	
4.	Pre-requisites	To study this course, Student must have Diploma in Biotechnology	
5.	Course Learning outcomes	On successful completion of this course, the students will be able to: <ol style="list-style-type: none"> 1. Student will get concept of industrial and human beneficial living organism, their exploitation and application. 2. Student will get insight on industrially important organism, recent development in fermentation processes and various optimization strategies at fermenter level. 3. Creat interest about design, types of fermenter and various critical components of bioreactors. 	
6.	Credit Value	4	
7.	Total Marks	Max. Marks-30+70	Min. Passing Marks: 35

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Kaushiki Lodi

KLodi

X. Singh
28.07.23

(Dr. Kiran Singh)

Varsha
28/7/23
Dr. Varsha Aglawe

Ragini

Prof. RAGINI GOTHALWAL
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R. Lodi
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Professor and Head
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and Science, JABALPUR (M.P.)

Part B – Content of the Course

Total No. of Lectures- Tutorials-Practical (in hours per week): L-T-P:

Unit	Topics	Number of Lectures (1 Hour Each)
I.	Discovery, classifications and nomenclature of enzymes; Physico chemical characterization of enzymes; Enzyme kinetics; Enzyme catalysis in solution kinetics and thermodynamic analysis, effects of organic solvents on enzyme catalysis and structural consequences. Kinetics of enzyme inhibition, <u>Biological Roles of Enzymes in our daily life</u>	12
II.	Immobilization of enzymes: principle and mechanism: Mechanism of enzyme function and reactions in process techniques; Enzymatic bioconversions e.g. starch and sugar conversion processes; High Fructose Corn Syrup; Interesterified fat; Hydrolyzed protein etc. and their downstream processing; baking by amylases, deoxygenation and desugaring by glucoses oxidase, beer mashing and chill proofing; cheese making by proteases and various other enzyme catalytic actions in food processing.	12
III.	Bioprocess technology: Basic principles in bioprocess technology; Media Formulation; Sterilization; Thermal death kinetics; Batch and continuous sterilization systems; Primary and secondary metabolites; Extracellular enzymes; Biotechnologically important intracellular products; exopolymers;	12
IV.	Bioreactor designs: Types of fermentation and fermenters; Concepts of basic modes of fermentation Batch, fed batch and continuous; Conventional fermentation v/s biotransformation; Solid substrate, surface and submerged fermentation; Fermentation economics; Fermentation media; Fermenter design – mechanically agitated; Pneumatic and hydrodynamic fermenters; Large scale animal and plant cell cultivation and air sterilization; Upstream processing; Media formulation; Sterilization; Aeration and agitation in bioprocess; Measurement and control of bioprocess parameters; Scale up and scale down process.	12
V.	Techniques of enzyme isolation, purification and enzyme assay, techniques used for the immobilization of enzymes, Applications of immobilized enzyme in Biotechnology; Bioprocess control and monitoring variables such as temperature, agitation, pressure, pH Microbial processes production, optimization, screening, strain improvement, factors affecting downstream processing and recovery; Representative examples of ethanol, organic acids, antibiotics etc.	12

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Page 2 of 100

Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Martin F. Chaplin and Christopher Bucke; Enzyme Technology, Cambridge, Univ Press
2. Anil Kumar and Sarika Garg; Enzymes and Enzyme Technology, Anshan Publishing; 1st edition
3. Jackson AT., Bioprocess in Biotechnology, Prentice Hall, Engelwood cliffs, 1991
4. Shufler ML and Kargi F., Bioprocess Engineering: Basic Concepts, 2nd Edition, Prentice Hall, Engelwood Cliffs, 2002.
5. Stanburry RF and Whitaker A., Principles of Fermentation Technology, Pergamon press, Oxford, 1977
6. Baily JE and Ollis DF., Biochemical Engineering fundamentals, 2nd edition, McGraw-Hill Book Co., New York, 1986.
7. Aiba S, Humphrey AE and Millis NF, Biochemical Engineering, 2nd Edition, University of Tokyo Press, Tokyo 1973.
8. Young M.M., Comprehensive Biotechnology: The Principles, applications and regulations of Biotechnology in Industry, Agriculture and Medicine, Vol 1, 2, 3 and 4. Reed Elsevier India Private Ltd, India, 2004.
9. Mansi EMTEL, Bryle CFA, Fermentation Microbiology and Biotechnology, 2nd Edition, Taylor & Francis Ltd. UK
10. Books published by Madhya Pradesh Hindi Granth Acadmey, Bhopal.

Suggestive digital platforms/web links- www.biologyonline.com

Suggested equivalent online courses: Coursera, NPTEL, Career's 360

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30 marks University Exam (UE) 70 marks

Internal Assessment : Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	30
External Assessment : University Exam Section Time : 03.00 Hours	Section(A) : Very Short Questions Section (B) : Short Questions Section (C) : Long Questions	70
Any remarks/suggestions:		

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Part A - Introduction

Program : Degree		Class: B.Sc.	Year: III Year	Session :2023-24
Subject: Biotechnology				
1.	Course Code	S3-BTECIQ		
2.	Course Title	Industrial Biotechnology		
3.	Course Type (Core Course/Discipline Specific Elective/ Elective/ Generic Elective /Vocational/....)	Discipline Specific Elective I (Practical) (Group A Paper I)		
4.	Pre-requisites	To study this course, Student must have Diploma in Biotechnology		
5.	Course Learning outcomes	On successful completion of this course, the students will be able to: <ol style="list-style-type: none"> 1. Student will get concept of industrial and human beneficial living organism, their exploitation and application. 2. Student will get insight on industrially important organism, recent development in fermentation processes and various optimization strategies at fermenter level. 3. Creat interest about design, types of fermenter and various critical components of bioreactors. 		
6.	Credit Value	2		
7.	Total Marks	Max. Marks-100	Min. Passing Marks: 35	

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Part B – Content of the Course

Total No. of Lectures- Tutorials-Practical (in hours per week): L-T-P:

Unit	Topics	Number of Lectures (2 Hours Each)
	<ol style="list-style-type: none"> 1. Determination of oxygen transfer rate and volumetric oxygen mass transfer coefficient (KLa) under variety of operating conditions in shake flask and bioreactor. 2. Determination of mixing time and fluid flow behavior in bioreactor under variety of operating conditions. 3. Rheology of microbial cultures and biopolymers and determination of various rheological constants. 4. Production of microbial products in bioreactors. 5. Studying the kinetics of enzymatic reaction by microorganisms. 6. Production and purification of various enzymes from microbes. 7. Comparative studies of Ethanol production using different substrates. 8. Microbial production and downstream processing of an enzyme, e.g. amylase. 9. Various immobilization techniques of cells/enzymes, use of alginate for cell immobilization 	30
Keywords/ Tags:		

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Part C - Learning Resources


Text Books, Reference Books, Other Resources


Suggested Readings:

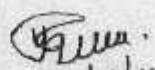
1. Martin F. Chaplin and Christopher Bucke; Enzyme Technology, Cambridge, Univ Press
2. Anil Kumar and Sarika Garg; Enzymes and Enzyme Technology, Anshan Publishing; 1st edition
3. Jackson AT., Bioprocess in Biotechnology, Prentice Hall, Engelwood cliffs, 1991
4. Shuffler ML and Kargi F., Bioprocess Engineering: Basic Concepts, 2nd Edition, Prentice Hall, Engelwood Cliffs, 2002.
5. Stanburry RF and Whitaker A., Principles of Fermentation Technology, Pergamon press, Oxford, 1977
6. Baily JE and Ollis DF., Biochemical Engineering fundamentals, 2nd edition, McGraw-Hill Book Co., New York, 1986.
7. Aiba S, Humphrey AE and Millis NF, Biochemical Engineering, 2nd Edition, University of Tokyo Press, Tokyo 1973.
8. Young M.M., Comprehensive Biotechnology: The Principles, applications and regulations of Biotechnology in Industry, Agriculture and Medicine, Vol 1, 2, 3 and 4. Reed Elsevier India Private Ltd, India, 2004.
9. Mansi EMTEL, Bryle CFA, Fermentation Microbiology and Biotechnology, 2nd Edition, Taylor & Francis Ltd. UK.
10. Books published by Madhya Pradesh Hindi Granth Acadmey, Bhopal.

Suggestive digital platforms/web links- Nil

Suggested equivalent online courses: Coursera, NPTEL, Career's 360



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Part D-Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
		Total Marks : 100	
Any remarks/ suggestions:			

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**GOVT. M.H. COLLEGE OF HOME SCIENCE AND SCIENCE FOR
WOMEN (AUTONOMOUS), JABALPUR (M.P.)**

**SCHEME OF PRACTICAL EXAMINATION
B.Sc. THIRD YEAR
BIOTECHNOLOGY
2023-2024**

PAPER I- INDUSTRIAL BIOTECHNOLOGY (Group A)

Duration: 3 Hrs

Maximum Marks: 70

SPOTTING

1. Basic model of Batch Fermenter
2. Media formulation & Sterilization
3. Primary & Secondary metabolites
4. Biotransformation
5. Industrial application of enzymes
6. Upstream and downstream process parameters
7. Antibiotics

MINOR PRACTICALS

1. To study production of microbial products in a bioreactor.
2. To study the production of ethanol using different substrate
3. To study production and purification of enzyme from microbes.
4. To study immobilization of cell/enzyme using alginate method.

MAJOR PRACTICALS

1. To determine oxygen transfer rate & volumetric oxygen mass transfer coefficient (KL_a) under variety of operating conditions in shake flask and bioreactor.
2. To determine the mixing time and fluid flow behaviour in a bioreactor under variety of operating condition.
3. To study production and downstream processing of enzyme from microbes.
4. To study kinetics of enzymatic reaction by microorganisms.
5. To study rheology of microbial cultures and biopolymers & determination of various rheological constants.

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**GOVT. M.H. COLLEGE OF HOME SCIENCE AND SCIENCE FOR
WOMEN (AUTONOMOUS), JABALPUR (M.P.)**

Part D- Assesment and Evaluation (Theory)

Suggested Continuous Evaluation Method

**B.Sc. THIRD YEAR
BIOTECHNOLOGY
2023-2024**

PAPER I - INDUSTRIAL BIOTECHNOLOGY

Maximum Marks – 100

Continuous Comprehensive Evaluation = 30 Marks

University Exam (UE) = 70

Internal Assesment:		External Assesment	
Continuous Comprehensive Evaluation = 30 Marks		University Exam (UE) = 70 Time- 3Hrs	
Assignment-	10Marks	Section (A): Very Short Questions	
Class Test	10Marks	Section (B): Short Questions	
Presentation	10Marks	Section (C): long question	
Total Marks	30	Total Marks	70

TOTAL MARKS = 100

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**GOVT. M.H. COLLEGE OF HOME SCIENCE AND SCIENCE FOR
WOMEN (AUTONOMOUS), JABALPUR (M.P.)**

B.Sc. THIRD YEAR - BIOTECHNOLOGY

Scheme of Practical Examination

PAPER I- INDUSTRIAL BIOTECHNOLOGY

Duration: 3 Hrs

Max. Marks: 70

1. Major Practical	15
2. Minor Practical	10
3. Minor Practical	10
4. Spotting (any 3)	15
5. Viva-Voce	10
6. Practical Records	10

Grand Total= 70

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**GOVT. M.H. COLLEGE OF HOME SCIENCE AND SCIENCE FOR
WOMEN (AUTONOMOUS), JABALPUR (M.P.)**


Part D- Assesment and Evaluation (PRACTICAL)


Suggested Continuous Evaluation Method

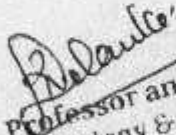
**B.Sc. THIRD YEAR
BIOTECHNOLOGY
2023-2024**

PAPER I - INDUSTRIAL BIOTECHNOLOGY

Internal Assesment		External Assesment	
Class Interaction/Quiz	10	Viva- Voce on Practical-	10
Attendance	05	Practical Record File-	10
Assignments(Chart/model/Seminar /Rural service/ technology dissemination /Report of Excursion/ Lab visits /Industrial visits	15	Table Work / Experiment	50
Total	30	Total	70
		TOTAL MARKS = 100	


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Part A - Introduction

Program : Degree		Class: B.Sc.	Year: III Year	Session :2023-24
Subject: Biotechnology				
1.	Course Code	S3-BTEC2D		
2.	Course Title	Agriculture Biotechnology		
3.	Course Type (Core Course/Discipline Specific Elective/ Elective/ Generic Elective /Vocational/....)	Discipline Specific Elective 2 (Theory) (Group A Paper II)		
4.	Pre-requisites	To study this course, Student must have Diploma in Biotechnology		
5.	Course Learning outcomes	<p>On successful completion of this course, the students will be able to:</p> <ol style="list-style-type: none"> 1. The student will empower with the fundamental of the agriculture biotechnology such as organic farming agrobiolgy and techniques. 2. The learner will get the deep understanding of soil microbiology, microbial diversity of soil and importance of organic farming. 3. Student will empower through the hand on training on composting, vermiculture and methane production. 4. Learned molecular tetchiness will provide knowledge of further application. 5. Basic principle biofertilizer and biopeptide development will impart field knowledge. 		
6.	Credit Value	4		
7.	Total Marks	Max. Marks-30+70	Min. Passing Marks: 35	

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Part B – Content of the Course

Total No. of Lectures- Tutorials-Practical (in hours per week): L-T-P:

Unit	Topics	Number of Lectures (1 Hour Each)
I.	Organic farming: Biofertilizers and Biopesticides Biological N ₂ fixation, H ₂ production, biofertilizers and biopesticides; solid wastes; sources and management (composting, vermiculture and methane production). Single cell protein (Spirulina, yeast, mushroom).	12
II.	National and international status of organic farming .Agencies and institutions related to organic agriculture. Organic and Indian National Standards for organic products. Organic Food Quality and Human Health.	12
III.	Agrobiology Agrobacterium plant interaction; Virulence; Ti and Ri plasmids; Opines and their significance; TDNA transfer; Disarming the Ti plasmid. Genetic Transformation Agrobacterium mediated gene delivery; Co integrate and binary vectors and their utility; Direct gene transfer PEG mediated, electroporation, particle bombardment and alternative methods; Screen able and selectable markers; Characterization of transgenics; Chloroplast transformation; Marker free methodologies; Gene targeting. Genetically modified crops.	12
IV.	Gene Editing- Gene transfer technique-physical chemical, Biological method; Gen isolation and gene silencing, mutagenesis-random & site directed, RNA structure of Ribozymes, Regulation of gene editing, Gene editing tools- CRISPR-Cass & TALEN, R Applications in crop improvement, seed industry and nutritional security.	12
V.	Techniques and Applications: enzyme detection, hybridization, PCR, Gene probe technology etc.; Strategies for controlling pathogen transfer; Biopesticides in integrated pest management	12

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Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

List of Recommended Books

Recommended Books

1. Rao Subba, Soil microbiology.
2. Waksman and Starkey, Soil and microbes.
3. Mehrotra, Plant pathology.
4. Alexander, M. Introduction to Soil Microbiology, 3rd Edition. Wiley Eastern Ltd., New Delhi
5. Purohit S.S., Microbiology.
6. Metcalf and Eddy Wastewater Engineering- Treatment, disposal and Reuse, Inc., Tata McGraw Hill, New Delhi.
7. M. Moo-young (Ed-in-chief) Comprehensive Biotechnology. Vol. 4, , Pergamon Press, Oxford.
8. De., A.K., Environmental Chemistry, Wiley Eastern Ltd. New Delhi.
9. Allsopp D. and K.J. Seal Introduction to Biodeterioration, ELBS/Edward Arnold
10. Kristensen, P., Taji, A. and Reganold, J. (2006). Organic Agriculture: A Global Perspective. CSIRO Press, Victoria, Australia
11. Altieri, M. (1990). Agroecology: The Science of Sustainable Agriculture. Westview Press, Boulder, CO
12. Bavec, F. and Bavec, M. (2007). Organic Production and Use of Alternative Crops. CRC Press, Boca Raton, FL
13. Joshi, M., Setty, T.K.P. and Prabhakarasetty (2006). Sustainability through Organic farming. 1st Edition. Kalyani Publishers, Ludhiana, India.
14. Atwal, A. S. 1991. Agricultural Pests of India and South - East Asia. Kalyani Publishers, New Delhi.
15. Books published by Madhya Pradesh Hindi Granth Academy, Bhopal.

Suggestive digital platforms/web links- www.biologyonline.com

Suggested equivalent online courses: Coursera, NPTEL

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Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30 marks University Exam (UE) 70 marks

Internal Assessment : Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	30
External Assessment : University Exam Section Time : 03.00 Hours	Section(A) : Very Short Questions Section (B) : Short Questions Section (C) : Long Questions	70
Any remarks/suggestions:		

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Part A - Introduction

Program : Degree		Class: B.Sc.	Year: III Year	Session :2023-24
Subject: Biotechnology				
1.	Course Code	S3-BTEC2Q		
2.	Course Title	Agriculture Biotechnology		
3.	Course Type (Core Course/Discipline Specific Elective/ Elective/ Generic Elective /Vocational/....)	Discipline Specific Elective 2 (Practical) Group A Paper II		
4.	Pre-requisites	To study this course, Student must have Diploma in Biotechnology		
5.	Course Learning outcomes	<p>On successful completion of this course, the students will be able to:</p> <ol style="list-style-type: none"> 1. The student will empower with the fundamental of the agriculture biotechnology such as organic farming agrobiology and techniques. 2. The learner will get the deep understanding of soil microbiology, microbial diversity of soil and importance of organic farming. 3. Student will empower through the hand on training on composting, vermiculture and methane production. 4. Learned molecular tetchiness will provide knowledge of further application. 5. Basic principle biofertilizer and biopesticide development will impart field knowledge. 		
6.	Credit Value	2		
7.	Total Marks	Max. Marks-100	Min. Passing Marks: 35	

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R. B. D. S. I.

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Part B – Content of the Course

Total No. of Lectures- Tutorials-Practical (in hours per week): L-T-P:

Unit	Topics	Number of Lectures (2 Hours Each)
	<ol style="list-style-type: none"> 1. To study pollution stress by chlorophyll and carotenoid ratio from algae sample. 2. To study of effect of heavy metal on growth of bacteria. 3. Isolation and Enumeration of the microorganism from soil by serial dilution agar plate method. 4. Isolation of fungi from soil by warcup's method. 5. Isolation of azotobacter species from soil. 6. Isolation of microorganism from rhizosphere. 7. Isolation of microorganism from phyllosphere (phyloplane) by serial dilution, agar plate method or leaf impression method. 8. Plant diseases – leaf curl of papaya, rust of wheat, citrus canker, red rot of sugarcane. Study of weeds- Parthenium, water hyacinth 9. Visit to Apiculture area 10. Visit to Mushroom industry 11. Visit to terrace farming area 12. Study of policies and incentives of organic production 13. Study of farm inspection and certification . 14. Determination of amount of bleaching powder required to disinfect a water sample by Horrock's test. 15. To determine pH, electrical conductivity, total solids, total suspended solids and total dissolved solids in given sample of water. 16. To determine the amount of oil and grease content present in the given water sample 	30
Keyword s/Tags:		

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Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Rao, Subba, Soil microbiology.
2. Waksman and Starkey, Soil and microbes.
3. Mehrotra, Plant pathology .
4. Alexander, M. Introduction to Soil Microbiology, 3rd Edition. Wiley Eastern Ltd., New Delhi
5. Purohit, S.S., Microbiology.
6. Metcalf and Eddy, Wastewater Engineering- Treatment, disposal and Reuse., Inc., Tata McGraw Hill, New Delhi.
7. De., A.K., Environmental Chemistry, Wiley Eastern Ltd. New Delhi.
8. Joshi, M., Setty, T.K.P. and Prabhakarasetty (2006). Sustainability through Organic farming. 1st Edition. Kalyani Publishers, Ludhiana, India.
9. Books published by Madhya Pradesh Hindi Granth Academy, Bhopal.

Suggestive digital platforms/web links- Nil

Suggested equivalent online courses: Coursera, NPTEL

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
		Total Marks : 100	

Any remarks/ suggestions:

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GOVT. M.H. COLLEGE OF HOME SCIENCE AND SCIENCE FOR
WOMEN (AUTONOMOUS), JABALPUR (M.P.)

SCHEME OF PRACTICAL EXAMINATION
B.Sc. THIRD YEAR
BIOTECHNOLOGY
2023-2024

PAPER II- AGRICULTURE BIOTECHNOLOGY (Group A)

Duration: 3 Hrs

Maximum Marks: 70

SPOTTING

1. Leaf curl of Papaya
2. Rust of Wheat
3. Citrus canker
4. Red rot of Sugarcane
5. Parthenium
6. Water hyacinth
7. Rhizobium
8. Mushroom Production
9. Apiculture

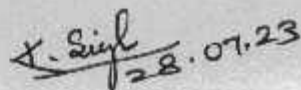
MINOR PRACTICALS

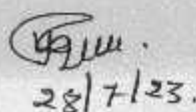
1. To study pollution stress by chlorophyll and carotenoid ratio from algae sample.
2. To study the effect of heavy metal on growth of bacteria.
3. To isolate fungi from soil by warcup's method.
4. To isolate azotobacter species from soil.
5. To isolate microorganism from rhizosphere.
6. To study Policies and incentives of Organic production
7. To study Farm inspection and certification.
8. To Determine pH, electrical conductivity, total solids, total suspended solids and total dissolved solids in given sample of water.

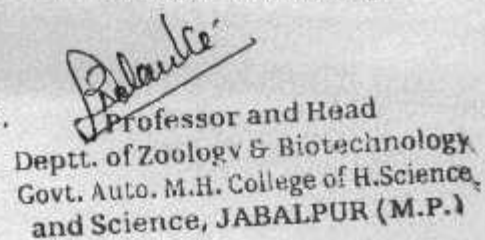
MAJOR PRACTICALS

1. To isolate and enumerate microorganism from soil by serial dilution agar plate method.
2. To isolate microorganism from phyllosphere by Serial dilution, Agar plate method and leaf impression method.


P. K. Doshi


X. Singh
28.07.23


P. K. Doshi
28/7/23.


Professor and Head
Deptt. of Zoology & Biotechnology,
Govt. Auto. M.H. College of H.Science,
and Science, JABALPUR (M.P.)

GOVT. M.H. COLLEGE OF HOME SCIENCE AND SCIENCE FOR
WOMEN (AUTONOMOUS), JABALPUR (M.P.)

B.Sc. THIRD YEAR - BIOTECHNOLOGY

Scheme of Practical Examination

PAPER II- AGRICULTURE BIOTECHNOLOGY

Duration: 3 Hrs

Max. Marks: 70


1. Major Practical	-----	15
2. Minor Practical	-----	10
3. Minor Practical	-----	10
4. Spotting (any 3)	-----	15
5. Viva-Voce	-----	10
6. Practical Records	-----	10

Grand Total= 70


R. K. Doshi

X. Singh
28.07.23

Y. Singh
28/7/23.


Professor and Head
Deptt. of Zoology & Biotechnology
Govt. Auto. M.H. College of H. Science
and Science, JABALPUR (M.P.)

**GOVT. M.H. COLLEGE OF HOME SCIENCE AND SCIENCE FOR
WOMEN (AUTONOMOUS), JABALPUR (M.P.)**

Part D- Assesment and Evaluation (PRACTICAL)

Suggested Continuous Evaluation Method

**B.Sc. THIRD YEAR
BIOTECHNOLOGY
2023-2024**

PAPER II - AGRICULTURE BIOTECHNOLOGY

Internal Assesment		External Assesment	
Class Interaction/Quiz	10	Viva- Voce on Practical-	10
Attendance	05	Practical Record File-	10
Assignments(Char/model/Seminar /Rural service/ technology dissemination /Report of Excursion/ Lab visits /Industrial visits	15	Table Work / Experiment	50
Total	30	Total	70
		TOTAL MARKS = 100	

K. K. K.

X. Singh
28.07.23

Y. Singh
28/7/23.

P.

P. B. B.
28.7.23

Professor and Head
Deptt. of Zoology & Biotechnology
Govt. Auto. M.H. College of H.Science
and Science, JABALPUR (M.P.)

**GOVT. M.H. COLLEGE OF HOME SCIENCE AND SCIENCE FOR
WOMEN (AUTONOMOUS), JABALPUR (M.P.)**

Part D- Assesment and Evaluation (Theory)

Suggested Continuous Evaluation Method

**B.Sc. THIRD YEAR
BIOTECHNOLOGY
2023-2024**

PAPER II - AGRICULTURE BIOTECHNOLOGY

Maximum Marks – 100

Continuous Comprehensive Evaluation = 30 Marks

University Exam (UE) = 70

Internal Assesment:		External Assesment	
Continuous Comprehensive Evaluation = 30 Marks		University Exam (UE) = 70	
		Time- 3Hrs	
Assignment-	10Marks	Section (A): Very Short Questions	
Class Test	10Marks	Section (B): Short Questions	
Presentation	10Marks	Section (C): long question	
Total Marks	30	Total Marks	70

TOTAL MARKS = 100

Rodhi

H. Singh
28.07.23

P. Singh
28/7/23

[Signature]



**GOVT. M.H. COLLEGE OF HOME SCIENCE &
SCIENCE FOR WOMEN (AUTONOMOUS),
JABALPUR M.P.**

SYLLABUS – BIOTECHNOLOGY

(Minor & elective)

2023-2024 (NEP 2020)

UNDER GRADUATE

(B.Sc. III Year)

Part A - Introduction			
Program : Degree		Class:	Year: III Year
Session :2023-24			
Subject: Biotechnology			
1.	Course Code	S3-BTEC2T	
2.	Course Title	Applied Biotechnology	
3.	Course Type (Core Course/Discipline Specific Elective/ Elective/ Generic Elective /Vocational/....)	Minor/Elective (Theory)	
4.	Pre-requisites	This course can be opted as an elective by the students/Open for all	
5.	Course Learning outcomes	<p>On completion of this course, students should be able to:</p> <ol style="list-style-type: none"> 1. Students can depict about design, types of fermentor. Recent development in fermentation process & various optimization strategic of fermentation. 2. Learners can get inside of biofertilizer and biopesticide, global environmental problem agrobiolgy techniques regulation and application. 3. Students depict about concept of environment principal technique and pollution as well as bioremediation, biodiversity, conservation and management. 4. They may creat interest in the bioinformatics tools and their application computational tools and method. Rational for and against IPR and patent and trade and entrepreneurship. 	
6.	Credit Value	4	
7.	Total Marks	Max. Marks-30+70	Min. Passing Marks: 35

RPD

R. Doshi

K. Singh
28.07.23

(Dr. Kiran Singh)

Varsha

28/7/23

Dr. Varsha Aglawe

Ragini
Prof. RAGINI GOTHALWAL
Head & Coordinator
Dept. of Biotechnology
Barkatullah University, Bhopal-462025

R. D. Doshi
28.07.23
Professor and Head
Deptt. of Zoology & Biotechnology
Govt. Auto. M.H. College of H.Science
and Science, JABALPUR (M.P.)

Part B – Content of the Course

Total No. of Lectures- Tutorials-Practical (in hours per week): L-T-P:

Unit	Topics	Number of Lectures (1 Hour Each)
I.	Environmental Pollution - Basic concepts, significance, public awareness, public assessment water quality, treatment of waste water. biopesticide-bacterial and fungal, microbial leaching, biodegradation modern fuels.	12
II.	National & International strategies of organic farming, organic food, quality & human health. Strategies for controlling pathogen transfer, integrated pest management , biofertilizers genetically modified crops.	12
III.	Fermentation technology, basic principle of bioprocess technology, primary & secondary screening, strain improvement, inoculum development, industrial sterilization process, scale up & product recovery. Types of fermentation, factor affecting, fermentation design.	12
IV.	Bioinformatics & Biostatistics History of bioinformatics, computer organization, Computer in biology, computer in biological data & their types, introduction to measurement of dispersion & central tendency, their types & application, data types & presentation modes.	12
V.	IPR forms & scope, types, international organization like, WTO, TRIPS, & GATT. Biotechnology & IPR- plant variety protection, act. Animal breeder's, rights, patenting microbes organism and genes potential markers & variants.	12

PD
Rudhi

Ragini
Prof. RAGINI GOYALWAL
Head & Coor.
Dept. of Biotechnology
Barkatullah University, Bhopal-462026

Sig
28.07.23

Vijay
28/7/23

Je
Professor and Head
Dept. of Zoology & Biotechnology
Govt. Auto. M.H. College of H.Science
and Science, JABALPUR (M.P.)

Part C - Learning Resources

Text Books, Reference Books, Other Resources


Suggested Readings:

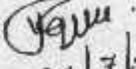
1. Khan Irfan A, Fundamental of Biostatistics.
2. Wanganeo & Singh, Application of statics in Biological Science by Parihar, (2012) Book Enclave publication.
3. Rao, P.S. Sunder An introduction to Biostatistics.
4. De. A. K., Environmental Chemistry, Wilaey Easton Ltd. New Delhi.
5. Purohit S. S., Microbiology.
6. Dubey R. C., Advanced Biotechnology.
7. Kumar Anil & Garg Sarika, Enzymes and enzyme technology, Anshan publishing.
8. Jackson AT, Bioprocess in Biotechnology (1991), Prentice Halls Engalwood Cliff.
9. Stranburge RF, Whitakar A, Principles of fermentation technology (1997) Pergammers press exfer.
10. Kristerson P., Taji, A. and Reganold J ,Organic Agriculture- A global perspective 2006) . CSIRA Press, Australia.
11. Altieri M, Agroecology: The Science of sustainable agriculture (1990) West view press
12. Joshi, M., Setty, T.K.V., and Prabhakara Setty, Sustainability through organic farming (2006) , Kalyani Publishers, Ludhiana, India.
13. Sinha P. K. & Sinha Priti, Computer fundamentals.
14. Sharma Vinay, Ashok Munjal, Asheesh Shankar, A text book of Bioinformatics Rastogi Publication.
15. Nambisan Padma, An introduction to ethical , Safety & intellectual property rights issue in Biotechnology .
16. Goel, & Parashar, IPR, Bioesfty & Bioethics.
17. Gupta CB & Khanka SS., Entrepreneurship and small business management ,S chand & sons.
18. Tiwary P. & Pandey, P. ,Practical Guide for basic bioinformatics and biostatistics .
19. Agrawal S. K. Environmental Biotechnology.
20. Books published by Madhya Pradesh Hindi Granth Academy, Bhopal.


Suggestive digital platforms/web links- www.biologyonline.com


Suggested equivalent online courses: Coursera, NPTEL


K. D. D. D. D.


28.07.23


28/7/23.


Prof. RAGINI GOTTHIALWAL
Head & Coordinator
Dept. of Biotechnology
Berkatullah University, Bhopal-462006


Professor and Head
Dept. of Zoology & Biotechnology
Govt. M. H. College of Science and
and Science, JABALPUR (M.P.)

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30 marks University Exam (UE) 70 marks

Internal Assessment : Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	30
External Assessment : University Exam Section Time : 03.00 Hours	Section(A) : Very Short Questions Section (B) : Short Questions Section (C) : Long Questions	70
Any remarks/suggestions:		

PK
Klodhi

Ragini Gothlawal

Prof. RAGINI GOTHALWAL
Head & Coordinator
Dept. of Biotechnology
Barkshah University, Ekroli-452026

V. Singh
28.07.23

Pranav
28/7/23

Prabakar
28.7.23

Professor and Head
Deptt. of Zoology & Biotechnology
Govt. Auto. M.H. College of H.Science
and Science, JABALPUR (M.P.)

Part A - Introduction			
Program : Degree		Class:	Year: III Year
Session :2023-24			
Subject: Biotechnology			
1.	Course Code	S3-BTEC2P	
2.	Course Title	Applied Biotechnology	
3.	Course Type (Core Course/Discipline Specific Elective/ Elective/ Generic Elective /Vocational/....)	Minor/Elective (Practical)	
4.	Pre-requisites	This course can be opted as an elective by the students/Open for all	
5.	Course Learning outcomes	<p>On completion of this course, students should be able to:</p> <ol style="list-style-type: none"> 1. Students can depict about design, types of fermentor. Recent development in fermentation process & various optimization strategic of fermentation. 2. Learners can get inside of biofertilizer and biopesticide, global environmental problem agrobiolgy techniques regulation and application. 3. Students depict about concept of environment principal technique and pollution as well as bioremediation, biodiversity, conservation and management. 4. They may creat interest in the bioinformatics tools and their application computational tools and method. Rational for and against IPR and patent and trade and entrepreneurship. 	
6.	Credit Value	2	
7.	Total Marks	Max. Marks-100	Min. Passing Marks: 35

AD
Kishori

X. Sign
28.07.23

Pranav
28/7/23

Ragini

Prof. RAGINI GOTHALWAL
Head & Coordinator
Dept. of Biotechnology
Baskatulah University, Ghopel-463006

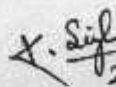
Rohit
28.7.23

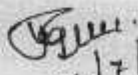
Part B – Content of the Course


Total No. of Lectures- Tutorials-Practical (in hours per week): L-T-P:

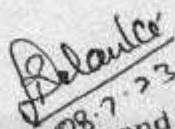
Unit	Topics	Number of Lectures (2 Hours Each)
	<ol style="list-style-type: none"> 1. Prepare a marksheet of class subjects. 2. Prepare a bar chart, pie chart for analysis of election results. 3. Problem based on probability and standard deviation. 4. Retrieval of biological data resources & data. 5. Use M.S. Word to insert a table in to document. 6. Demonstration of fermentor. 7. Demonstration of PCR. 8. Production of ethanol by yeast. 9. Isolation of Agotobacter, Rhizobium and Cyanobacteria from soil. 10. Isolation of microorganism from polluted site/ industrial waste. 11. Degradation of 2,4-D by bacteria. 12. Immobilization of microbial cells by Ca alginate. 13. Isolation of microorganism from rhizosphere. 14. Study of policies and incentives of organic production. 15. Study of air borne microorganism by agar plate techniques. 16. Understanding the use of NCBL phylogenetic analysis. 17. Proxy filling of Indian product patent. 	30
Keywords/ Tags:		


K. V. Doshi


 K. S. Jha
 28.07.23


 K. S. Jha
 28/7/23


 Prof. RAGINI GOTHALWAL
 Head & Coordinator
 Dept. of Biotechnology
 Barkaswala University, Bhopal-462025


 28.7.23
 Professor and Head
 Deptt. of Zoology & Biotechnology
 Govt. Auto. M.H. College of H.Science
 and Science, JABALPUR (M.P.)

Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Parihar, Wanganeo & Singh, Application of statics in Biological Science by Parihar, (2012) Book Enclave publication.
2. De. A. K., Environmental Chemistry, Wilaey Eastron Ltd. New Delhi.
3. Dubey R. C., Advanced Biotechnology.
4. Kumar Anil & Garg Sarika, Enzymes and enzyme technology, Anshan publishing.
5. Stranburge RF, Whitakar A, Principles of fermentation technology (1997) Pergammers press exfer.
6. Joshi, M., Setty, T.K.V., and Prabhakara Setty, Sustainability through organic farming (2006), Kalyani Publishers, Ludhiana, India.
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8. Sharma Vinay, Ashok Munjal, Asheesh Shankar, A text book of Bioinformatics Rastogi Publication.
9. Nambisan Padma, An introduction to ethical, Safety & intellectual property rights issue in Biotechnology.
10. Gupta CB & Khanka SS., Entrepreneurship and small business management, S chand & sons.
11. Tiwary P. & Pandey, P., Practical Guide for basic bioinformatics and biostatistics.
12. Books published by Madhya Pradesh Hindi Granth Academy, Bhopal.

Suggestive digital platforms/web links- www.biologyonline.com

Suggested equivalent online courses: Coursera, NPTEL

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
		Total Marks : 100	

Any remarks/ suggestions:

R. K. Doshi

H. Singh
28.07.23

99111
28/7/23

Ragini Gothwal

Prof. RAGINI GOTHALWAL
Head & Coordinator
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Professor and Head
Deptt. of Zoology & Biotechnology
Govt. Auto. M.H. College of H.Science
and Science, JABALPUR (M.P.)
Page 92 of 100

**GOVT. M.H. COLLEGE OF HOME SCIENCE AND SCIENCE FOR
WOMEN (AUTONOMOUS), JABALPUR (M.P.)**

SCHEME OF PRACTICAL EXAMINATION

B.Sc. THIRD YEAR

BIOTECHNOLOGY

2023-2024

PAPER - APPLIED BIOTECHNOLOGY (Minor/Elective)

Duration: 3 Hrs

Maximum Marks: 70

SPOTTING

1. Biogas production
2. Biological oxygen demand
3. Biopesticides
4. Basic steps in Vermicomposting
5. Basic design of batch Fermentor
6. Input devices
7. Output devices
8. TRIPS
9. GATT

MINOR PRACTICALS

1. To prepare marksheet of class subjects.
2. To prepare bar chart, pie chart for analysis of election results.
3. To solve the problem based on probability and standard deviation..
4. To retrieve biological data resources and data..
5. To use M.S word to insert a table into document..
6. To demonstrate Fermentor.
7. To demonstrate PCR.
8. To perform ethanol production by yeast.
9. To immobilize Microbial cell by Calcium alginate..

MAJOR PRACTICALS

1. To isolate Agrobacter, Rhizobium and Cyanobacteria from soil.
2. To isolate microorganism from polluted site /Industrial waste
3. To perform degradation of 2,4D by Bacteria.
4. To isolate microorganism from rhizosphere.
5. To study policies and incentives of organic production. .
6. To study air borne microorganism by agar plate technique.
7. To understand the use of NCBL phylogenetic analysis..
8. To study the Proxy filling of Indian product patent.

R. Doshi

X. Singh
28.09.23

AD

Rolaukr

28/7/23

**GOVT. M.H. COLLEGE OF HOME SCIENCE AND SCIENCE FOR
WOMEN (AUTONOMOUS), JABALPUR (M.P.)**

B.Sc. THIRD YEAR – BIOTECHNOLOGY (MINOR/ELECTIVE)

Scheme of Practical Examination

PAPER – APPLIED BIOTECHNOLOGY

Duration: 3 Hrs

Max. Marks: 70

1. Major Practical -----	15
2. Minor Practical -----	10
3. Minor Practical -----	10
4. Spotting (any 3) -----	15
5. Viva-Voce -----	10
6. Practical Records -----	10

Grand Total=

70

R. Doshi

K. Singh
28.07.23

AD

R. Singh
29/7/23

R. Sankar

Professor and Head
Dept. of Zoology & Biotechnology
Govt. Auto. M.H. College of H.Science
and Science, JABALPUR (M.P.)

**GOVT. M.H. COLLEGE OF HOME SCIENCE AND SCIENCE FOR
WOMEN (AUTONOMOUS), JABALPUR (M.P.)**

Part D- Assesment and Evaluation (PRACTICAL)

Suggested Continuous Evaluation Method

**B.Sc. THIRD YEAR
BIOTECHNOLOGY
2023-2024**

PAPER - APPLIED BIOTECHNOLOGY

Internal Assesment		External Assesment	
Class Interaction/Quiz	10	Viva- Voce on Practical-	10
Attendance	05	Practical Record File-	10
Assignments(Char/model/Seminar /Rural service/ technology dissemination /Report of Excursion/ Lab visits /Industrial visits	15	Table Work / Experiment	50
Total	30	Total	70
		TOTAL MARKS = 100	

K. Doshi

(Signature)

28/7/23

X. Singh
28.07.23

(Signature)
Professor and Head
Deptt. of Zoology & Biotechnology
Govt. Auto. M.H. College of H.Science
and Science, JABALPUR (M.P.)

**GOVT. M.H. COLLEGE OF HOME SCIENCE AND SCIENCE FOR
WOMEN (AUTONOMOUS), JABALPUR (M.P.)**

Part D- Assesment and Evaluation (Theory)

Suggested Continuous Evaluation Method

**B.Sc. THIRD YEAR
BIOTECHNOLOGY
2023-2024**

PAPER - APPLIED BIOTECHNOLOGY

Maximum Marks – 100

Continuous Comprehensive Evaluation = 30 Marks

University Exam (UE) = 70

Internal Assesment:		External Assesment	
Continuous Comprehensive Evaluation = 30 Marks		University Exam (UE) = 70	
		Time- 3Hrs	
Assignment-	10Marks	Section (A): Very Short Questions	
Class Test	10Marks	Section (B): Short Questions	
Presentation	10Marks	Section (C): long question	
Total	30	Total	70

TOTAL MARKS = 100

Rodhi

AD

28/7/23

28.07.23

Prabha
Head
Deptt. of Zoology & Biotechnology
Govt. Auto. M.H. College of H.Science
and Science, JABALPUR (M.P.)