

तार : विश्वविद्यालय  
Gram : UNIVERSITY



टेलीफोन : कार्यालय : 2320496  
कुलसचिव : निवास : 2321214  
फैक्स : 0510 : 2321667

# बुन्देलखण्ड विश्वविद्यालय, झाँसी BUNDELKHAND UNIVERSITY, JHANSI

झाँसी (उ.प्र.) 284128

संदर्भ.....

दिनांक 24/06/22

## The Minutes of Meeting of BOS

In reference to the BOS of department of .....  
..... *Biotechnology* ..... , Institute of *J.C. Bose Institute*  
..... *of Life Sciences* ..... held on 24/06/22 regarding the  
revision of syllabus in tune with CBCS/NEP-2020 and subsequent  
approval from Academic Council. This is to certify that the syllabus is  
100% revised.

*Ans!*  
Registrar  
Bundelkhand University  
JHANSI

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24/06/22  
HOD/Coordinator  
Department of Biotechnology  
Bundelkhand University  
Jhansi-284128 (U.P.)

**DEPARTMENT OF BIOTECHNOLOGY  
BUNDELKHAND UNIVERSITY, JHANSI  
BOARD OF STUDIES (BOS)**

**IN ACCORDANCE WITH NATIONAL EDUCATION POLICY - 2020**

Name of the course- B.Sc. (Hons) Biotechnology Subject- Biotechnology Faculty: Faculty of Science									Date of BOS- 24/06/2022
S. No.	Bos member	Designation	Feedback of students	Revision of syllabus (mentioned in percentage)	Credit course	Noncredit course	Multidisciplinary course	Vocational/skilled orientation course	Name of value-added course with title (semester wise)
1	Prof. Shailendra Kumar (External 1)	Professor	Yes	100% (As implemented NEP2020)	Yes	Yes	Yes	Yes	1. Food and Nutrition (Semester-I) 2. First Aid and Health (Semester-II) 3. Human Values and Environment Studies (Semester-III) 4. Physical Education and Yoga (Semester-IV) 5. Analytic Ability and Digital Awareness (Semester-V) 6. Communication Skills and Personality Development or Character Building (Semester-VI)
2	Shree Bhanu Pratap Singh (External 2)	In-charge, Parag Dairy, Jhansi							
3	Prof. R. K. Saini, (Dean Science and Convener)	Professor							
4	Dr. Jose Mathew (Internal 1)	Assistant Professor							
5	Dr. Vinay Singh Chauhan (Internal 2)	Assistant Professor							
6	Dr. Bhanumati Singh (Internal 3)	Assistant Professor							
7	Dr. Sarvendra V. Singh (Internal 4)	Assistant Professor							
8	Dr. Hemant Kumar (Internal 5)	Assistant Professor							

*Hemant*  
*Shree Bhanu*

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24/06/2022

*Shailendra*  
24/06/2022

Internal members

Dean Science and Convener

External members

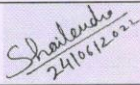
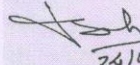
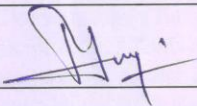
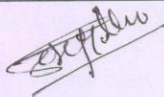
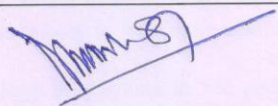
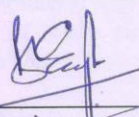
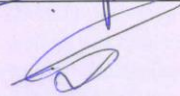
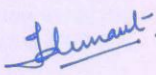
**Department of Biotechnology**  
**Bundelkhand University- Jhansi 284128 (UP)**

**Minutes of Board of Studies (BOS) of Department of Biotechnology on 24<sup>th</sup> June 2022**

As per Bundelkhand University notification given regarding Board of studies (BOS) meeting of the department of Biotechnology, J C Bose institute of Life Sciences, session 2022 vide letter number: पत्रांक - बुवि०/एके०/2022/7496-7506 dated 12/07/2022.

The agenda of the BOS of Biotechnology session 2022-23 on 24<sup>th</sup> June 2022

1. Implementation of NEP2020 in B.Sc. (H) Biotechnology (Undergraduate) and M.Sc. Biotechnology (Post Graduate) course/programmes from academic session 2022-23
2. Developing curriculum and syllabus of B.Sc. (Hons.) and M.Sc. Biotechnology course/programmes under NEP2020
3. Panel of experts for the Undergraduate and Post graduate programme under NEP2020
4. Panel of experts for the B.Sc. (H) Biotechnology and MSc. Biotechnology old pattern for session 2022-23.

Sr. No.	Name of BOS members	Signature
<b>External Members: The external members have joined the BOS meeting 'ONLINE MODE'</b>		
1	Prof. Shailendra Kumar, Department of Microbiology, Ram Manohar Lohia Avadh University, Faizabad, UP	 24/06/2022
2	Shree Bhanu Pratap Singh, In-charge, Parag Dairy Jhansi, UP	 24/06/2022
Convener of BOS		
3	Prof. R. K. Saini, Dean Science	
Internal members		
4	Dr. Jose Mathew, Assistant Professor	
5	Dr. Vinay Singh Chauhan, Assistant Professor	
6	Dr. Bhanumati Singh, Assistant Professor	
7	Dr. Sarvendra V. Singh, Assistant Professor	
8	Dr. Hemant Kumar, Assistant Professor	

**Department of Biotechnology  
Bundelkhand University- Jhansi 284128 (UP)**

**Minutes of Board of Studies (BOS) of Department of Biotechnology on 24<sup>th</sup> June 2022**

As per Bundelkhand University letter no. बुंवि०/एके०/2022/7496-7506 dated 12/07/2022 regarding Board of Studies (BOS) meeting of the department of Biotechnology, J C Bose institute of Life Sciences, Meeting was held on 24<sup>th</sup> June 2022 at Bundelkhand University, Jhansi in the presence of BOS members.

The following decision have been made in the BOS meeting and approved by the BOS members.

- 1- Ordinance and general rules, regulation and guidelines as per National Education Policy 2020 (NEP2020) for the Bachelor in Honours (Semester System) programme in Biotechnology shall be provided by Bundelkhand University Jhansi, UP and will be implemented accordingly from session 2022 onwards.
- 2- The Ordinance which will be provided (and implemented from session 2022 onwards) by Bundelkhand University Jhansi UP will supersedes all the previous relevant ordinance, rules and regulations.
- 3- The syllabus, course content and panel experts of Major III elective (Table 3a), Minor I GE (Table 4), Minor II (SEC/AEC- Table 5) and Minor III (Value-added course -Table 6) except syllabus of Biotechnology (Table 3a, Major 3 for Science (DSE) for undergraduate course science discipline and Tools and techniques in Bioinformatics (Table 4) GE or Minor 1 for science, commerce and arts discipline for undergraduate courses will be as provided by the Bundelkhand University, Jhansi (UP) and implemented accordingly.
- 4- The syllabus and panel of experts for syllabus of Biotechnology (Table 3a, Major 3 for Science (DSE) for undergraduate course science discipline and Tools and techniques in Bioinformatics (Table 4) GE or Minor 1 for science, commerce and arts discipline for undergraduate courses has been submitted and approved by the BOS members which will be implemented by Bundelkhand University, Jhansi for courses of science, commerce and arts discipline as required.
- 5- The syllabus and panel of experts for Major 1 (DSC1) and Major 2 (DSC2) and Major 3 (DSC3) as well as practicals (Lab techniques) I, II and III and training for undergraduate has been submitted and approved by the BOS members for academic session 2022-23 as per NEP2020.
- 6- The panel of experts for BSc. (H) Biotechnology programme as old pattern has been submitted and approved by the BOS members for academic session 2022-23.
- 7- The syllabus, course content and panel experts of Minor elective for post graduate programme will be as provided by the Bundelkhand University, Jhansi (UP) and implemented accordingly.
- 8- The syllabus and panel of experts for Major 1 (DSC1) and Major 2 (DSC2), Major 3 (DSC3), Major 4 (DSC4) and major 5(DSC5) as well as practicals (Lab techniques) I and II and Research project/training for post graduate has been submitted and approved by the BOS members for academic session 2022-23 as per NEP2020.
- 9- The panel of experts for M.Sc. Biotechnology programme as old pattern has been submitted and approved by the BOS members for academic session 2022-23.

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24/06/2022



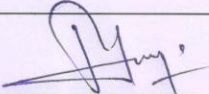
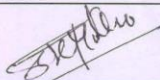
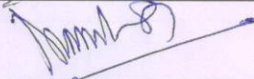
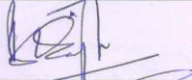
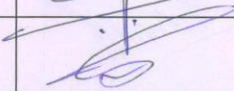
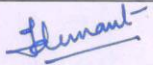
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10- The duration of training and report submission for undergraduate and post graduate programme (programme under NEP 2020) shall be of three weeks as per departmental time table schedule.

11- The curriculum and syllabus of undergraduate and post graduate programme (Under NEP 2020) have been approved by the BOS members.

12- All the suggestions and directions provided by BOS members have been incorporated.

**All the decision mentioned have been incorporated and approved by BOS Members.**

Sr. No.	Name of BOS members	Signature
<b>External Members: The external members have joined the BOS meeting 'ONLINE MODE'</b>		
1	Prof. Shailendra Kumar, Department of Microbiology, Ram Manohar Lohia Avadh University, Faizabad, UP	 24/06/2022
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DEPARTMENT OF BIOTECHNOLOGY, BUNDELKHAND UNIVERSITY – JHANSI



**SYLLABUS  
OF  
B.Sc. (Hons.) BIOTECHNOLOGY (NEP2020)**

**TO BE IMPLEMENTED FROM THE ACADEMIC SESSION  
2022-23 ONWARDS**

**DEPARTMENT OF BIOTECHNOLOGY  
BUNDELKHAND UNIVERSITY– JHANSI  
UTTAR PRADESH – 284128, INDIA**

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**Programme Outcome (P. O.)**

The B.Sc. (H) Biotechnology programme of Bundelkhand University aims to train the students in various theoretical and practical principles for the study and research in the field of Biology, Agriculture, Pharmaceutical, Industrial and Clinical research. The students in this program acquire deep knowledge and critical thinking skills for conducting advanced research and understand the necessary knowledge and concepts of biotechnology and its applications in related areas. Understand the ability to apply biotechnological knowledge in practical or experiment design, which students can conduct independently, employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of experiment. To solve the problems of related subject and think methodically, independently and draw a logical conclusion. Create an awareness of the impact of biotechnology on the environment, society, and development outside the scientific community. Comprehend about the introduction and history of biotechnology.

**Programme Specific Outcomes (PSOs)**

PSO1: Students will be able to demonstrate their knowledge of Cell Biology, Microbiology, Biostatistics and Biotechniques to solve various problems in Biotechnology. The cell biology and basic structural and functional study of prokaryotic and eukaryotic cells. Acquire knowledge in domain of biotechnology enabling their applications in industry and research.

PSO2: Students will be able to gain deep knowledge in cell biology

PSO3: Students will be able to gain fundamental knowledge in techniques commonly used in Biotechnology laboratories and their uses.

PSO4: Students will be able to learn the fundamentals of Biostatistics and different test applied in biological research.

PSO5: Students will be able to gain understanding of microbes and microbiology in the field of biotechnology.

PSO6: Acquire knowledge of biotechnology through theory and practical

PSO7: Understand good laboratory practices and safety and Develop research-oriented skill

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24/06/2022

National Education Policy -2020

DEPARTMENT OF BIOTECHNOLOGY  
BUNDELKHAND UNIVERSITY, JHANSI

SYLLABUS FOR THE “CERTIFICATE IN BIOTECHNOLOGY”

(B.Sc. First year)

(Total Credits in First Year: 46)

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*[Signature]*

*[Signature]*

*[Signature]*  
24/06/2022

*Shailender*  
24/06/2022



First Year – 1<sup>st</sup> Semester

1. DSC1 - CELL BIOLOGY (101)

Paper Type – Theory

Teaching Hours –60

Paper Type – Discipline Specific Core

Total Credits -4

**Course Objectives:**

Understand cells of prokaryotic and eukaryotic system and their organelle's structure and functions. Aspects of cell cycle its components and its control. To introduce the fascinating mechanism of biological membrane transport

**Course Outcome**

After successful completion of the course student will be able to understand.....

CO1: cell theory and types of cells, structural and functions of cell organelles

CO2: biological membrane transport system, active and passive transport

CO3: Overview of cell cycle, Cell division Mitosis and Meiosis

**Syllabus and lecture Plan:**

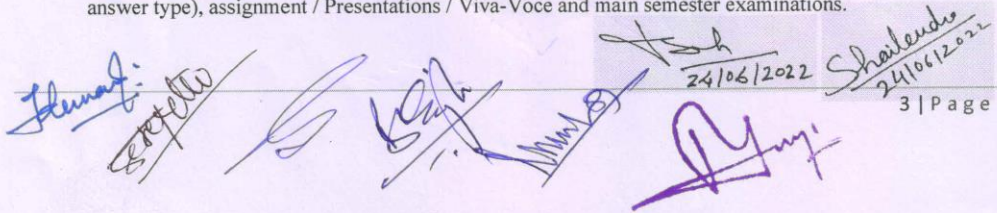
Unit	Unit content	No. of Hours (L50+T10+P0)
Unit I - Introduction	Cell as a basic unit of living organisms. Cell theory. Prokaryotic and Eukaryotic cells. Difference between animal and plant cells.	5 + 1
Unit II - Structure and function of cell organelles.	Golgi bodies. Endoplasmic reticulum. Mitochondria, Ribosomes, Lysosomes, Chloroplast, Peroxisomes, Glyoxisomes, Cytoskeletal elements. Nuclear membrane, Nucleolus.	15 + 4
Unit III - Biological membranes and transport.	Types and cellular location. Chemical composition. Function of biomembranes. Energy transduction. Signal transduction. Nutrient transport across membranes Porines and facilitated diffusion. Symport, antiport and uniport. Active transport, proton and Na <sup>+</sup> -K <sup>+</sup> pumps	20 + 4
Unit IV - Cell cycle	Cell cycle, different phases of cell cycle and cell division- mitosis and meiosis.	10 + 1

**References Books:**

- Molecular Biology of The Cell, Alberts, B., Johnson, A., Lewis, J., (Author), Raff, M., Roberts, K. and Walter, P. (2008) 5th edition, Garland Science, New York
- Molecular Cell Biology, Lodish, H., Berk, A., Kaiser, C.A. and Krieger, M. (2007) 6th edition, W.H. Freeman & Co., New York
- Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
- De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
- Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
- Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

**Teaching Methodology** – Class room lectures, PowerPoint presentations, online class/E-Content, etc.

**Evaluation Criteria – Written** Internal Sessional examinations (MCQ / one word answer / short answer type), assignment / Presentations / Viva-Voce and main semester examinations.


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2. DSC 2- BIOCHEMICAL TECHNIQUES (102)

Paper Type – Theory Teaching Hours –60  
 Paper Type - Discipline Specific Core Total Credits -4

**Course Objectives:**

To provide detailed knowledge of techniques used in biological research and industries. Understanding bio-techniques is essential to strengthen the knowledge of the candidate desired to work in the field of biotechnological research, development and manufacturing. Learning bio-techniques is important for students of all fields of life sciences

**Course Outcome**

After successful completion of the course student will be able to understand....

- CO1: Various types of spectroscopy techniques and its applications
- CO3: Role and types of electrophoresis methods used in separating Biomolecules
- CO4: Various Chromatographic techniques and their applications
- CO5: Centrifugation techniques in biochemistry
- CO6: Radio isotopes, its properties and applications

**Syllabus and Lecture plan:**

Unit	Unit content	No. of Hours (L50+T10+P0)
Unit I - Spectroscopic techniques	Colorimetry, Beer-Lambert law, Principles, instrumentation and application of UV-Visible spectrophotometry, Principles and applications of Mass spectroscopy	10 + 2
Unit II - Electrophoretic Methods of Separation	Principle, types, instrumentation and applications, Agarose gel electrophoresis and Polyacrylamide (Native & SDS-PAGE), IEF	10 + 2
Unit III - Chromatography- Principles and applications	Principle, types and applications: Paper, Thin layer, Ion-exchange, GC and HPLC	10 + 2
Unit -IV - Hydrodynamic techniques	Centrifugation-principle, types and applications, sedimentation coefficient and factors affecting sedimentation, Preparative and analytical ultracentrifugation techniques	10 + 2
Unit V - Radioisotopic Techiques	Radioactivity, half-life, Units of radioactivity, Measurements of radioactivity, Geiger Mueller counter, gamma counter, Liquid Scintillation counter. Autoradiography, Safety measure in handling radioisotopes.	10 + 2

**Books/Authors**

1. A Biologists guide to principles and techniques of practical biochemistry. Wilson and Goulding.
2. Instrumental methods of chemical analysis, Chatwal and Anand
3. Essentials of Biophysics. Narayanan, P.
4. Bioseparations. Principles and practices. Sivasankar, B.

**Teaching Methodology** – Class room lectures, PowerPoint presentations, online class/E-Content, etc.

**Evaluation Criteria** – Written Internal Sessional examinations (MCQ / one word answer / short answer type), assignment / Presentations / Viva-Voce and main semester examinations.


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**DEPARTMENT OF BIOTECHNOLOGY, BUNDELKHAND UNIVERSITY – JHANSI**

**3. Practical DSC1**

Paper Type – Lab Techniques 1

Total Hours - 60

Paper Type – Discipline Specific Core

Total Credits -2

S.NO.	Practical	No. of Hours (L0+T0+P60)
1	Microscopic Observation of animal cell	60
2	Microscopic Observation of plant cells	
3	Microscopic Observation of bacterial cells	
4	Microscopic observation of mitotic cell division	
5	Microscopic observation of meiotic cell division	
6	Observation of ovary cell	
7	Staining nucleus	

**Practical Methodology** – Hands on Training / Demonstration etc.

**Evaluation Criteria** – According to ordinance or written examination with Viva-Voce

**4. Practical DSC2**

Paper Type – Lab Techniques 2

Total Hours –60

Paper Type – Discipline Specific Core

Total Credits -2

S.NO.	Practical	No. of Hours (L0+T0+P60)
1	Common Instruments in laboratory	60
2	Measurement of pH of a solution	
3	Use of colorimeter	
4	Use of spectrophotometer	
5	Performing Agarose gel electrophoresis	
6	Performing Paper chromatography	
7	Use of centrifugation for preparative purposes	

**Practical Methodology** – Hands on Training / Demonstration etc.

**Evaluation Criteria** – According to ordinance or written examination with Viva-Voce

L-Lecture

T- Tutorial

P- Practical

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First Year – 2<sup>nd</sup> Semester

1. DSC1 - BIOSTATISTICS (201)

Paper Type – Theory

Teaching Hours – 60

Paper Type – Discipline Specific Core

Total Credits -4

**Course Objectives:**

Understand meaning of measures of central tendency

Importance of statistics is necessary for researchers to test their hypothesis and to analyze their experimental data to make firm conclusions

**Course Outcome**

After successful completion of the course student will be able to understand....

CO1 Diagrammatic, graphical and tabular representations of data, Measures of central tendency, dispersion, Regression and correlation, Probability, Basic concepts of hypothesis testing, Level of significance

One way and two-way ANOVA, Z test, t test

**Syllabus and Lecture Plan:**

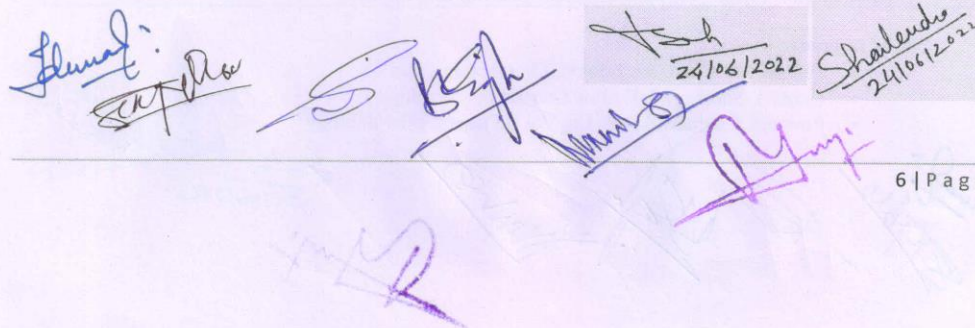
Unit	Unit content	No. of Hours (L48+T12+P0)
UNIT I- Measures of central tendency	Mean, Median, Mode, AM, GM, HM, Quartiles	8 + 2
UNIT II Measures of central dispersion	Range mean deviation, mean absolute deviation, Mean squared deviation (variance), Root-mean square deviation (Standard deviation). Coefficient of deviation Quartiles deviation	8 + 2
UNIT III Probability and distributions	Introduction, Random experiment, Sample space, Events. Theorems of probability (Addition and Multiplication). Conditional probability. Bayes theorem. Random variable and probability distributions. Binomial distribution. Poisson distribution. Applications of probability and distributions	8 + 2
UNIT IV	Tests of significance: Based on T, F, Z and chi square distributions	8 + 2
UNIT V	Analysis of variance: One-way and Two-way classification	8 + 2
UNIT VI	Correlation and Regression: Regression lines (Y on x=x on Y). Regression coefficient	8 + 2

**Reference Books:**

1. Methods in Biostatistics. Mahajan, B.K.
2. Biostatistics. Arora, P.N. and Mahajan, P.K.
3. Elements of Biostatistics. Prasad, S.
4. Practicals in Statistics. Sharma, H.L.
5. Differential Calculus. Shanti Narayan
6. Integral Calculus. Shanti Narayan
7. Fundamentals of Mathematical Statistics. Gupta, S.C., Kapoor, V.K.

**Teaching Methodology** – Class room lectures, PowerPoint presentations, online class/E-Content, etc.

**Evaluation Criteria** – Written Internal Sessional examinations (MCQ / one word answer / short answer type), assignment / Presentations / Viva-Voce and main semester examinations.


  
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2. DSC2 - Microbiology (202)

Paper Type – Theory

Teaching Hours -60

Paper Type – Discipline Specific Core

Total Credits -4

**Course Objectives:** Student will get familiar with the foundation concepts of history of Microbiology. They will gain knowledge of various (physical and chemical) methods of control of microorganisms and safety measures to be followed while handling microbes. They will be able to classify microorganisms on the basis of different modes, able to understand bacterial gene transfer methods. They will also understand mechanism of antibiotics to control microorganisms as well as the mechanisms behind antibiotic resistance. They will understand how virus is different from other microorganisms.

**Learning outcomes:**

CO1. Understand the developments in Microbiology and list the contributions of various scientists.

CO2. They will get well acquainted with morphology of bacteria

CO3. Assess the implication of various sterilisation procedures and bio safety measures in clinical labs and industries.

CO4. Acquire knowledge about antibiotics and mode of action and after how much analysis they can be used for controlling disease

CO5. They will understand how different are DNA and RNA viruses

**Syllabus and Lecture Plan:**

Unit No.	Topic/Content	Teaching Hours	
		Lecture/Tutorial (50L + 10T +0P)	
		L	T
1	Introduction to microbiology. History and scope of microbiology.	6	1
2	Classification, Morphology and Physiology of Bacteria. Classification of bacteria: Phylogenic, Adamsonian or Numerical and Genetic classification. Morphology: Size, Shape, Capsule, Pili and flagella. Structure of Gram +ve and Gram -ve Cell wall. Bacterial Growth: Growth Curve, Generation time, Quantitative measurements of bacterial growth. Continuous and Synchronous growth. Bacterial toxins: Exo and Endotoxins. Endospore forming bacteria: Aerobic and Anaerobic spore	8	3
3	Microbial Genetics Recombination in bacteria: Transformation, Conjugation, transduction and transfection.	8	1
4	Sterilization and disinfection. Methods of sterilization: Dry heat, wet heat, radiation, chemical, filtration and gaseous process. Principles and procedures. Antiseptics and disinfectants. Gases and chemicals.	8	1
5	Antimicrobial Chemotherapy. Mechanisms of action of drugs. Antimicrobial drugs. Drug resistance. Types. Mechanism of drug resistance. Drug sensitivity tests. Disc and tube dilution method.	8	1
6	Virology. Morphology and replication of viruses. General characteristics and structure. symmetry, capsids, envelope. Outline classification of Animal and plant viruses. Replication of viruses. Negative strand, positive strand. RNA and DNA tumor viruses. Bacteriophages. Lytic and Lysogenic cycle, Viroids. Prions. Virinos. Important viral diseases of man.	12	3

**List of reference books:**

- Pelczar M.J.Chan, 5th Edition, Microbiology
- Roger Y.Stanier, 5th Edition General microbiology
- Powar & Dagainawala Vol I & Vol II, General Microbiology

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DEPARTMENT OF BIOTECHNOLOGY, BUNDELKHAND UNIVERSITY – JHANSI

- Prescott L. M. Microbiology, 6th Edition
- Atlas R.M. Microbiology
- R.C. Dubey & Maheshwari, A Textbook of Microbiology, 1st Edn, 2005.
- Medical Microbiology, Anantnarayan
- Stanier, General Microbiology, 5th Edn.
- Ingraham, Introduction to microbiology, 3rd Edn
- Tortora, Microbiology: An Introduction 8th Edition.

**Teaching Methodology** – Class room lectures, PowerPoint presentations, online class/E-Content, etc.

**Evaluation Criteria** – **Written** Internal Sessional examinations (MCQ / one word answer / short answer type), assignment / Presentations / Viva-Voce and main semester examinations.

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DEPARTMENT OF BIOTECHNOLOGY, BUNDELKHAND UNIVERSITY – JHANSI

3. Practical DSC 1

Paper Title – Lab Techniques 1

Total Hours –60

Paper Type – Discipline Specific Core

Total Credits -2

List of practical:

1. In a study on patients of typhoid fever the following data are obtained. Find the arithmetic mean by the step deviation method.

Age in years	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
No. of cases	1	0	1	10	17	38	9	3

2. The following table gives the marks obtained by 80 students in Economics. Find the median.

Marks	No of students	Marks	No of students
10-14	4	30-34	7
15-19	6	35-39	3
20-24	10	40-44	9
25-29	5	45-49	6

3. Calculate the mode from the following frequency distribution.

Size (x)	4	5	6	7	8	9	10	11	12	13
Frequency (f)	2	5	8	9	12	14	14	15	11	13

4. Find  $Q_1$  and  $Q_3$  for the following data.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	5	7	10	12	15	12	6	2	8

5. Calculate the coefficient of correlation of ranks obtained by 10 students of a class in Hindi and English

Hindi	1	2	3	4	5	6	7	8	9	10
English	3	8	1	7	10	2	9	4	6	5

6. Find mean deviation from mean and coefficient of mean for the following data.

Marks	20	18	16	14	12	10	8	6
No of students	2	4	9	18	27	25	14	1

7. In a cross between Tall (TT) and dwarf (tt) 1574 tall and 554 dwarf plants were obtained. Suggest if a Mendelian ratio of 3:1 is suitable or not.
8. RBCs count lac/mm<sup>3</sup> and Hb% g/100ml of 500 persons of test locality was recorded as follows. Is there a significant relation between RBCs count and Hb%? Find it by chi – square method?


  
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**Practical Methodology** – Hands on Training/ Demonstration etc.

**Evaluation Criteria** – According to ordinance or written examination with Viva-Voce

**4. Practical DSC 2**

Paper Type – Lab techniques 2

Total Hours –60

Paper Type – Discipline Specific core

Total Credits -2

S.NO.	Practical	No. of Hours (L0+T0+P60)
1	To demonstrate the equipments to be used in microbiology lab.	60
2	To prepare cleaning recipe for the glasswares and to perform the sterilization activity for glasswares.	
3	To prepare bacterial media for routine cultivation.	
4	To perform viable counting of bacteria from given sample.	
5	To purify the bacterial culture from mixed culture.	
6	To characterize bacteria on the basis of cultural morphology	
7	To prepare slants for the preservation of bacterial cultures.	
8	To perform simple staining and gram staining for given bacterial culture.	
9	To perform MBRT test for determining bacterial load in milk sample.	
10	To characterize bacteria on the basis of oxygen requirement (catalase activity, and growth pattern in broth).	

**Practical Methodology** – Hands on Training/ Demonstration etc.

**Evaluation Criteria** – According to ordinance or written examination with Viva-Voce

**List of references:**

Microbiology. A Laboratory manual. Cappucino, J.G., Sherman, N. and Weselee  
Experiments in Microbiology, Plant Pathology and Biotechnology. Aneja, A.R  
Microbes in Action by Harry W. Seeley, Paul J. Van Demark; Freeman

*Handwritten signatures and dates:*  
Shailendra 24/06/2022  
Other signatures: [unclear], [unclear], [unclear]



Table -2 List of Honours Course

Major Bachelor in Honours Course –Major I and II) for Arts, commerce and Science (DSC)	
1	Environmental science
2	Biotechnology
3	Biochemistry
4	Microbiology
5	Biomedical sciences
6	Life sciences
7	Forensic science
8	Earth science
9	Food technology
10	B Com
11	Hindi
12	Education
13	English
14	Social work
15	Economics

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Major –III for Science (DSE)	
1	Environmental science
2	Biotechnology
3	Chemistry
4	Mathematics
5	Home science
6	Zoology
7	Forensic science
8	Earth sciences
9	Food technology
10	Agriculture microbiology
11	Agriculture biotech
12	Botany
13	Physics

Table 3a: list of Subject for Science discipline. Select anyone except the major stream given in table 2.

Major –III for B.A. (Hons) (DSE)	
1	Political science
2	Social work
3	Hindi
4	English
5	Fine Arts
6	History
7	Home science
8	Physical education
9	Education
10	Translation
11	Karyalayi hindi (basic of the official language of India)

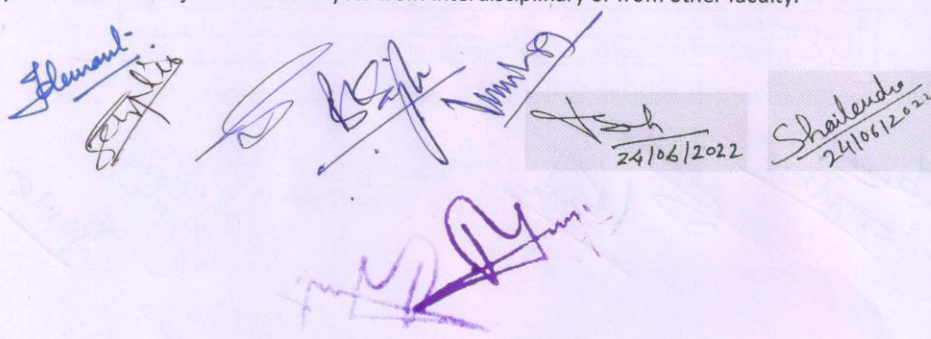
Table 3b: list of Subject for Arts discipline. Select anyone except the major stream

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- Handwritten signature in blue ink: "S. Singh" with "24/06/2022" below it.
- Handwritten signature in purple ink: "Shailendra" with "24/06/2022" below it.
- Handwritten signature in purple ink: "M. Singh" with "24/06/2022" below it.

Subject Other faculty Minor -I (GE)		
1	Agro forestry	Interdisciplinary
2	Horticulture	Interdisciplinary
3	Disaster management	Interdisciplinary
4	Fundamentals of entrepreneurship	Interdisciplinary
5	Business economics	Commerce
6	Modern political thoughts	Arts
7	Indian national movement	Arts
8	Ghandhian philosophy	Arts
9	Tribal culture	Arts
10	Social security	Arts
11	Indian arts and culture	Arts
12	Village and Panchayatiraj	Arts
13	Manuscript conservation	Arts
14	Traditional knowldge in Indian medicine and medicinal plants	Interdisciplinary
15	Alternative medicine	Science
16	Basics of electronic media	Science
17	Tools and techniques in bioinformatics	Science
18	Urban development & economic growth	Interdisciplinary
19	Non-conventional energy resource	Interdisciplinary
20	Cyber-crime (cryptograph)	Interdisciplinary
21	Dirking water quality assessment	Interdisciplinary
22	Water conservation and river linking	Interdisciplinary
23	Energy and environment	Interdisciplinary
24	Hindi shahitya ka itihas	Interdisciplinary
25	History of English literature	Interdisciplinary

**Table 4** list of Subject of GE / Minor –I for science, Commerce and Arts Select one subject for first year and other subject for second year from interdisciplinary or from other faculty.


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**Table 5** list of Skill enhancement courses for science, commerce and Arts disciplines. Select one course in each Semester for first two year (Sem –I, II, III and IV only)

(SEC/AEC) or Minor –II	
1	Hand writing document examination
2	Vedic math
3	Astrology
4	Gen stone and dimensional stone
5	Computer hardware & networking
6	Soft skill
7	Tour guide and heritage
8	Hospital management
9	Clinical diagnostics
10	Bakery and value added production
11	Tally
12	Food processing
13	Industrial microbiology
14	photography
15	Chemical sale marketing
16	Seed technology
17	Rural development
18	Community health
19	Health and hygiene
20	Organic farming

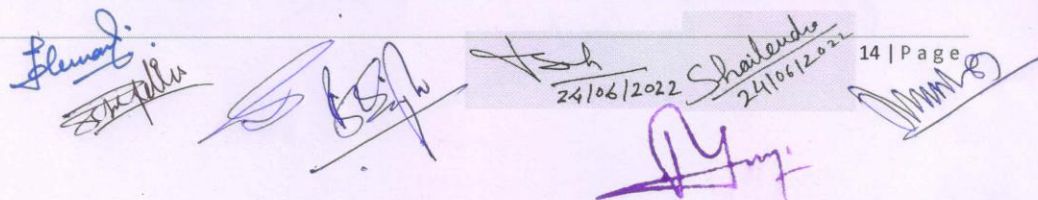
**Table 6:** list of Co-curricular courses common for science, commerce and Arts disciplines. Select one course in each Semester for three years (Sem I, II, III, IV, V and VI)

SN	Course paper	Semester
1	Food and Nutrition	(Semester-I)
2	First Aid and Health	Semester-II
3	Human Values and Environment Studies	Semester-III
4	Physical Education and Yoga	Semester-IV
5	Analytic Ability and Digital Awareness	Semester-V
6	Communication Skills and Personality Development or Character Building	Semester-VI

**Note 1-** Ordinance and general rules, regulation and guidelines as per National education policy 2020 for the Bachelor in Honours (semester system) programme in Biotechnology shall be provided by Bundelkhand University Jhansi, UP and will be implemented accordingly from 2022 onwards. The ordinance which will be provided (and implemented from 2022 onwards) by Bundelkhand University Jhansi, UP supersedes all the previous relevant ordinance, rules and regulations.

**Note 2:** Syllabus and Course content of Major III (DSE -Table 3a), Minor I (GE-Table 4), Minor II (SEC/AEC-Table 5) and Minor III (VAC-Table 6) shall be as provided by the Bundelkhand University, Jhansi.

**Note 3:** After completing 1<sup>st</sup> year (I and II semester with 46 credits) - Awarded for Certificate in Biotechnology.


  
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