

Department of Microbiology Bundelkhand University, Jhansi-284128 (UP)

Minutes of Board of Studies (BOS) of Microbiology on 25th February 2022.

As per the notification given regarding the Board of Studies (BOS) of Microbiology session vide Letter No -पत्रांक – बु० वि०/ए के० /2022/6192 दिनांक – 25/02/2022 the BOS has been held on 25th February 2022 at Bundelkhand University, Jhansi in the presence of BOS members.

1. In the reference of letter No.: बु० वि० /एके०/2022/ 6180 dated 07.01.2022 regarding 'Advance P. G. Diploma in Micro and Food Technology', the ordinance, course/diploma curriculum and syllabus for the mentioned diploma has been proposed and finalized to submit the Bundelkhand University, Jhansi to restart (as mentioned in the reference of letter No.: बु० वि० /एके०/2022/ 6180 dated 07.01.2022) from academic session 2022-2023 with suggested following modification:

1. (I) **Revision of Title of 'Advance P. G. Diploma in Micro and Food Technology':**

In the title of this diploma the word 'Micro' will be 'Microbiology' and the revised title of diploma will be entitled as 'Advance P.G. Diploma in Microbiology and Food Technology'.

1. (II) Advance Post Graduate (P.G.) Diploma entitled as 'Advance P.G. Diploma in Microbiology and Food Technology' will be conducted under Choice Based Credit System (CBCS).

1. (III) The code of diploma and codes of theory papers / practicals / training under diploma will be finalized by Bundelkhand University, Jhansi and incorporated accordingly.

1. (IV) All the suggested/directed modification in the proposed syllabus has been incorporated in the respected theory papers.

All the mentioned suggested modifications [including 1. (I), 1. (II), 1. (III), 1. (IV)] have been completed to restart the diploma in Department of Microbiology, Bundelkhand University, Jhansi (U.P.) from academic session 2022-2023.

2. **Regarding Revision of eligibility criteria for B.Sc. (H) Microbiology and M.Sc. Microbiology course for academic session 2022-2023.**

2. (I) **Eligibility criteria for admission in B.Sc. (Hons.) Microbiology:**

10+2 (Physics, Chemistry and Biology) / (Physics, Chemistry and Maths) with 45% marks aggregate.

2. (II) **Eligibility criteria for admission in M.Sc. Microbiology:**

Bachelor degree /B.Sc. in Biological sciences/ B.Sc. Life sciences/ B.Sc. Agriculture Science/ Bachelor in Dental Surgery (BDS)/ Bachelor in Dental Science/ Bachelor in Basic Sciences / Bachelor in Forensic Science/ Bachelor in MLT (Medical lab technology), Bachelor in Pharmacy (B. Pharma), Bachelor in Physiotherapy (BPT)/ Bachelor in environmental sciences or equivalent sciences with 45% marks.

The eligibility criteria for B.Sc. (H) Microbiology and M.Sc. Microbiology course for academic session 2022-2023 has been revised as per the suggestion of committee members. The revised eligibility criteria for admission in B.Sc. (H) Microbiology and M.Sc. Microbiology course has been mentioned in 2.(I) and 2. (II)

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Department of Microbiology
Bundelkhand University, Jhansi-284128 (UP)

As per the notification given regarding the Board of Studies (BOS) of Microbiology vide Letter No -पत्रांक - बु० वि०/ए के०/2022/6192, दिनांक - 25/02/2022.

Agenda of the Board of Studies (BOS) of Microbiology, on dated: 25.02.2022:

1. In the reference of letter No.: बु० वि० /एके०/2022/ 6180 dated 07.01.2022: Regarding ordinance, syllabus, course curriculum of 'Advance P. G. Diploma in Micro and Food Technology'.
2. Regarding revision of title of diploma/course mentioned in point no.-2 of Letter No -पत्रांक - बु० वि०/ए के०/2022/6192, दिनांक - 25/02/2022.
3. Revision of eligibility criteria for B.Sc. (H) Microbiology and M.Sc. Microbiology course for academic session 2022-2023.

Members of BOS:

Narain
25.2.2022

S.P. Jirni
25.02.2022

Ranjana
25/2/22

SL
25/02/22

Bag
25/02/2022

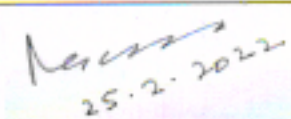
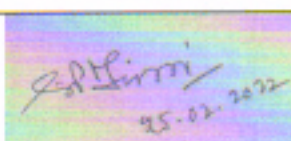
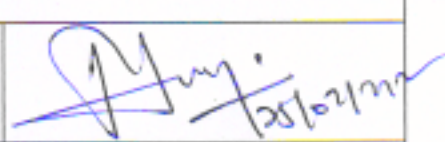

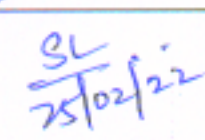
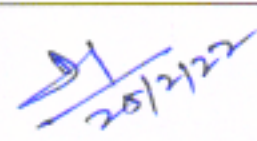
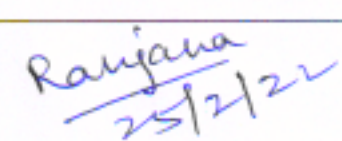
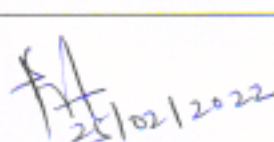
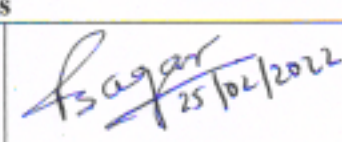
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Sr. No.	Name and address of Members of BOS	Signature
External Members: The external members have joined BOS 'ONLINE MODE'		
1.	Prof. Rajeev Gaur Department of Microbiology, Dr. Ram Manohar Lohia Avadh University, Ayodhya, U.P.	 25.2.2022
2.	Dr. Shree Prakash Tiwari Associate Professor Department of Microbiology, V.B.S. Purvanchal Vishwavidyalaya, Jaunpur (U.P.)	 25.02.2022
Members		
3.	Prof R. K.Saini Dean Science Bundelkhand University, Jhansi	 25/02/22
Internal Members (05)		
4.	Dr Rishi Kumar Saxena Associate Professor, Department of Microbiology, Bundelkhand University, Jhansi	
5.	Dr Sangeeta Lal Assistant Professor, Department Microbiology, Bundelkhand University, Jhansi	 25/02/22
6.	Dr Devendra Mani Tripathi, Assistant Professor, Department of Microbiology, Bundelkhand University, Jhansi	 25/2/22
7.	Dr Ranjana Bhati Assistant Professor, Department of Microbiology, Bundelkhand University, Jhansi.	 25/2/22
8.	Dr Sanjay Kumar Assistant Professor, Department of Microbiology, Bundelkhand University, Jhansi	 25/02/2022
Convener of Board of Studies		
9.	Mr Pankaj Kumar Sagar Coordinator, Department of Microbiology, Bundelkhand University, Jhansi	 25/02/2022

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बुन्देलखण्ड विश्वविद्यालय, झाँसी

सूचना

माननीय कुलपति जी के आदेशानुसार सूचित किया जाता है कि Department of Microbiology पाठ्यक्रम समिति की बैठक दिनांक 25/02/2022 को पूर्वान्ह 02.00 बजे विश्वविद्यालय सभागार में आहूत की गयी है। अतः आपसे अनुरोध है कि बैठक में निर्धारित तिथि एवं समय पर उपस्थित होने का कष्ट करें।

कार्यसूची :-

1. उत्तर प्रदेश शासन के पत्र संख्या-नि.-05/सत्तर-1-2014 दिनांक 25/02/2014 में दिये गये शिक्षा में सुधार सम्बन्धी बिन्दुओं पर विचार।
2. Reagarding ordinance, Syllabus, course/diploma corriculum of "Advance P.G.Diploma in Micro and Food Technoloy.
3. Reagarding revision of title of diploma/course mentioned in point no-2.
4. Revision of eligibility criteria for B.Sc.(H) Microbiology and M.Sc.Microbiology course for academic session 2022-2023.
5. अन्य मद अध्यक्ष की अनुमति से।

सेवा में,

- 1- Prof. Rajeev Gaur, Deptt. of Microbiology, Dr. Ram Manohar Lohia Avadh University, Ayodhya. U.P. (External Member)
- 2-Dr. Shree Prakash Tiwari, (Asso.Prof.) Deptt. of Microbiology V.B.S.Purvanchal University Jaunpur (U.P) (External Member)
- 3- Prof. R.K. Saini, Dean Science, B.U. Jhansi
- 4- Dr. Rishi K.Saxena, Asso.Prof. Deptt.of Microbiology, B.U. Jhansi. -Internal Member
- 5- Dr. Sangeeta Lal, Deptt.of Microbiology, B.U.Jhansi. Internal Member
- 6- Mr. Pankaj Kumar Sagar, Convenor, Asst.Prof., B.U.Jhansi-
- 7- Dr. Devendra Mani Tripathi, Asst.Prof, B.U.Jhansi- Internal Member
- 8- Dr. Ranjana Bhati, Asst.Prof, B.U.Jhansi. Internal Member
- 7- Dr. Sanjay Kumar, Asst.Prof, B.U.Jhansi. Internal Member

बुन्देलखण्ड विश्वविद्यालय, झाँसी

पत्रांक:- बु0वि0/एके0/2022/6192

प्रतिलिपि - निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

1. वित्त अधिकारी।
2. सहायक कुलसचिव (अतिगोपनीय)।
3. कुलपति जी के निजी सचिव।
4. कुलसचिव के आशुलिपिक।

कुलसचिव

दिनांक:- 25/2/2022

कुलसचिव

**BUNDELKHAND UNIVERSITY,
JHANSI**



**For Advance Post Graduate (P.G.) Diploma entitled:
'Advance P.G. Diploma in Microbiology and Food Technology'**

**Department of Microbiology,
Bundelkhand University, Jhansi**

(w.e.f. : 2022-2023)

Name of Programme: Advance P.G. Diploma in Microbiology and Food Technology'

Programme Objective:

The programme has been designed in such a way so that the students will gain theoretical as well as practical knowledge on various domains of Microbiology and Food technology and will be able to communicate and collaborate with other disciplines effectively.

Programme Outcomes (POs): After completion of programme students will be able to:

PO1: Understand the concept and fundamentals of various aspects related to Microbiology and food technology as well as its implementation

PO2: Develop scientific research plan and also interpretation of outcomes.

PO3: Obtain the knowledge and technical skills for successful career.

PO4: Be a member of an organization / institution working in subject/field of Microbiology and food technology

PO5: The programme will help to develop a range of generic skills that are relevant in enhancing entrepreneurship skills among students.

PO6: Implement scientific approach for the betterment of humans, environment and entire nature.

PO7: Develop confidence to take up challenging tasks of research in the field of Microbiology and other related fields.

Programme Specific Outcomes (PSOs):

PSO1: The student will be able to gain theoretical and practical/laboratory knowledge of various aspects of Biomolecules of life and methods in quality control , Microbial metabolism and enzymology , Microbial diversity and environmental microbiology , Food and dairy technology, Bioprocess and fermentation technology, Genetic Engineering and genetically modified food, Food Nutrition and agro technology.

PSO2: To acquire and demonstrate expertise in good laboratory practices in a microbiological laboratory and also be able to explain the theoretical knowledge and laboratory / practical skills of the tools and techniques of different field of Microbiology including food and dairy technology.

PSO3: The student will acquire in depth knowledge on diversity, distribution, cell structure and economic importance of different microorganism.

PSO4: Students will be well versed with instruments about their principle and working procedure of various instruments.

PSO5: Students will acquire information about nutritional requirements of bacterial growth and the parameters affect its growth.

PSO6: Students get acquired with sufficient knowledge of relationship between food and microbes and fermented food products.

PSO7: To gain knowledge of fundamentals of enzymes, factor affecting the activity of enzymes and enzymes kinetics and large scale production of enzymes and also production of different product related to food industry.

PSO8: Student will gain knowledge about various techniques of genetic engineering and their applications in biological research. The course includes recombinant DNA technology and its application in agriculture, health and industry.

Course I: Biomolecules of life and methods in quality control

Course objectives: Students will learn the fundamental of Biochemistry and the structure and function of various bio molecules. The objective of this paper is to provide students with a basic understanding of structural, chemical biology and functions of macromolecules. Study of different method involved in quality control in food industry.

Course learning outcome:

1. Classification and structural properties of carbohydrates and lipids, glycoproteins and glycolipids and proteo glycans their significance in biological systems.
2. Structure and Classifications of aminoacids and protein based on different criteria, ramachandran plot and fibrous and globular protein. Evolution of proteins
3. Waste disposal in food industry.
4. Understand classification and basic concept and properties of enzymes
5. Understand different quality control in food industry.
6. Structure and conformations of nucleic acids, physical and functional property of DNA and RNA

Course II: Microbial metabolism and enzymology

Course objectives: The main objective of the course is to provide fundamental and basic knowledge of microbial physiology and metabolic pathways. The courses also focus on the bacterial growth parameters and different bacterial culture methods. The course includes study of the production, extraction, purification, characterization and application of enzymes.

Course learning outcome: After the successful completion of the course, students will be able to:

1. Acquire information about nutritional requirements of bacterial growth and the parameters affect its growth.
2. Gain information about kinds of nitrogen fixing bacteria and nitrogen cycle.
3. Explain the various metabolic pathways of bacteria.
4. Learn about the different bacteriological media used for bacterial cultivation.
5. Explain Nutritional classification of microorganisms
6. The major classes of enzyme and their functions in the cell an role of co-enzyme cofactor in enzyme catalyzed reaction.
7. Differentiate between equilibrium and steady state kinetics and analyzed simple kinetic data and estimate important parameter (Km, Vmax, Kcat etc).
8. Enzyme purification and enzyme engineering.

Course III: Microbial diversity and environmental microbiology

Course objectives: The main objective of this course is to aware and understand the basic principles of Ecology and Ecosystem along with diverse microbial interactions. The course introduces the fundamental and important concepts of microbiology_with special emphasis on microbial diversity.

Course learning outcome: The student at the completion of the course will be able to:

1. Understanding of the basic principles of Ecology and Ecosystem along with diverse microbial interactions.
2. Students will be able to appreciate the diversity of microorganisms and microbial communities inhabiting a multitude of habitats playing key role in mitigation of metal and other environmental toxicity.
3. Gain knowledge on microbial diversity, different system of classification.
4. Understand interactions between microbes and natural resources to improve soil health.
5. Be acquainted with the historical account and development of microbiology as a scientific discipline.
6. Acquire in depth knowledge on diversity, distribution, cell structure and economic importance of different microorganism.

Course IV: Food and dairy technology

Course objectives: To study general principles and basic concept of food microbiology fermented foods, food preservation and spoilage and also various dimensions of food technology.

Course learning outcome: On successful completion of the course, students will be able to

1. Get acquired with sufficient knowledge of relationship between food and microbes and fermented food products.
2. Explain the different methods of food preservation.
3. Gain knowledge about the different aspect and techniques involved in food technology.
4. Gain knowledge about the role of microbes in the production of dairy products.
5. Know about microbial spoilage in foods with detection and characterization.

Course V: Bioprocess and fermentation technology

Course objectives:

1. The purpose of this course is to teach students about applying biotechnology to industrial process
2. To teach the basic principles of processing of bioproducts
3. To expose students to relevant advancement in industrial Bioprocess technology
4. To study of fermentor and different techniques involved in fermentation technology.

Course learning outcome:

1. Student can appreciate the relevance of microorganisms and have a better understanding to industrial context
2. Students will learn the design and operations of various bioreactors and downstream processing
3. Student will be able to apply gene manipulation technique to industrially important microorganism.
4. Student will be able to define about scale up fermentation process, recovery and purification of fermented product.
5. Student will be able to get knowledge about industrial production of antibiotics.

Course VI: Genetic Engineering and genetically modified food

Course objectives: The main objective of this course is to explain various techniques of genetic engineering and their applications in biological research. The course includes recombinant DNA technology and its application in agriculture, health and industry.

Course learning outcome: At the completion of course the student will be able to:

1. Explain the basic principles behind molecular cloning.
2. Gain knowledge about recombinant DNA Technology and its application.
3. Explain the methods for production of gene libraries.
4. Explain the method of polymerase chain reaction and its application.
5. Study of formation of different genetically modified food by applying techniques of genetic engineering.

Course VII: Food Nutrition and agro technology

Course objectives: The main objective of this paper is to provide of knowledge about food nutrition value and methods of related to agriculture. Study about significance of Indian biodiversity and environmental policies and laws in India

Course learning outcome: The student at the completion of the course will be able to:

1. Gain knowledge about significance of Indian biodiversity.
2. Gain knowledge of different soil types of India, agro climatic zones,
3. Explain global warming and greenhouse effect.
4. Gain knowledge about functional foods of plant & animal origin: sea foods, egg, milk, Vegetables, nuts, spices, probiotics
5. Explain environmental policies and laws in India.
6. Well versed with Weed, Plant diseases and their IPM.
7. Define Rhizosphere & microbial flora of Soil, Soil and water pollutants.

1. Admission

1.1 Nomenclature of Course/diploma: ‘Advance P.G. Diploma in Microbiology and Food Technology’

1.2: The programs shall be run on full time basis.

1.3: Intake: 25 seats. A number of intake/seats may be increased and decreased as per the direction of Bundelkhand Univeristy, Jhansi (U.P.). Statutory reservation (as applicable), shall be applicable as per University/State Government rules/norms.

1.4: Provision of weightage (if applicable): Bundelkhand Univeristy, Jhansi weightage as per rule.

1.5: Eligibility for admission: Minimum Bachelor degree /B.Sc. in Biological sciences/ B.Sc. Life sciences/ B.Sc. Agriculture Science/ Bachelor in Dental Surgery (BDS)/ Bachelor in Dental Science/ Bachelor in Basic Sciences / Bachelor in Forensic Science/ Bachelor in MLT (Medical lab technology), Bachelor in Pharmacy (B. Pharma), Bachelor in Physiotherapy (BPT)/ Bachelor in environmental sciences or equivalent sciences with minimum 45% marks.

1.6: Course Fee: As per the direction of admission cell/ administration/ Bundelkhand Univeristy, Jhansi.

1.7: The candidate shall be admitted to course/diploma through online registration and consequent online admission system of the University as per guideline of admission committee. Admission of eligible candidates will be strictly on the basis of direct admission (DA)/ entrance test (ET) as per the direction of admission cell/committee by University. The admission mode maybe modified by admission system of the University as per guideline of admission committee.

1.8: Those appearing for the final year of the qualifying examination shall also be eligible to apply, while they have to submit proof of appearing / passing the final year examination as minimum requirements at the time of admission/personal interview. The direction of Hon’ble Vice-chancellor, Bundelkhand Univeristy, Jhansi will be implemented.

1.9: Duration of course/diploma: One Year (Two Semesters). Total duration of course will be 01 Year comprise two semesters. The total number of teaching days in each semester shall be completed under **Choice Based Credit System (CBCS)** as prescribed by the University ordinance/U.G.C.

2. Medium of course/diploma: Medium of instruction and examination shall be English.

3. Attendance

Minimum attendance required to be eligible to appear in the examination for each paper shall be 75% of all class lectures (Theory and Practical).

In case a student is short of attendance due to illness, participation in sport, extra curricular activities etc the following rules shall apply.

3. (I): Shortage of up to 10% shall be condoned by the Head of the department (HOD) on the specific recommendation by teacher of the department.

3. (II): A shortage of up to 25% can be condoned by the Hon'ble Vice Chancellor on the specific recommendations of the HOD.

3. (III): Student will be allowed to go for training in Institution with due permission from the HOD.

3. (IV): The training period duly certified by the Head of the Department of the concerned Department/ Institution will be considered as normal attendance for the student.

4. Examination:

4. (I) Theory Examination (A+B)

(A) Sessional examinations shall be conducted by the subject teacher as mentioned in the academic calendar of the department. The questions may be objective/short answer type/multiple choice question (MCQ) / assignment (followed by viva-voce) and will be set by the concerned teacher. The weightage of sessional examination will be 30%

(B) Semester examination shall be conducted by the Bundelkhand University, Jhansi. The question paper will be set by examiners appointed by the Hon'ble Vice chancellor, Bundelkhand University based on the recommendation of the board of studies (BOS). The University will decide the pattern of the question paper. The weightage of this examination will be 70%.

4. (II) Practical Examination

The practical examination will be conducted as mentioned in course/diploma curriculum/syllabus. The examiners will be appointed by Hon'ble Vice chancellor, Bundelkhand University on the basis of the recommendations of the course committee and Board of studies (BOS). The marks of the practical examination will be distributed on the following basis.

(1) 25% based on the performance of the students in the practical experiments conducted in the department laboratory under the faculty In charge of the concerned practical. The students will have to submit a practical record to the faculty In charge.

(2) 50% based on the performance at the final practical examination.

(3) 25% based on the viva-voce conducted by the examiners.

4. (III) Training - Presentation and Viva -voce

Each students of II Semester will have to complete training (**One Month**) at various research institute/Universities/Industries reputed and submit report for fulfilment of the diploma. For presentation /Viva-voce of training report the Internal and external examiner will be appointed by the Hon'ble Vice-Chancellor on the recommendation of the course committee/ BOS.

5. ELIGIBILITY CRITERIA FOR PROMOTION

5.1 In case a student fails in an academic semester his/her sessional marks / practical marks/training /viva-voce marks shall be carrying forward.

5.2 BACK PAPER

5.2. (I). The students have to pass at least 50% of the total number of theory papers in year (Two semester course/diploma) to avail the chance to reappear in back examination as per Bundelkhand University norms.

5.2 (II). If a student unable to pass 50 % of theory papers in a year (two semester course/diploma) it will be counted as year back. In this regard the guideline of Bundelkhand University will be followed / implemented.

5.3 SPECIAL BACK PAPER

The special back paper shall be conducted after the final examination result of last semester of the course/diploma program. The special back paper examination may be conducted as per the guidelines/ directions of Bundelkhand University.

5.4 IMPROVEMENT IN GRADE

A Student can only appear for improvement in theory subject / paper of previous academic semester if he / she is passed in all papers of previous semester. There shall be no provision for organizing a special examination for the purpose of improvement in grade.

6. DURATION OF COURSE/DIPLOMA COMPLETION

6.1 The maximum duration to complete the course/diploma shall be double of the minimum course programme duration. (In case of one year course/diploma it shall be two academic semesters). Failing which he/she shall have to discontinue from the course. To complete the course/diploma beyond the stipulated duration, the guidelines/norms of Bundelkhand University will be followed.

6.2 In case a year back student, fails again i.e. in his/.her Second attempt, such cases shall be referred to the examination committee and the student shall be allowed to take the third attempt on the basis of recommendation of the examination committee but maximum time allowed for completing the course / diploma will remain the same as in 6.1 point.

6.3 Ex students shall take proper permission for admission through online process before appearing in respective examination. If a student is restricted to appear in next examination on recommendation of UFM Committee the students have to follow the process/ directions as decided by the committee, Bundelkhand University.

7. AWARD OF DIVISION

7.1 CONVERSION OF GRADES INTO PERCENTAGE

Conversion formula for the conversion of CGPA into Percentage is $CGPA \text{ Earned} \times 10 = \text{Percentage of marks scored}$.

Illustration: $CGPA \text{ Earned } 8.2 \times 10 = 82.0\%$

7.2 Division shall be awarded only after the final semester examination based on integrated performance of the student for both the semester as per the following details

7.2 (I) A student who qualifies for the award of the advance P.G. diploma securing “A” or above grade in all the subjects/papers pertaining to both the semesters and in addition secure a CGPA of 8.0 and above shall be declared to have passed the examination in **FIRST DIVISION WITH HONOURS**.

7.2 (II) A student who qualifies for the award of the advance P.G. diploma securing “B” or above grade in all the subjects/papers pertaining to both the semester and in addition secure a CGPA of 7.0 and above shall be declared to have passed the examination in **FIRST DIVISION**.

7.2 (III) A student who qualifies for the award of the advance P.G. diploma securing “C” or above grade in all the subjects/papers pertaining to both the semester and in addition secure a CGPA of 5.0 and above shall be declared to have passed the examination in **SECOND DIVISION**.

7.2 (IV) Eligibility of Passing

The Bundelkhand University has adopted the enlarged UGC prescribed grade system (CBCS). At the end of each semester, the performance of students shall be evaluated in terms of marks which shall be converted into letter grade as per the following equivalent grade point in table-1 as directed by UGC for CBCS system.

Letter Grade	Numerical grade
O (Outstanding)	10
A+ (Excellent)	9
A (very good)	8
B+ (Good)	7
B (Above average)	6
C (Average)	5
F (Fail)	0
Ab (Absent)	0

7.2 (IV) **A:** The minimum passing marks shall be 40% of the maximum marks as prescribed in the University Examination and 40% of marks in the aggregate marks in the subject including internal / sessional marks. i.e. Minimum Passing Grade is “C”.

7.2 (IV) **B:** A student who obtains Grades O to C shall be considered as passed. If a student secure “F” grade, he/she shall be considered as FAIL and shall have to appear in the examination. It is mandatory for student to earn the required SGPA in each semester. If a student is not able to secure 40% grade in any theory/practical/internal/sessional/vive-voce/training examination awarded grade point shall be ZERO (0).

BUNDELKHAND UNIVERSITY, JHANSI-284128
DEPARTMENT OF MICROBIOLOGY
CURRICULUM
‘Advance P. G. Diploma in Microbiology and Food Technology’
(One Year)

Course / Diploma Code: ≠

Course	Paper code	Title of the paper	Type	Credits	External Assessment	Internal Assessment	Total Marks
SEM -I	≠	Biomolecules of life and methods in quality control	Core	04	70	30	100
	≠	Microbial metabolism and enzymology	Core	04	70	30	100
	≠	Microbial diversity and environmental microbiology	Core	04	70	30	100
	≠	Lab Course I	Core	04	70	30	100
	≠	Lab Course II	Core	04	70	30	100
		(20 Credits)					Total
*SEM -II	≠	Food and dairy technology	Core	04	70	30	100
	≠	Bioprocess and fermentation technology	Core	04	70	30	100
	≠	Genetic Engineering and genetically modified food	Elective	04	70	30	100
	≠	Food Nutrition and agro technology	Elective	04	70	30	100
	≠	Lab Course I	Core	04	70	30	100
	≠	Training – Presentation and Viva-voce	Core	04	-	-	100
		* Note: Student has to opt any one from two electives in the second semester (SEM-II)					
	(20 Credits)					Total	500
(Total Credits : 40) Grand Total (Marks)							1000

≠: The code of diploma and codes of theory papers / practicals / training under diploma will be finalized by Bundelkhand University, Jhansi and incorporated accordingly.

SEMESTER-I

BIOMOLECULES OF LIFE AND METHODS IN QUALITY CONTROL

Unit-I

1. Carbohydrates: Structure, Isomerism, Classification, Properties and Biological significance.
2. Lipids: Functions and properties of fatty acids; Lipids with specific biological functions.

Unit-II

1. Amino Acids & Proteins: Structure, Classification, Properties and Functions.
2. Enzymes: Basic concepts, Nomenclature and Classification; Enzyme kinetics

Unit-III

1. Nucleic acids: Structure and properties of Purine and Pyrimidine Bases, DNA and RNA.
2. Vitamins: Structure and Biological role of fat-soluble and water-soluble vitamins.

Unit-IV

1. Quality control in food industry-Methods of evaluation and quality control of raw material, manufacturing processes and finished goods
2. Waste disposal in food industry

Unit-V

1. Food contamination – Sources and transmissions by water, air, sewage and soil
2. Sanitation and sterilization of Food

References

1. Principles of Biochemistry (5th Edition) – Lehninger, Nelson and Cox.
2. A text Book of Biochemistry by JL Jain, CBS Publication, New Delhi.
3. Practical Biochemistry (3rd Edition) – David Plummer. Pub: Tata McGraw Hill.
4. Longree, K. (1967). Quality Food Sanitation. McGraw Hill Publishers:New York.
5. Adams, M.R and Mass, M.D. (2008). Food Microbiology. newAge International Pvt. LTd.
6. Kawata, J.G. (1963). Environment Sanitation in India. Lucknow Publishing House
7. Pelezar, H.J. and Rober, D. (1968). Microbiology. 2nd Edition. McGraw Hill:New York.

MICROBIAL METABOLISM AND ENZYMOLOGY

Unit-I

1. Basic concepts of bioenergetics and metabolism
2. definition of growth, balanced and unbalanced growth, Synchronous growth,. Bacterial growth curve , the mathematics of growth-generation time, specific growth rate, batch and continuous culture, Temperature -temperature ranges for microbial growth. Measurement of growth and influence of environmental factor affecting the growth.
3. pH-classification based on pH ranges and adaptations, solutes and water activity, oxygen concentration, radiation and pressure.

Unit-II

Culture media: Types of culture media: Routine and specialized media; selective media, differential media, enriched media, enrichment media, enumeration media, assay media and maintenance media

Unit-III

1. Carbohydrate metabolism: Concept of aerobic respiration, anaerobic respiration and fermentation. Central metabolic pathways: EMP pathway, ED pathway, PP pathway, and TCA cycle. Anaplerotic reactions, gluconeogenesis, glyoxylate cycle.
2. Mitochondrial and bacterial electron transport. Oxidation-reduction potential and energetic of electron transport.

Unit-IV

1. Enzymes: basic concept as a biocatalyst, specificity, active sites, activity unit and iso-enzymes, enzyme classification.
2. Enzyme kinetics- Michaelis-Menton equation for simple enzymes, determination of kinetic parameters.
3. Enzyme inhibition: competitive, noncompetitive and uncompetitive inhibition, allosteric enzymes.

Unit-V

1. Nitrate and ammonia assimilation in Prokaryotes.
2. Methyloproths and pathways of methane oxidation.
3. Vitamins and cofactors: structure, distribution and biological properties.

References

1. Microbial Physiology and Metabolism by Caldwell, DR, Edition 2nd, Star Pub Co.
2. Microbial Physiology, Moat, AG, Foster, JW and Spector, MP, Edition 4th, John Willey Publication.
3. Stanier RY, Ingraham JL, Wheelis ML and Painter PR. (2005). General Microbiology. 5th edition McMillan.
4. Brun. Y. V and Shimkets L. J. 2000 Prokaryotic development ASM press.
5. Advances in Microbial Physiology by Rabert Poole, RK., Volume 53 Elsevier Science & Technology.

MICROBIAL DIVERSITY AND ENVIRONMENTAL MICROBIOLOGY

Unit- I

1. General introduction of microorganisms.
2. Whittaker's Five-Kingdom system including Gram positive and Gram negative bacteria.
3. Morphology and ultra structure of bacteria.

Unit-II

1. Microbial Ecology and Evolution.
2. Environmental Effects on Microbial Growth.
3. Concepts of Microbial Biodiversity: Physiological, Genetic and Species.

Unit-III

1. Microbial interactions: Neutral, Beneficial & Harmful.
2. Microbial Aspects of Biogeochemical Cycles – Carbon & Nitrogen.
3. Concept & application of Metagenomics.

Unit-IV

1. Methods Used in Environmental Studies- BOD, COD and DO, MPN Test.
2. Methanogenesis and Methanotrophy
3. Eutrophication and Algal Bloom.

Unit-V

1. Bioleaching and its Application.
2. Heavy Metals Toxicity, Bioremediation, Phytoremediation, Biodegradation
3. Extremophiles: Acidophilic, Alkalophilic, Thermophilic Microbes

References

1. Principles of Microbial Ecology by Brock, TD, Edition 3rd, Prentice-Hall.
2. Microbial Ecology - Fundamentals and application by Atlas and Bartha, Edition 4th Benjamin Cummings.
3. Dubey, R.C.and Maheshwari, D.K., A Text Book of Microbiology, S. Chand Publications, New Delhi.
4. A text book of Ecology and Environment by P D Sharma.

PRACTICALS

1. Isolation and enumeration of microorganisms from given samples.
2. Different biochemical tests to identify the unknown microbial culture in the given sample.
3. Study of different sterilization techniques and sanitation.
4. Gram staining, Isolation and Identification of bacteria in food quality control.
5. pH estimation of food.
6. Buffer Preparation.
7. Experiments on properties of monosaccharides.
8. Experiments on properties of amino-acids.
9. Effect of salt concentration/ temperature/pH on microbial growth.
10. To prepare growth curve of bacteria
11. Lactophenol cotton blue mounting for fungus.
12. Endospore / capsule/ flagella staining.
13. Isolation of nitrogen fixing bacteria.
14. Isolation and identification of coliforms from water by presumptive, confirmed & completed test.

SEMESTER-II

FOOD AND DAIRY TECHNOLOGY

Unit-I

1. History and Evolution of Food and Dairy Processing Industries in India.
2. Food & Dairy Products as Milk Powder, SCM, Cream, Butter, Ghee, Ice-Cream, Infant Formulae, Sea food.
3. Food Preservation- Freezing & Thermal Process, Canning, Pickling, Cold Storage, Frozen Food Storage.

Unit-II

1. Principles and applications of Hurdle technology.
2. Food packaging- Objectives, lacquer, Labeling Laws Printing, Barcode, Codex.
3. Testing Procedures for Packaged Foods, Confectionary Products, Importance and Functions of Quality Control.

Unit-III

1. Types of hazards associated with food and dairy industries.
2. Introduction of ISO, HACCP, GMP, GHP, QMS, TQM, BIS, AG Mark, Kaizen, Food Additives.
3. Bio Fermentor, Probiotics and Prebiotics, Vinegar, Beer, Wine, Sauerkraut, Tempeh, Soya Sauce.

Unit-IV

1. Dairy Management and Entrepreneurship,
2. Issues & Challenges of Food and Dairy Industries.

Unit-V

1. Modern ICT Tools in Food and Dairy Extension.
2. Ethical consideration in food products

References

1. Food Microbiology; WC Frazier; Tata McGraw Hill, Delhi
2. Microbiology, Pelczar, Chan and Krieg, Tata McGraw Hill, Delhi
3. Basic Food Microbiology, Bannett, Chapman and Hall
4. Food Microbiology; M. R. Adams
5. Principles And Practices of Dairy And Food Technology, HH Pandey

BIOPROCESS AND FERMENTATION TECHNOLOGY

Unit-I

1. Introduction to fermentation Processes, Major types of organisms used in fermentation.
2. Microbial growth kinetics,
3. Batch culture, Continuous Culture, Fed-Batch Types, applications, fermentation kinetics.

UNIT III

1. Fermentor: Construction, design and Types
2. Control of fermentation, requirements for control, design of a fermentation control systems, sensors and controllers, control of incubation, aeration and agitation
3. Sterilization of air and fermentor system

UNIT II

1. Isolation, preservation and improvement of industrially important microorganisms,
2. Fermentation media: media formulation: Various substrate: Carbon and Nitrogen sources, Screening of various media, Typical media
3. Development of inoculum for industrial fermentations.

Unit-IV

1. Scale up fermentation process, Recovery and purification of fermented product
2. Downstream Processing: Biomass separation by centrifugation; filtration; flocculation and other methods; Cell disintegration: Physical; chemical and enzymatic methods;
3. Industrial production of alcohol and alcoholic beverages (Beer and Wine).

Unit-V

1. Industrial production of Penicillin and Streptomycin.
2. Industrial production of organic acids: Lactic acid and Citric acid.
3. Industrial production of Vitamin B12 and Riboflavin and Single Cell Protein (SCP).

References

1. Principles of fermentation Technology by Stanbury PF, Whitaker A and Hall SJ.
2. Industrial Microbiology by Casida LE. Wiley Eastern Limited.
3. Biotechnology - A text book of Industrial Microbiology Wulf Crueger & Anneliese Crueger.
4. Prescott and Dunn's Industrial Microbiology by Reed, G, CBS Publishers & Distributors.

GENETIC ENGINEERING AND GENETICALLY MODIFIED FOOD

Unit I

1. Introduction and steps of Recombinant DNA Technology, Enzymes used in DNA technology: DNA manipulating enzymes (Restriction Endonucleases , Polymerases, Kinases, Ligase and Phosphatases Nucleases).
2. Cloning vectors used in recombinant DNA technology: Plasmids, Phasmids, Cosmids, Artificial chromosomes, Shuttle vectors and Expression vectors,
3. Application of Recombinant DNA technology in health and food industry.

Unit II

1. Isolation and purification of nucleic acid, Separation of nucleic acid by ultracentrifugation. Electrophoresis.
2. Gene transfer methods: Electroporation , Microinjection, lipofection.

Unit III

1. Introduction and steps of Polymerase Chain Reaction (PCR): Principle, types and its application.
2. Nucleic acid hybridization: Principle, technique applications of hybridization: various types of blotting techniques, Microarray based detection.

Unit IV

1. Molecular Markers: Principles, types and application,
2. DNA sequencing method: Sanger's method, Maxam and Gilbert Method, Automated method.
3. Transgenic technologies and their applications.

Unit V

1. **Recombinant DNA Technology in Foods and crops.** Genetically engineered proteins: Bovine Somatotropin in Milk; Genetically engineered bacteria: Transgenic plants: Resistant crops. Edible vaccines: Cholera vaccine in potatoes; Transgenic animals.
2. Genetically Modified Food: Its uses, advantages, disadvantages and Future Prospects.

References

1. Biotechnology. Singh, B. D.
2. Gene Cloning and DNA Analysis by TA Brown. Blackwell Publishing, Oxford, U.K.
3. Molecular Biotechnology by Glick BR and Pasternak JJ. ASM Press Washington D.C.
4. Principle of gene cloning by Old and primrose VthEds.
5. S B Primrose and R M Twyman Principles of Gene Manipulation and Genomics Seventh edition 2006 Blackwell Publisher, Australia.

FOOD NUTRITION AND AGRO TECHNOLOGY

Unit-I

1. Ecology - definition, division and significance.
2. Soil Types of India, Agro Climatic Zones, Global warming and greenhouse effect.
3. Crop Rotation, Biogeochemical Cycles – Carbon & Nitrogen.

Unit-II

1. Microbial technology: Biofertilizers, Biofuel, Bioplastic.
2. Rhizosphere & Microbial flora of Soil, Soil and water pollutants.
3. Classification and Causes of plant diseases,

Unit-III

1. Basic Concept of Integrated Pest Management
2. Weed Control measures.
3. Heavy metal contamination of environments.

Unit-IV

1. Nutritional value of Cereals.
2. Vital link between nutrition and health
3. Functional foods of plant & animal origin: sea foods, egg, Milk, Vegetables, Nuts, spices, Probiotics

Unit-V

1. Artificial Intelligence in modern Agro practices.
2. Environmental policies and laws in India
3. Significance of Indian biodiversity.

References

1. Microbial Ecology (Basic Microbiology) by CAMPBELL
2. Fundamentals and application by Atlas and Bartha, Edition 4th Benjamin Cummings.
3. Dubey, R.C.and Maheshwari, D.K., A Text Book of Microbiology, S. Chand Publications, New Delhi.
4. Fundamental Agricultural Microbiology by K.R. Aneja.

PRACTICALS

- 1.** MBRT of various milk samples and their standard plate counts.
- 2.** Isolation of bacteria and fungi from bread, spoiled fruits and vegetables.
- 3.** Culture transfer techniques, isolation of pure cultures.
- 4.** Microbial isolation and screening. Isolation of antibiotic producing organism.
- 5.** Bacterial growth curve studies.
- 6.** Extracellular activities of micro organisms- amylase, gelatinase, lipase, caseinase.
- 7.** Qualitative study of enzyme activity
 - i.** Effect of pH, Temperature, Substrates, Inhibitor on enzyme activity.
- 8.** Enzyme kinetics – Km, Vmax, Specific activity and activity determination.
- 9.** Isolation of Genomic DNA from Bacterial Cell.
- 10.** Agarose Gel Electrophoresis.
- 11.** Determination of purity and quantity of DNA sample.
- 12.** Isolation of Rhizospheric Microbial sps.
- 13.** Microscopic study of pathogens by preparing slides