

तार : विश्वविद्यालय
Gram : UNIVERSITY



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

बुन्देलखण्ड विश्वविद्यालय, झाँसी
BUNDELKHAND UNIVERSITY, JHANSI

झाँसी (उ.प्र.) 284128

संदर्भ. B.O./B.M.S./2022/Memo

दिनांक 08/07/2022

The Minutes of Meeting of BOS

In reference to the BOS of department of
Biomedical Sciences....., Institute of Biomedical Sciences,
..... B.O. held on ^{NEP} 08/07/2022 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.


08/07/2022
HOD/Coordinator
Balbir Singh
Co-ordinator
Department of Bio-Medical Sciences
Bundelkhand University
Jhansi-284128 (U.P.)

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बुन्देलखण्ड विश्वविद्यालय, झाँसी BUNDELKHAND UNIVERSITY, JHANSI

संदर्भ BU/BMS/2017/memo

झाँसी (उ.प्र.) 284128

दिनांक 23/07/2017

The Minutes of Meeting of BOS

In reference to the BOS of department of
Biomedical Sciences....., Institute of Biomedical Sciences
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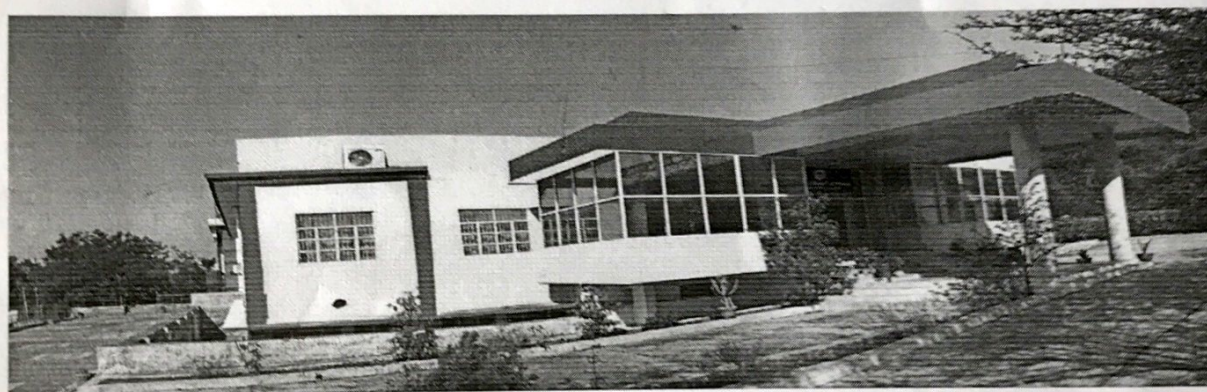
Balbir Singh
23/07/2017
HOD/Coordinator
Balbir Singh
Co-ordinator
Department of Bio-Medical Sciences
Bundelkhand University
Jhansi-284128 (U.P.)



**ORDINANCE and SYLLABUS B.Sc. (Hons.) BIOMEDICAL
SCIENCES-SEMESTER SYSTEM
PROGRAMME UNDER NEW EDUCATION POLICY -2020**

Revised in session

2022-23



**INSTITUTE OF BIOMEDICAL SCIENCES
BUNDELKHAND UNIVERSITY, JHANSI,
UTTAR PRADESH**

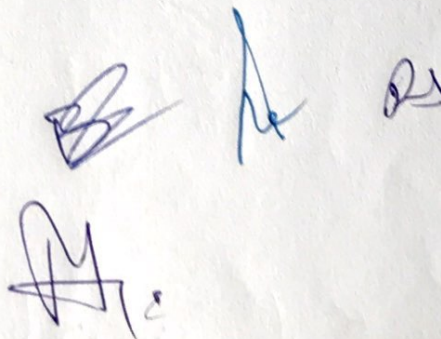
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[Handwritten signature]
(BALBIR SINGH)
[Handwritten signature]
(Dr. Ranveer)

[Handwritten signature]
Dr. Ranveer Singh

National Education Policy -2020
INSTITUTE OF BIOMEDICAL SCIENCES
BUNDELKHAND UNIVERSITY, JHANSI
SYLLABUS FOR THE DEGREE OF
"BACHELOR (Hons.) IN BIOMEDICAL SCIENCE"
(B.Sc (Hons.) BIOMEDICAL SCIENCE)

The ordinance that will be provided by the Bundelkhand University will governs all the rules and regulations as per the NEP-2020 for graduate programs B.Sc. Biomedical sciences running in the Bundelkhand University, Campus Jhansi from 2022 onwards. This ordinance supersedes all the previous relevant ordinances, rules and regulations.



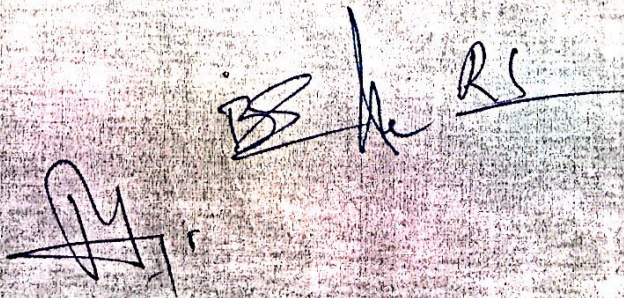
Semester Structure and Distribution of credits in undergraduate Hons. Program

Table-1

SEM -I							
SEM	Major I & II (DSC): Credit 4/5/6	Major-III (DSE): Credit 4/5/6	Minor-I(GE) Credit 4	Minor-II (SEC/AEC) Credit 3	Minor-III (VAC) qualifying	Industrial /Training	ΣCredits
-I	DSC-1 TH-I DSC-2 TH-II	DSE-1 TH-I	GE 1 -TH-1	SEC-1-TH-1	VCA-1 TH-1		25
SEM-II							
-II	DSC-3TH-I DSC-4 TH-II	DSE-1 TH-1		SEC2-TH-1	VCA-2 TH-1		21
CERTIFICATE in Faculty							
-III	DSC-5 TH-I DSC-6 TH-II	DSE-1 TH-1	GE -2 TH-1	SEC-3TH-1	VCA-3TH-1		25
-IV	DSC-7 TH-I DSC-8 TH-II	DSE-1 TH-1		SEC-4TH-1	VCA-4TH-1		21
DIPLOMA in Faculty							
-V	DSC-9 TH-I DSC-10 TH-II DSC-11TH-III	-	-		VCA-5TH-1		18
-VI	DSC-12 TH-I DSC-13 TH-II DSC-14 TH-III	-	-		VCA-6TH-1	Industrial /Training program (4)	22
BACHELOR in Hons....							
							132

EXPLANATION OF TABLE

DSC	Subject with practical (4+2) =6 Credits	Subject without practical 6 Credits
DSE	Subject with practical (4+2) =6 Credits	Subject without practical: 6 Credits
GE	4 Credits	
SEC/AEC	3 Credits	
Industrial Training	4 Credits	
VAC	Qualifying	



Ordinance and Syllabus for B.Sc. (Hons) Biomedical Science as per New Education Policy 2020

**Department of Biomedical Sciences, Bundelkhand University, Jhansi
Course Curriculum B.Sc. (Hons.) Biomedical Science (Session Year 2022-23 Onward)**

I Year

Semester <u>1st</u>	Subject Code	Subject Title	Core /Elective	Credits	Marks		
					Int.	Ext.	Total
Major 1/ DSC 1	BBMS 1	Biochemistry	Core	4	25	75	100
Major 2/ DSC2	BBMS 2	Human physiology and Anatomy- I	Core	4	25	75	100
DSC 1	Practical-I	Biochemistry	Core	2	25	75	100
DSC2	Practical-II	Human physiology and Anatomy-I	Core	2	25	75	100
Major 3	DSE	Student shall select anyone paper from given Table- 3a (except major stream given in table 2a.)	Elective	6	25	75	100
Minor 1	GE 1	From table 4 (Select one subject for first year and other subject for second year from interdisciplinary or from other faculty)	Elective	4	25	75	100
Minor 2	SEC 1	From table 5 (Select one course in each Semester for first two year (Sem -I, II, III and IV only)	Elective	3	25	75	100
Minor 3	VAC 1	Food and Nutrition (Table- 6)		Qualifying			
				Total=25			700
<u>Semester-II</u>							
Major 1/ DSC 1	BBMS 3	Laboratory Diagnostics and Management	Core	4	25	75	100
Major 2/ DSC 2	BBMS 4	Human physiology and Anatomy II	Core	4	25	75	100
DSC 1	Practical- III	Laboratory Diagnostics and Management	Core	2	25	75	100
DSC2	Practical- IV	Human physiology and Anatomy II	Core	2	25	75	100
Major 3	DSE	From table 3a (Select anyone except the major stream given in table 2a)	Elective	6	25	75	100
Minor 1	SEC 2	From table 5 (Select one course in each Semester for first two year (Sem -I, II, III and IV only)	Elective	3	25	75	100
Minor 2	VAC 2	First Aid and Health (Table- 6)		Qualifying			
				Total=21			600

Total Credit in first year (Sem. 1 and sem 2) = 25+21= 46.

DSC- Discipline specific core; DSE -Discipline specific elective; GE- Generic elective;

AEC- Ability enhancement course; SEC- Skill enhancement course; VAC- Value added course

B. Singh

M. K.

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2nd Year

Semester- III	Paper	Paper Title	Paper Code Core /Elective	Credits	Marks		
					Int.	Ext.	Total
Major 1/ DSC 1	BBMS 5	Medical Microbiology	Core	4	25	75	100
Major 2/ DSC2	BBMS 6	Cytology	Core	4	25	75	100
DSC 1	Practical- V	Medical Microbiology	Core	2	25	75	100
DSC2	Practical- VI	Cytology	Core	2	25	75	100
Major 3	DSE	From table 3a (Select anyone except the major stream given in table 2a)	Elective	6	25	75	100
Minor 1	GE 3	From table 4 (Select one subject for first year and other subject for second year from interdisciplinary or from other faculty)	Elective	4	25	75	100
Minor 2	SEC 3	From table 5 (Select one course in each Semester for first two year (Sem -I, II, III and IV only)	Elective	3	25	75	100
Minor 3	VAC 3	Human values and Environment (Table- 6)		Qualifying			
				Total=25			700
Semester- IV							
Major 1/ DSC 1	BBMS 7	Pharmacology and Toxicology	Core	4	25	75	100
Major 2/ DSC2	BBMS 8	Immunology & Immunodiagnostics	Core	4	25	75	100
DSC 1	Practical- VII	Pharmacology and Toxicology	Core	2	25	75	100
DSC2	Practical- VIII	Immunology & Immunodiagnostics	Core	2	25	75	100
Major 3/DSE		From table 3a (Select anyone except the major stream given in table 2a)	Elective	6	25	75	100
Minor 2	SEC 4	From table 5 (Select one course in each Semester for first two year (Sem -I, II, III and IV only)	Elective	3	25	75	100
Minor 3	VAC 4	Physical education and Yoga (Table- 6)		Qualifying			
Total Credit in 2nd year (Sem. 3 and Sem. 4) => 25+21=46				Total=21			600

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<u>Semester-V</u>	Paper	Paper Title	Paper Code-Core /Elective	Credits	Marks		
					Int.	Ext.	Total
Major 1/DSC 1	BBMS 9	Clinical Biochemistry	Core	4	25	75	100
Major 2/ DSC 2	BBMS 10	Pathology	Core	4	25	75	100
Major 3/ DSC 3	BBMS 11	Biomedical Instrumentation & Analytical Techniques	Core	4	25	75	100
DSC 1	Practical-IX	Clinical Biochemistry	Core	2	25	75	100
DSC 2	Practical-X	Pathology	Core	2	25	75	100
DSC 3	Practical-XI	Biomedical Instrumentation & Analytical Techniques	Core	2	25	75	100
Minor 3	VAC 5	Analytical ability and digital awareness (Table- 6)		Qualifying			
				Total=18			600
<u>Semester-VI</u>							
Major 1/DSC 1	BBMS 12	Medical Biotechnology	Core	4	25	75	100
Major 2/ DSC 2	BBMS 13	Pharmacy & Pharmaceuticals	Core	4	25	75	100
Major 3/ DSC 3	BBMS 14	Medical Genetics	Core	4	25	75	100
DSC 1	Practical-XII	Medical Biotechnology	Core	2	25	75	100
DSC 2	Practical-XIII	Pharmacy & Pharmaceuticals	Core	2	25	75	100
DSC 3	Practical-XIV	Medical Genetics	Core	2	25	75	100
	Industrial /Training Program			4	25	75	100
Minor 3	VAC 6	Student shall select anyone paper from given Table- 6		Qualifying			
				Total=22			700
<ol style="list-style-type: none"> 1. After completion of First Year (Semester 1 and 2) student will be awarded 'Certificate in Biomedical science'. 2. After completion of Second Year (Semester 3 and 4) student will be awarded 'Diploma in Biomedical science'. 3. After completion of Third Year (Semester 5 and 6) student will be awarded 'Bachelor(Hons.) in Biomedical science'. 4. Students have to complete a compulsory Industrial Training as per departmental time table. 5. Total credits in all three years = 132 (46+46+40). 							

B.Sc. (Hons.) Biomedical Science (Semester I)

Title of paper: Biochemistry

Type: Major DSC 1/ Core 1

Total Credit: 04

Total hours: 60 L/T/P

Course objectives: To provide knowledge of various Bio-molecules structure and functions present in the human body for understanding the normal functioning and their significance in maintaining the normal health.

Course learning outcome: After course completion student will learn the use of Biochemistry in Medicine.

2. Knowledge of various Biochemical processes, their functioning, understanding of underlying cause of disorders and metabolic changes caused in different diseases.

Sr. No.	Unit No.	Syllabus Content	Hours (L/T/P)
1	Unit I.	Introduction to Biochemistry, Use of Biochemistry in Medicine. Carbohydrates and its metabolism: Structure & classification of carbohydrates-monosaccharide, Oligosaccharides, disaccharides, trisaccharides, polysaccharides. Biological & Medical importance of oligosaccharides, Polysaccharides. Glycolysis, Aerobic Respiration, Krebs's Cycle, Oxidative phosphorylation, Pentose Phosphate Pathway, Gluconeogenesis, Glycogenesis, Glycogenolysis	10
2	Unit II.	Lipids and Metabolism: Introduction, classification, nomenclature, structure and properties of Fatty acids: saturated and unsaturated fatty acids. Essential and non-essential fatty acids, triacylglycerol, rancidity of fats. Biological & Medical significance of fats. Fatty Acid Synthesis, Biosynthesis and Degradation of Cholesterol, Formation of Ketone Bodies.	10
3	Unit III.	Amino acids: Introduction, classification based on their solubility, shape, composition and functions, amino acids as zwitter-ion in aqueous solution, Structure and formation of peptide bonds. Amino Acids Catabolism, Nitrogen Excretion and Urea Cycle.	10
4	Unit IV.	Proteins: Protein structure: primary structure of proteins, secondary structure of proteins- helix and pleated sheets, tertiary structure of proteins, forces stabilizing the tertiary structure and quaternary structure of proteins. Denaturation and renaturation of proteins..	10
5	Unit V.	Nucleic acids: Nature of genetic material; evidence that DNA is the genetic material, Composition of RNA and DNA, features of DNA double helix. Denaturation. Different types of RNA and DNA. <i>Nucleotide Synthesis-</i> Salvage Pathway and de novo Pathway, <i>Nucleotide Degradation-</i> Formation of Uric Acid.	10
6	Unit VI.	Enzymes: History, general characteristics, nomenclature, classification. Definitions of holoenzyme, apoenzyme, coenzymes, cofactors, activators, inhibitors, active site, metallo-enzymes, specific enzymes, isoenzymes, monomeric enzymes, oligomeric enzymes and multi-enzyme complexes. Units of enzyme activity.	10

- BOOKS RECOMMENDED:** (1) *Biochemistry by U. Satyanarayana and U. Chakrapani*
 (2) *Principle of Biochemistry: Lehninger by Nelson & Cox*
 (3). *Biochemistry by T. A. Brown*

4. *Biochemistry by Harper*

Teaching Methodology

- (1) Class Room Lectures (2) Powerpoint presentations
 (3) Class seminars, Quizzes, assignments (4) Demonstrations, etc.

Evaluation Criteria:

- (1) MCQ based Internal Assessments
 (2) Group Discussion, Class Seminars
 (2) MCQ/Objective type question-based final assessment or as decided by the University.

Title of paper Practical I : Biochemistry

Type: Major DSC 1/ Core 1

Total Credit: 02

Total hours (Hrs): 30 Hrs

Sr. No.	List of Practicals	Hrs= 30
1	To study the various laboratory safety rules.	
2	To study various glass ware, plastic ware, equipment and instrument used in laboratory.	
3	Preparation of molar, molal and percentage solution .	
4	Preparation of w/w, w/v, and v/v solutions.	
5	Preparation of buffer solution and measurement of pH by pH strip.	
6	Detection of starch by color reaction.	
7	Activity of salivary amylase enzyme.	
8	To study the working principal of colorimeter.	
9	Estimation of carbohydrate/ proteins by colorimeter.	

List of Reference Books

1. *Text Book of Practical by S K gupta.*
2. *Text Book of Practical by S P Singh.*

Teaching Methodology

Practical learning in Laboratory through scientific Model/ instruments and experiments.

Evaluation Criteria:

- (1) Performance of practicals
- (2) Spotting, preparation of model, scientific charts.
- (3) Practical records, Viva Voce




Major 2/ DSC2 CORE:

Title of paper: Human Physiology and Anatomy-I

Total Credit: 04

Total hours: 60 L

Course objectives: To provide knowledge of various physiological systems of the human body for understanding the normal functioning and role of different systems in maintaining the homeostasis.

Course learning outcome: Knowledge of various Physiological systems, their functioning, roles in Homeostasis, related disorders and changes caused in different diseases.

Sr. No.	Unit No.	Syllabus Content	Hours (L/T/P)
1.	A	Functional organization of human body, control of internal environment. Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Skeletal System; Structure and function of Skelton .Classification of joints and their function. Joint disorders.	5
2.	B	Muscle Physiology: Physiology and anatomy of skeletal muscle, molecular mechanism of muscle contraction, Excitation-contraction coupling, abnormalities.	10
3.	C	Nerve physiology: Physiology and anatomy of nervous system, structure of nerve cells, Origin and conduction of membrane potential, excitation of nerve fiber, basic functions of synapses, saltatory nerve transmission.	5
4.	D	Sense Organs: Physiology and anatomy of skin, eye and ear, physiology of vision, hearing, taste, smell and touch. Regulation of body temperature.	15
5.	E	Body fluids: Blood, Blood Cells, lymph, composition and functions, erythropoiesis, blood groups, Rh factors, Blood coagulation, Blood Pressure, regulation of blood pressure.	10
6.	F	Cardiovascular physiology: Physiology and anatomy of cardiac muscle, structure and function of heart, circulation, origin and conduction of cardiac impulses, cardiac cycle, cardiac output, ECG, Heart sounds, angiography.	15

List of Reference Books

1. Text Book of Medical Physiology by Guyton and Hall
2. Text book of Physiology by Ganong and by Tortora
3. Instant Notes on Human Physiology by Dr. Lavkush Dwivedi

Teaching Methodology

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|--|------------------------------|
| (3) Class Room Lectures | (2) Powerpoint presentations |
| (4) Class seminars, Quizzes, assignments | (4) Demonstrations, etc. |



Evaluation Criteria:

- (3) MCQ based Internal Assessments
- (4) Group Discussion, Class Seminars

Title of paper Practical V: Human Physiology

Total Credit: 02

Type: CORE

Total hours : 30 Hrs

List of Practical	Hours
<ol style="list-style-type: none">1. Study of different human Physiological system using torso model.2. Blood group detection.3. Measurement of clotting time4. Measurement of Bleeding time.5. To measure pulmonary capacities.6. Preparation of heamin crystals.7. To perform cardiac Efficiency Test.8. Measurement of body temperature.9. To demonstrate the Hemocytometer	30 hours

List of Reference Books

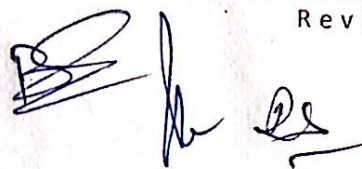
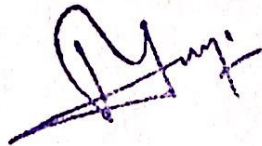
- 3. *Text Book of Practical Physiology by CL Ghai*

Teaching Methodology

Practical learning in Laboratory through scientific experiments

Evaluation Criteria:

- (4) Performance of practicals
- (5) Spotting
- (6) Practical records
- (7) Viva Voce



Semester II

Title of paper: Diagnostic Laboratory Management Major 1/ DSC1 CORE:

Total Credit: 4

Total hours: 60 L/T/P

Course objectives: 1. The purpose of this course is make students familiar with knowledge of diagnostic laboratory and its management in hospitals.

2: To expose students to common/routine Pathological tests, Biochemistry tests, Microbiology tests generally carried out in diagnostic laboratory and blood bank management.

Course learning outcome:1. Student will learn routine test performed in clinical diagnostic laboratory and their importance. Learn basic features required for diagnosis and disease management.

2: Student will be able to apply diagnostics techniques to understand disease, their management.

3. Contributing in providing better health facility to community and reduce burden of health on economy.

Sr. No./Unit No.	Syllabus Content	Hours (L/T/P)
1.	Introduction to Basics of clinical laboratory diagnostic, importance, scope and application in hospital. Concept of health and disease. History of diseases, various disease agents. Concept of transmission, prevention and control of infections and diseases, Hospital/ laboratory infection, their prevention and control of cross infection.	10
2.	Principles and standards for a clinical laboratory staff. Hand hygiene & method of Hand washing.. Risk of infection in sample handling-like blood born disease HIV, Hepatitis B & C etc. Coagulation Disorders. Lab Diagnosis of Bleeding Disorders.	10
3.	Routine Instruments used in diagnostic laboratory, in haematology. Sample Collection and Preservation of Blood. Use of autoanalyser in haematology, Making of stains in haematology. Urinometer. Anti coagulant vials-their preparation and use. Preparation of different pH, Buffer solutions & reagents used in lab.	10
4.	Introduction to Sample Collection & analysis, reporting, format of a lab test report, reference range, abnormal results. Collection & Preservation of Urine Sample. Abnormal constituents of urine. Physical & Chemical examination of urine. Microscopic examination of urine. Basics of Biomedical waste management.	10
5.	Laboratory Safety and Laboratory Hazards. Awareness and Safety in a clinical diagnostic laboratory, General safety precautions. Patient management for clinical samples collection	10
6.	Laboratory quality management system: Laboratory design & Administration. Importance of calibration and Validation of Clinical Laboratory instrument. Documentation, preserving and maintaining of medical records. Procurement of equipment and inventory control. GLP. Blood Banking - an introduction. Blood Bank setup and Functioning, sterilization & santity.	10



Recommended list of Books:

1. Principles of Clinical Laboratory Management by Jane Hudson.
2. Clinical Laboratory Management: by Donna L. Nigon.
3. Laboratory Management System - by Pawan Bharati Kumar.

Teaching Methodology

- (4) Class Room Lectures (2) Powerpoint presentations
(5) Class seminars, Quizzes, assignments (4) Demonstrations, etc.

Evaluation Criteria:

- (5) MCQ based Internal Assessments
(6) Group Discussion, Class Seminars
(5) MCQ/Objective type question-based final assessment or as decided by the University.

Practical: Diagnostic Laboratory Management

Type: Major DSC 1/ Core 1

Total Credit: 2

Total hours: 30 Hrs

Sr. No.	List of Practicals	Hrs= 30
1.	Lab Hazards & Safety Measures	
2.	Techniques & Process of sample collection	
3.	Assessing hemoglobin with different methods.	
4.	Making of slide and staining	
5.	Loading of Neubauer's chamber.	
6.	TLC	
7.	DLC	
8.	ESR & PCV	
9.	Reticulocyte count	
10.	RBC Count	
11.	Platelet Count	
12.	Osmotic fragility Test	
13.	BT/CT/PT/PC	
14.	Blood grouping methods	
15.	Uses of anti-coagulants	
16.	Examination of Malarial Parasite.	
17.	Urine collection and preservation	
18.	Urine examination – Physical / Chemical	

Teaching Methodology

Practical learning in Laboratory through scientific experiments

Evaluation Criteria:

1. Performance of practical in Laboratory
2. Spotting, assignment
3. Practical records, Viva Voce

Title of paper: Human Physiology and Anatomy-II
Total Credit: 04

Type: Major 2 / DSC 2 Core
Total hours: 60 L

Course objectives: To provide knowledge of various physiological systems of the human body for understanding the normal functioning and role of different systems in maintaining the homeostasis.

Course learning outcome: Knowledge of various Physiological systems, their functioning, roles in Homeostasis, related disorders and changes caused in different diseases.

Sr. No.	Unit No.	Syllabus Content	Hours (L/T/P)
1.	A	Digestion: Physiology and anatomy of the alimentary canal, movement of food and secretory functions, digestion, absorption, regulation of secretions and motility, basal metabolic rate, nutrition, and dietary balances.	15
2.	B	Respiration: Physiology and anatomy of respiratory system. Mechanism of breathing, transport of gases, regulatory mechanism, O ₂ dissociation curves, chloride shift, Bohr effect, Haldane effect, artificial respiration.	10
3.	C	Excretion: Physiology and anatomy of excretory organs, urine formation, counter current principle, controlling factors, micturition, regulation of body fluids and acid base balance.	10
4.	D	Endocrine: Physiology and anatomy of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal, Pineal Gland, Gonads and Hypothalamus, Feedback mechanism, control of endocrine secretion.	15
5.	E	Reproduction: Physiology and anatomy of reproductive organs, hormonal regulation of ovulation, fertilization, implantation, gestation, parturition and lactation, oogenesis, spermatogenesis.	10

List of Reference Books

1. *Text Book of Medical Physiology by Guyton and Hall*
2. *Textbook of Physiology by Ganong and by Tortora*

Teaching Methodology

- (1) Class Room Lectures
- (2) Powerpoint presentations
- (3) Class seminars, Quizzes, assignments
- (4) Demonstrations, etc.

Evaluation Criteria:

- (1) MCQ based Internal Assessments
- (2) Group Discussion, Class Seminars
- (3) MCQ/Objective type question-based final assessment or as decided by the University.



Title of paper: Human Physiology Practical -II

Type: Practical CORE 2

Total Credit: 02

Total hours (Hrs): L/T/P (0 Hrs. / 0 Hrs. /60

Hrs)

Practical: II

List of Practical	Hours
1. To perform Total RBC Count 2. To perform Total Leukocyte Count (TLC) 3. To perform DiffrentialLeukocyte Count (DLC) 4. Recording of blood pressure. 5. To Record Breath Holding Time (BHT) 6. To perform Pulmonary Function Tests. 7. To perform an osmotic fragility test of RBCs. 8. To estimate Hemoglobin concentration of own blood sample. 9. To determine near point &Near Response.	30 hours

List of Reference Books

4. *Text Book of Practical Physiology by CL Ghai*

Teaching Methodology

Practical learning in Laboratory through scientific experiments

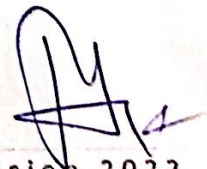
Evaluation Criteria:

(1) Performance of practicals

(2) Spotting

(3) Practical records

Viva Voce



SEMESTER III

Title of paper: Medical Microbiology

MAJOR 1 (DSC 1) CORE:

Total Credit: 4

Total hours: 60L/T/P

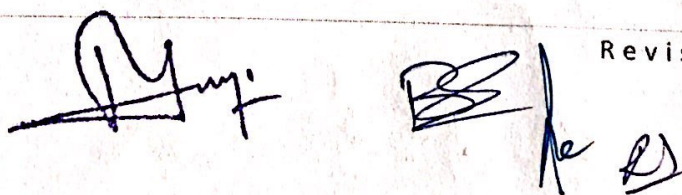
Course objectives:

1. To provide knowledge of isolation and identification of different microbes.
2. Students will be able to understand working in microbiology laboratory considering all the aspects of safety.
3. Students will acquire knowledge about validating the microbiological equipment and reporting the observations in clinical microbiology laboratory.

Course learning outcome:

1. Students will be able to acquire, articulate, retain and apply knowledge relevant to microbiology.
2. Students will acquire and demonstrate competency in laboratory safety.
3. The routine and specialized microbiological laboratory skills applicable to microbiological research or clinical methods, including accurately reporting observations and analysis.

Sr. No.	Unit No.	Syllabus Content	Hours (L/T/P)
1.	1	General Microbiology: History of Microbiology, Classification of Microorganism, Microscopic Methods for observing Microorganisms, Culture and Nutrient of Microorganisms, Sterilization and Disinfection.	13
2.	2	Viruses: Introduction, Historical background, Classification, Isolation, Origin, Nature, Structure, Morphology, Composition, Animal, Plant and Bacterial Virus, Bacteriophages, Multiplication Cycles, Interferon, Physical Properties. Bacteria: Classification, Morphology, Structure, Chemical Composition, Plasmids, Microsomes, Cytoplasmic Inclusion, Growth and Reproduction, Microbial Ecology.	15
3.	3	Algae, Fungi and Protozoa: Growth, Structure, Function, Reproduction, Classification and Economic Importance.	10
4.	4	Economic use of Microbes: Role in Antibiotics, Vitamins, Pesticides, Petroleum, Fermentation Industry, and Environment Protection.	10
5.	5	Microbial Diseases: Anthrax, Whooping Cough, Botulism, Tetanus, Diphtheria, Tuberculosis, Dysentery, Leprosy, Diarrhea, Pneumonia, Malaria, Leishmaniasis, Sleeping Sickness, AIDS, Cholera, Dengue, Hepatitis, Measles.	12



List of Reference Books

1. *Text book of Microbiology – by Prescott*
2. *Text book of Microbiology – by Anant Narayan & Paniker*
3. *Text book of Microbiology – by Pelzar*

Teaching Methodology

1. Teacher-Centered Instruction
2. Small Group Instruction
3. Student-Centered / Constructivist Approach
4. Project-Based Learning.

Evaluation Criteria: Assignments ,Presentation ,Attendance ,Final exam

Title of paper Practical: Medical Microbiology

Type: DSC 1 / CORE

Total Credit: 02

Total hours (Hrs): 30 Hrs

List of Practical	Hours -30
<ol style="list-style-type: none">1. Demonstration of various sterilization techniques used in laboratory.2. Aseptic culture preparation.3. Microscopic examination and identification of bacteria4. Microscopic examination and identification of fungus.5. Identification of fruiting bodies of <i>mucor</i>, <i>penicillium</i> and <i>rhizopus</i>.6. Staining of <i>conidia</i>.7. Preparation of minimal media for culture of bacteria.8. Culture of bacteria and development of bacterial colony9. Permanent slides.10. Agglutination test	

Teaching Methodology

1. Practical learning in Laboratory through scientific experiments
2. Teacher-Centered Instruction , Small Group Instruction
3. Student-Centered / Constructivist Approach
4. Project-Based Learning.

Evaluation Criteria: 1.Performance of practicals 2.Spotting, Assignments 3.Practical records, Final exam, Attendance 4.Viva Voce

Total Credit: 4

Total hours: L/T/P (60hrs)

Course objective: To understand the structure and function of organelles in a cell.

1. To learn about cellular transport and protein trafficking.

Course Learning Outcome: The students at the completion of the course will be able to:

1. Understand structure of biomolecules
2. Understand tools and techniques of biological importance
3. Understand the structure and function of the cell organelles and the process of cell division.

Sr. No.	Syllabus Content	Hours (L/T/P)
1.	The Cell: Historical background, significant landmarks, cell theory. Eukaryotes and Prokaryotes.	5
2.	Microscopy: Principles of different types of optical systems, basics of electron microscopy.	5
3.	Artificial Membrane: Liposomes. Cell Membrane: Organization, composition, movement of substances, junction complexes.	8
4.	Cell Organelles: Study of various cell organelles, structure and their functional significance. Nucleus: Nuclear membrane, Nucleolus, chromatin material, Nucleocytoplasmic interaction.	8
5.	Chromosome structure: Organization, morphology, differentiation, polytene and lampbrush chromosomes, sex chromosomes and sex determination.	5
6.	Cytochemistry: Chemistry of fixation, staining, cytochemistry of cellular constituents, tissue culture method, autoradiography, cell fractionation.	5
7.	Cytoskeletal elements: Microtubules, micro filaments, intermediate filaments.	4
8.	Cell Physiology: Cellular respiration, endocytosis, role of endosomes, lysosomes, exocytosis, cellular motility, aging and death.	8
9.	Cellular Chemistry: Inorganic and organic constituents, macromolecules of life, sugars, amino acids, types of bonding.	8
10	Cell Cycle and its regulation, Cell Division: Mitosis, Meiosis, movement of chromosomes and their significance.	8

List of Reference Books

1. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by P.S. Verma & V.K. Agrawal
2. Cell Biology by De Robertes
3. Cell Biology by Bruce Albert
4. Cell Biology by C.B.Powar.

Teaching Methodology

1. Class Room Lectures
5. Class seminars, Quizzes, assignments
- (3) Powerpoint presentations
- (4) Demonstrations, etc.

Evaluation Criteria:

- (7) MCQ based Internal Assessments
- (8) Group Discussion, Class Seminars
7. MCQ/Objective type question-based final assessment or as decided by the University.

Title of paper: Practical Cytology Type: DSC 2 CORE
Total Credit: 02 Total hours (Hrs): 30 Hrs

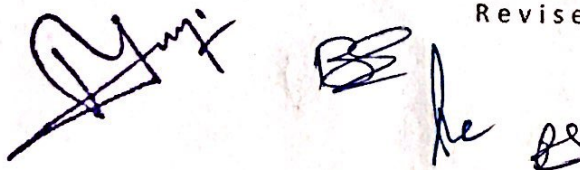
List of Practical	Hours 30
<ol style="list-style-type: none">1. Study of various parts of dissecting and compound microscope.2. Microscopic identification of plant and animal cell.3. Measurement of cell size using ocular and stage micrometer.4. Microscopic examination of bacterial cell using suitable stain.5. To check the permeability of cells using salt solution of different concentrations.6. To perform plasmolysis and deplasmolysis in plant cell.7. Mitotic squash preparation of root tip of onion and identification of various divisional stages.8. Study of permanent slides of mitosis and meiosis9. Staining of cheek epithelial cells using methylene blue	

Teaching Methodology:

- (1) Microscopic examination
- (2) Hands on training in Laboratory
- (3). Practical learning in Laboratory using scientific instruments.

Evaluation Criteria:

- (1) Performance of practicals
- (2) Spotting
- (3) Practical records
- (4) Viva Voce



Semester IV

Title of paper: Pharmacology & Toxicology MAJOR 1 (DSC 1) CORE

Total Credit: 4

Total hours: 60 L/T/P

Course objectives: 1. They would have observed the effect of drugs on animals by simulated experiments

2. They would get an idea about correlation of pharmacology with other bio medical sciences.

3. They would have understood the signal transduction mechanism of various receptors

Course learning outcome: 1. Students would have understood the pharmacological actions of different categories of drugs

2. They would have studied in detailed about mechanism of drug action at organ system/sub cellular/ macromolecular levels.

Sr. No.	Syllabus Content	Hours (L/T/P)
1.	Introduction to pharmacology, scope of pharmacology. Routes of administration of drugs, their advantages and disadvantages. Role of pharmacology in pharmaceutical industries and preclinical trials.	10
2.	Pharmacokinetics: Various processes of absorption of drugs and the factors affecting them; ADME absorption, distribution, metabolism and excretion of drugs. General mechanism of drug action and the factors which modify drug action	10
3.	Pharmacodynamics: Principles of drug action, Receptors, Receptor families, Drug receptor theory (Interaction), targets for drug action, therapeutics index, Biological half life, Dose response relationship, Synergistic and antagonistic action of drugs, Tolerance. Pharmacological classification of drugs.	13
4.	Toxicology: Introduction and scope of toxicology. Definition of poison, general principles of treatment of poisoning. Definition of different branches of toxicology. Role of toxicology in drug development.	12
5.	Types of toxicity and its measurement: Acute toxicity, Sub-acute and chronic toxicity. Risk and safety analysis: Margin of safety, Therapeutic index, Ideal therapeutic index, ED ₅₀ , LD ₅₀ . Specific toxicity studies: Carcinogenicity, teratogenicity, in-vitro, mutagenicity tests. Environmental and Pesticide Toxicology	15

List of Reference Books

1. A Text Book of Pharmacology by K.D. Tripathi 2. Text Book of Pharmacology & Toxicology by Goodman & Gillman 3. Text Book of Pharmacology & Toxicology by Barar

Teaching Methodology

1. Teacher-Centered Instruction 2. Small Group Instruction 3. Student-Centered / Constructivist Approach

Evaluation Criteria: Assignments, Presentation, Group Discussions. T
(1) Assignments 2.Presentation 3.Attendance .Final exam

Title of paper Practical Pharmacology & Toxicology DSC 1/ Core

Total Credit: 02

Total hours (Hrs)= 30 Hrs

Sr. No.	List of Practicals	Hours=30
1	Demonstration of effects of increasing doses of acetylcholine (Ach) and to plot the dose- response curve.	
2	Hemolytic assay for measurement of toxicity	
3	Methyltetrazolium test (MTT) for cytotoxicity assessment	
4	Determination LD 50.	
5	Assessment of reproductive toxicity of pesticide	
6	Hematotoxicity in rat after exposure to pesticide	
7	Behavioral study in rat after pesticide exposure	

List of Reference Books

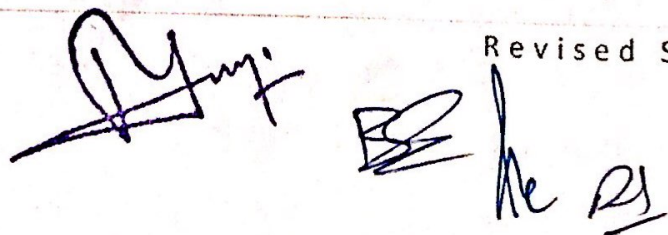
1. *A Text Book of Pharmacology by K.D. Tripathi*
2. *Text Book of Pharmacology & Toxicology by Goodman & Gillman*
3. *Text Book of Pharmacology & Toxicology by Barar*
4. *Pharmacology by Kulkarni*
5. *Text book of Pharmacology by S.D. Seth and V.Seth*

Teaching Methodology

1. Practical learning in Laboratory through scientific experiments and models.
2. Student-Centered / Constructivist Approach .
3. Project-Based Learning.

Evaluation Criteria:

- (1) Performance of practicals
- (2) Spotting
- (3) Practical records, Viva Voce.



Title of paper: Immunology & Immunodiagnostics Major 2/ DSC 2

Total Credit: 4

Total hours: 60 L/T/P

Course Objectives:

1: The purpose of this course is to teach students about concept of Immunology.

1. To understand and being aware to the application of Immunology as Immunodiagnostics techniques.

Learning Outcomes:

1: Student can understand the importance of Immunology & Immunodiagnostics and have a better understanding in the context to diagnostic laboratory.

2: Student will be able to apply learned knowledge to understand disease and their diagnosis related to Immune system disorder.

Sr. No.		Syllabus contents	Hours
1	UNIT I	Introduction and History of immunology, <ul style="list-style-type: none">• <i>Immunity</i>–Antigen, antibody, immunogen, pathogen, allergen, Haptens, Adjuvants, Superantigens, epitope, paratope, Antigenicity and Immunogenicity, Innate and Adaptive Immunity and Characteristics, Primary and Secondary Immune Response,• <i>Anatomical organization of immune system</i> – Lymphocytes (T & B Cells), Primary and secondary lymphoid organs, lymphocyte traffic. Hematopoiesis, Properties of T and B cells, TCR, BCR	12
2	UNIT II-	Complement System Components, <ul style="list-style-type: none">• Activation pathways and their regulation,• role of the complement system in the immune response• Complement deficiencies	8
3	UNIT III-	Humoral Immunity- Mechanism of action of B-Cells, Role of B-Cells as APC, <ul style="list-style-type: none">• Immunoglobulins – structure and functions,• Organization and expression of immunoglobulin genes.• Mechanisms of antibody diversity, Class switching, Immunoglobulin Superfamily.	10
4	UNIT IV-	Cell-Mediated Immunity Major Histocompatibility Complex. <ul style="list-style-type: none">• Mechanism of action of T-cells,• MHC Restriction, MHC I and II molecules, Role of MHC in tissue transplantation.• Antigen Processing & Presentation of Endogenous & Exogenous antigens.• Cytokines, structure, types, functions, and cytokine receptors.	10
5	UNIT V-	Hypersensitivity- Definition, Type I, II, III, and IV type hypersensitivity, delayed type of hypersensitivity.	10



		Immune Imbalances- Autoimmunity – Organ-specific and systemic diseases, mechanisms of autoimmunity and therapeutic approaches, • Immunodeficiency Syndromes – Primary and secondary immune-deficiencies, their diagnosis and therapeutic approach.	
6	UNIT VI	Immunodiagnostic & Therapeutics • Antigen and Antibody interactions – Affinity, Avidity, Cross-reactivity, RIA, ELISA, Immunoprecipitation, Immunodiffusion, Double diffusion, Agglutination, Ab therapy. • <i>Vaccines</i> – Active and passive immunization, Types of vaccines and their mechanism of action	10

Recommended Books:

1. Kuby Immunology. Goldsby, R.A., Thomas J Kindt, Barbara, A Osborne, and Kuby, Janis.

Teaching Methodology

- (1) Class Room Lectures
- (2) Powerpoint presentations
- (3) Class seminars, Quizzes, assignments
- (4) Demonstrations, etc.

Evaluation Criteria:

- (1) MCQ based Internal Assessments
- (2) Group Discussion, Class Seminars
- (3) MCQ/Objective type question-based final assessment or as decided by the University.

Title of paper: Practical - Immunology & Immunodiagnostics DSC2/ CORE

Total Credit: 2

Total hours: 30 Hrs

Sr. No.	List of Practicals	Hours=30
1	Demonstration of Immunological techniques Cell Adhesion Assay, Phagocytosis Assay, Indirect Haemagglutination	
2	Dot ELISA technique , RIA (Radio Immunoassay)	
3	Single Immunodiffusion technique, Double Diffusion Immuno technique	
4	Immunoprecipitation technique	
5	Immunoelectrophoresis	
6	Lymphocyte Separation	
7	Blood Group Analysis	

Teaching Methodology

Practical learning in Laboratory through scientific experiments

Evaluation Criteria:

2. Performance of practicals
3. Spotting
4. Practical records, Viva Voce

Total Credit: 4

Total hours: 60 L/T/P

Course Objectives:

- 1: The purpose of this course is to teach students about concept and principles Clinical Biochemistry.
- 2: To understand and being aware to the working in Clinical Biochemistry diagnostic laboratory.

Learning Outcomes:

- 1: Student can understand the importance of Clinical Biochemistry and have a better understanding in the context to diagnostic laboratory.
- 2: Student will be able to apply learned knowledge to understand disease and their diagnosis related to Biochemistry.

Sr. No.	Unit No.	Syllabus Content	Hours (L/T/P)
1	1	Metabolic diseases and disorders Carbohydrate Metabolism related diseases i.e. Diabetes Mellitus, Galactosuria, Fructosuria, Hunter's Syndrome and Glucose Tolerance Test, Glucose Storage Diseases.	8
2	2	Lipid Metabolism related diseases i.e. Gaucher's disease, Tay-Sacch's disease, Hypercholesterolemia, Fatty Liver, Obesity, Atherosclerosis.	7
3	3	Protein Metabolism related diseases i.e. Albinism, Phenylketonuria, Alkaptonuria, Maple-Syrup Urine Disease (MSUD).	7
4	4	Nucleic Acid Metabolism related diseases i.e. Lesch-Nyhan Syndrome, Von-Gierke's disease, Gout.	7
5	5	Porphyrin metabolism related diseases- i.e. Jaundice-types, diagnosis and treatment, Porphyrias.	7
6	6	Mineral Metabolism related diseases i.e. Anemia, Cushing's syndrome, Rickets, Osteoporosis, Menke's disease, Wilson's disease, Fluorosis.	7
7	7	Biochemical changes in body fluids- a. Blood- composition, alteration in pathological conditions. b. Urine- composition, alteration in pathological conditions. c. Cerebrospinal Fluid- composition, alteration in pathological conditions.	9
8	8	Organ function tests: a. Renal function tests b. Liver function tests. c. Gastric function tests.	8

Books Referred: 1. *Biochemistry by U. Satyanarayana and U. Chakrapani*

2. Text Book of Biochemistry with clinical Correlation by: Thomas M Devlin
3. Lecture Notes on Clinical Biochemistry by Beckett, Walker, Rae and Ashby
4. Principle of Biochemistry: Lehninger by Nelson & Cox

Teaching Methodology

1. Class Room Lectures
- (2) Powerpoint presentations
3. Class seminars, Quizzes, assignments
- (4) Demonstrations, etc.

Evaluation Criteria:

1. MCQ based Internal Assessments
2. Group Discussion, Class Seminars
3. MCQ/Objective type question-based final assessment or as decided by the University.

Major 1/ DSC 1 CORE:

Total Credit: 2

Total hours: 30 Hrs

Title of paper: Practical - Clinical Biochemistry

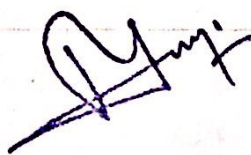
Sr. No.	List of Practicals	Hrs 30
1	1. Collection of blood sample by finger prick method for blood test.	
2	Detection of protein in urine sample	
3	Detection of urine sugar.	
4	Preparation and study of charts of different metabolic disorder.	
5	Detection of pus cells in urine sample.	
6	Colorimetric measurement of blood sugar	
7	Measurement of total protein from blood	

Teaching Methodology

Practical learning in Laboratory using scientific instruments & charts, models etc.

Evaluation Criteria:

- (1) Performance of practicals
- (2) Spotting
- (3) Practical records
- (4) Viva Voce



Title Paper: Pathology
Total Credit: 4

Major 2/ DSC 2 Core
Total hours: L/T/P (60 hrs)

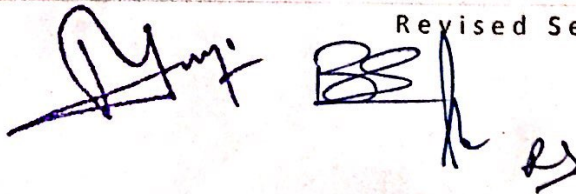
Course objective: 1.To analyze the relationships among animals and microbes
2. To study the structure and function of different organ system in body.

Course Learning Outcome: 1.To understands the metabolic activity of different organ system.
2. To learn how to diagnose and management of disease.

Sr. No.	Syllabus Content	Hours (L/T/P)
1.	Historical background, important discoveries, general aspects, pathogenicity.	6
2.	Disorders of cells and tissues: Hypoplasia, Hyperplasia, Hypertrophy, Metaplasia Neoplasia.	6
3.	Disorders of blood cells and heart: WBC and RBC disorders, Hemorrhagic diseases, Abnormal Hemoglobin, Arteriosclerosis, Embolism, Heart diseases, Hypertension, Hemorrhage and Hemorrhage Shock.	8
4.	Disorders of respiratory tract: Tonsillitis, Bronchitis, Asthma, Emphysema, Cough, CO poisoning, Hypoxia.	8
5.	Disorders of digestive tract: Gastritis, Ulcers, diseases of pancreas and liver, Constipation and Diarrhea.	8
6.	Disorders of excretory system: Nephritis, Acidosis, and Disorders of Urination	6
7.	Disorders of nervous system: Sclerosis, Migraine, Depression, Schizophrenia, Neurosis, Epilepsy, Parkinsonism.	6
8.	Disorders of reproductive system: Impotency, Infertility, Abortions, Menopause and other abnormalities	6
9.	Disorders of bones, joints and cartilages.	2
10	Autoimmune Disorders, Cancer	4

List of Reference Books

1. Pathologic Basis of Disease by Robbins and Cotran
2. Text Book of Pathology by Harsh Mohan
3. Text Book with clinical Correlation by Thomas M Devlin



Teaching Methodology

1. Class Room Lectures (2) Powerpoint presentations
 3. Class seminars, Quizzes, assignments (4) Demonstrations, etc.

Evaluation Criteria:

1. MCQ based Internal Assessments
 2. Group Discussion, Class Seminars
 3. MCQ/Objective type question-based final assessment or as decided by the University.

Practical X: Pathology**DSC 2/ CORE****Total Credit: 02****Total hours (Hrs): 30 Hrs**

List of Practical	Hours =30
1. Estimation of ESR by wintrob's method.	
2. Estimation from blood.	5
a. Sugar	
b. LFT	5
c. Creatinine	
d. Cholesterol	5
e. Billrubin	5
3. Estimation from urine	
a. Urea	
b. Bacterial contamination	
c. Ketone bodies	5
d. Blood e. Bile pigment	
f. Protein g. Urobilinogen	5

Teaching Methodology



- (1) Microscopic examination (2) Hands on training in Laboratory
 (3). Practical learning in Laboratory using scientific instruments.

Evaluation Criteria:

- (1) Performance of practicals
 (2) Spotting, Practical records, Viva Voce.

Revised Session

20 | Page
 2022

Title of paper: Biomedical Instrumentation and Analytical Techniques Major 3/ DSC 3

Total Credit: 4

Total hours: 60 L/T/P

Course objectives:

1. To provide basic conceptual knowledge of instrumentation techniques available.
2. To understand the aspects of separation for multi components.
3. Practical skills for the analysis of drugs and excipients using various instrumentation techniques.

Course learning outcome:

1. Learn to make accurate analysis and report the results in defined formats.
2. To learn documentation and report the observations with clarity.
3. To understand the professional and safety responsibilities for working in the analytical laboratory.

Sr. No.	Syllabus Content	Hours (L/T/P)
1.	Microscopy -Basic principles and application of light, phase contrast, dark field, fluorescence, interference, polarizing scanning and transmission electron microscopy, Freeze fracture, fixation and staining. Centrifugation Basic Principles of sedimentation different types of centrifuges and their uses analysis of subcellular fractions.	12
2.	Solutions - Buffer solutions, buffer index, buffer capacity. Principles of glass and reference electrodes, types of electrodes. Chromatography General principle of separation and classification of Chromatography. Principles of adsorption, partition, size exclusion and ion exchange chromatography. Thin layer, Gas, supercritical and High performance liquid chromatography.	12
3.	Spectroscopy Basic concepts and application of UV-Visible, fluorescence, IR, NMR, X-ray diffraction, CD, ORD spectroscopy, mass spectrometry in structure determination of biomolecules.	12
4.	Electrophoresis Basic principles, instrumentation and applications, moving boundary and zonal electrophoresis including paper and gel (SDS PAGE and Agarose) electrophoresis, isoelectric focusing, PFGE and Capillary electrophoresis	12
5.	Radioisotopic techniques Principles and application of tracer techniques in biology, radioactive isotopes and half life of isotopes, liquid scintillation, GM counter. Effect of radiation on biological system, radio-active labeling of biological macromolecules, autoradiography and radiation dosimetry.	12

List of Reference Books

1. *Biophysical Chemistry, Principles and Techniques* by Upadhyay, Upadhyay & Nath
2. *Principles and Techniques of Biochemistry and Molecular Biology* by Wilson & Walker.



Teaching Methodology

1. Teacher-Centered Instruction 2. Small Group Instruction 3. Student-Centered / Constructivist Approach 4. Project-Based Learning.

Evaluation Criteria: Assignments, Presentation, Group Discussions.

1. Assignments
2. Presentation
3. Attendance, Final exam.

Title of paper: Practical- Biomedical Instrumentation and Analytical Techniques

DSC 3- Practical CORE

Total Credit: 02

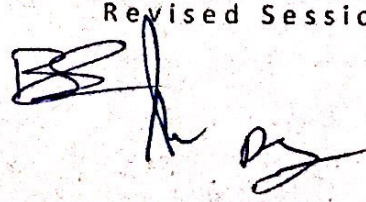
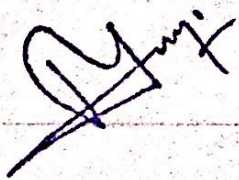
Total hours (Hrs): 30 Hrs

List of Practical	Hours
1. Calibration of pH meter and measurement of pH of given solution.	
2. Measurement of pH of deferent water samples collected from various water reservoirs of Jhansi.	
3. Measurement of pKa of acetic acid.	
4. To analyze different aminoacids by paper chromatography and TLC	
5. Separation of pigments from leaves by paper chromatography and TLC	
6. Demonstration of centrifuge machine.	
7. Centrifugation of RBCs from blood.	
8. Demonstration of Agarose Gel Electrophoresis.	
9. Demonstration of SDS-PAGE.	
10. Extraction and estimation of chlorophyll by spectrophotometer.	

Teaching Methodology

1. Practical learning in Laboratory through scientific experiments 2. Teacher-Centered Instruction 3. Small Group Instruction 4. Project-Based Learning.

Evaluation Criteria: Assignments, Presentation, Group Discussions.



Semester VI**Title of paper: Medical Biotechnology****Total Credit: 4****Major 1/ DSC 1****Total hours: 60 L/T/P****Course Objectives:**

- 1 The purpose of this course is to make aware and teach students about concept of **Biotechnology**.
- 2 To understand and being aware to the application of **Biotechnology** in Clinical diagnostic laboratory.

Learning Outcomes:

- 1: Student can understand the importance of **Medical Biotechnology** and have a better understanding in the context to diagnostic laboratory.
- 2: Student will be able to apply learned knowledge to understand disease and their diagnosis related to **Genetic**.

Sr. No.	Content of Syllabus	Hours
1	Introduction to basic Biotechnology and Genetic Engineering – scope, importance and application.	4
2	Central dogma a) DNA replication in <i>E. coli</i> and Eukaryotes (origin of replication, semi conservative hypothesis, bidirectional, structure and function of DNA polymerases, role of Replisome, Primosome, Okazaki fragments, helicase, primase, gyrase, topoisomerase and other proteins). b) Transcription (structure & function of RNA polymerases, intron & exon), Translation.	15
3	DNA Repair , Disease associated with repair mechanisms	6
4	Recombinant DNA Technology a) Restriction enzymes and their functions. b) Statement vectors- prokaryotic and eukaryotic. c) Transformation. Selection of specific cloned DNA d) Detection and identification of cloned DNA sequences. e) Application of recombinant DNA technology. Polymerase chain reaction (PCR).	15
5	Diseases linked with gene expression. Gene Therapy and Gene Bank.	6
6	Enzyme Immobilization - methods and advantages. Monoclonal antibodies, Hybridomas, HAT technique.	9
7	Fermentation technology: Commercial production. Molecular basis of Diagnosis of diseases, and Diagnostic Kits.	5

BOOKS RECOMMENDED: (1) *Text book of Genetics by Russell*
(2). *Genetics by P.K. Gupta*

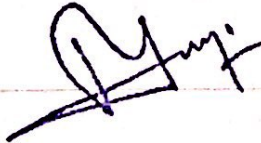
Title of paper: - Medical Biotechnology

Total Credit: 2

Total hours: 30 Hrs

Sr. No.	List of Practicals	Hours
1	Isolation of genomic DNA from given sample.	
2	Demonstration of Agarose Gel Electrophoresis.	
3	Precipitation of Proteins from given sample and its quantitative estimation.	
4	Preparation and study of charts of different cloning vector.	
5	Fermentation of milk by lactic acid bacteria	

BOOKS RECOMMENDED: (1) *Text book of Genetics by Russell*
(2). *Genetics by P.K. Gupta*



Course objectives:

1. Upon completion of this program the student will know the formulation aspects of different dosage forms do different pharmaceutical calculation involved in formulation and appreciate the importance of good formulation for effectiveness.
2. Students will demonstrate knowledge of and ability to use principles of therapeutics, quality improvement, communication, economics, health behavior, social and administrative aspects

Course learning outcome:

1. Understand the concept of ADME of drug in human body.
2. Determine the various pharmacokinetic parameters from either plasma concentration or urinary excretion data for drug
3. Students understood the mechanism of drug action and its relevance in the treatment of different diseases.

Sr. No.	Unit No.	Syllabus Content	Hours (L/T/P)
1.	1	Definition and scope of Pharmacy, Pharmacy as a career. Role of pharmacy in human health. Introduction to Pharmacopoeias with special reference to Indian Pharmacopoeia, B.P., U.S.P. and International Pharmacopoeia.	15
2.	2	Introduction to different branches of pharmacy with special emphasis on pharmacology, pharmacognosy and pharmaceuticals, their scope and interrelations with each other.	10
3.	3	Basic concepts of Discovery and development of new drugs, sources of new drugs and role of pharmacy in drug development. NDA (New drug application) and clinical trials.	10
4.	4	Introduction to pharmacognosy, scope of Pharmacognosy including indigenous system of medicine (Ayurveda, Unani, Siddha, Homeopathy). Various system of classification of drugs of natural origin (Herbal medicine).	10
5.	5	Adulteration and drug evaluation, Brief outline of occurrence, distribution outline of isolation, identification tests, therapeutic effects and pharmaceutical applications of plant alkaloids, glycosides.	15

List of Reference Books

1. *A Text Book of Pharmacology by K.D. Tripathi*
2. *Text Book of Pharmacology & Toxicology by Goodman & Gillman*

3. Text Book of Pharmacology & Toxicology by Barar
4. Pharmacology by Kulkarni
5. Text book of Pharmacology by S.D. Seth and V.Seth

Teaching Methodology

1. Teacher-Centered Instruction
2. Small Group Instruction
3. Student-Centered / Constructivist Approach
4. Project-Based Learning.

Evaluation Criteria: Assignments, Presentation, Group Discussions.

Practical : Pharmacy & Pharmaceuticals
Total Credit: 02

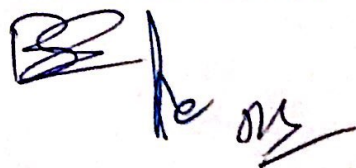
DSC 2/ CORE
Total hours (Hrs): 30 Hrs

List of Practical	Hours -30
Pharmacy & Pharmaceuticals	
<ol style="list-style-type: none"> 1. Study of different preparation of crude drugs. 2. Study of different type of capsule & tablets. 3. Demonstration of different mode of drug introduction in chosen animal model. 4. Syrups a) Syrup IP'1996. 5. Linctus a) Terpen Hydrate Linctus IP'66. 6. Suspensions <ol style="list-style-type: none"> a) Calamine lotion, b) Magnesium Hydroxide mixture. c) Aluminum Hydroxide gel. 7. Emulsions <ol style="list-style-type: none"> a) Turpentine Liniment, b) Liquid paraffin emulsion. 8. Powders and Granules <ol style="list-style-type: none"> a) ORS powder (WHO). b) Effervescent granules. c) Dusting powder. d) Divided powders. 	

Teaching Methodology

1. Teacher-Centered Instruction
2. Small Group Instruction
3. Student-Centered / Constructivist Approach
4. Project-Based Learning.

Evaluation Criteria: Assignments ,Presentation ,Attendance ,Final exam

Title of paper: Medical Genetics

Major 3/ DSC 3 CORE

Total Credit: 4

Total hours: 60 L/T/P

Course Objectives:

1: The purpose of this course is to teach students about concept and principles of inheritance.

Learning Outcomes:

1: Student can understand the importance of genetics and have a better understanding in the context medical sciences.

2: Student will be able to apply learned knowledge to understand genetic disease and their diagnosis.

Sr. No.	Syllabus Content	Hours
1	History of Genetics Pre and Post Mendelian concepts. Mendel's laws of Inheritance. Deviations from Mendel's laws.	10
2	Gene Interactions: Incomplete dominance, Co- dominance, Epistasis (dominant and recessive), Complementary genes. Allelic and non-allelic concept, multiple alleles, pseudo alleles. Polygenic Inheritance, Cytoplasmic Inheritance.	12
3	Chromosomal theory of inheritance, Recombination. Linkage and linked groups, types of linkage. Mutation: Somatic, germinal, reverse, forward mutation, frame shift mutations, substitution mutations.	12
4	Chromosomal Aberrations: Inversion, Translocation, Position effects. Variations in chromosome number. Sex Determination and sex linked inheritance.	12
5	Basis of heredity, Biochemical basis of gene action, one gene-one enzyme and one gene- one polypeptide concept. Human genetics- disorders, normal and abnormal karyotype.	14


BOOKS RECOMMENDED: *Text book of Genetics by Russell 2. Genetics by P.K. Gupta*

Teaching Methodology

1. Teacher-Centered Instruction 2.Small Group Instruction 3. Student-Centered / Constructivist Approach 4. Project-Based Learning.

Evaluation Criteria: Assignments, Presentation, Group Discussions. T

1. Assignments 2.Presentation 3.Attendance 4.Final exam



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Title of paper: Practical - Medical Genetics

Major 3/ DSC 3 CORE:

Total Credit: 2

Total hours: 30 Hrs

Sr. No.	List of Practicals	Hrs 30
1	Study of various phenotypic characters of pea plant.	
2	Study of various body parts of fruit fly (<i>Drosophila</i>) by hand lens.	
3	Study of gene interactions: <input type="checkbox"/> Dominant and Recessive <input type="checkbox"/> Incomplete dominance <input type="checkbox"/> Co-dominance <input type="checkbox"/> Epistasis (Dominant and recessive) <input type="checkbox"/> Complementary	
4	Study of various stages of meiosis.	
5	Study of various phenotypic characters in human population.	

Teaching Methodology

Practical learning in Laboratory using slides, scientific charts, models etc.

Evaluation Criteria:

- (1) Performance of practicals
- (2) Spotting
- (3) Practical records
- (4) Viva Voce

B.Sc. (Hons) Biomedical Science) program.

Program Outcomes (POs)

Program Outcomes (POs): It represents the knowledge, skills and experiences the students should have at the end of B.Sc. (Hons) Biomedical Science) program.

P01	Domain Knowledge	The B.Sc. (Hons) Biomedical Science started (in year 2004) as an interdisciplinary course at Institute of Biomedical Sciences, Bundelkhand University Jhansi. The course has been very successful in terms of the career options taken up by the students after graduation over the years. The course was running in annual mode till 2021 and in the semester mode from 2022 onwards, it has been structured to reinforce the basic exposure that students get in the higher secondary school and to gradually build on this knowledge-base. The proposed syllabus has taken advantage of the credit system to gradually make the transition from simple to complex concepts relevant to the interdisciplinary nature of undergraduate and post graduate program in Biomedical Science.
P02	Practical Analysis	Students are given practical training in a range of techniques that are fundamental in biomedical research including assessment organ-bath, assessment of ligand-receptor interactions, diagnostic applications of enzyme kinetics. The practical component of these courses is complemented by a series of Seminar and workshops which provide an opportunity to explore wider application of advanced biomedical techniques in the literature. This provides essential preparation for those who intending to progress towards honors study further.
P03	Developments of solution	After successful completion of this course, student should be able to demonstrate knowledge and understanding of receptor pharmacokinetics, pre-clinical methods used in drug screening and development, enzyme-linked diagnostics, Laboratory diagnostics, clinical trial structure and the

		systematic.
P04	Advance techniques Uses	There are different techniques used to demonstrate and practical work for students to develop knowledge. Therefore different instrument like chromatography, Spectrophotometer, PCR, Gel Electrophoresis are used in Biomedical Sciences.
P05	Beneficiary of citizen and society	Enable students to become informed and responsible citizens by inculcating the practice of practical, ethical thinking and optimal decision-making to minimize resource wastage. Development of drugs design by enhancement of welfare-oriented policy formulation covered under welfare for society.
P06	Ethics	Apply the existing ethical guidelines in everyday Biomedical Sciences, research thinking and community development.
P07	Individual and teamwork	Manage and build high performance teams by understanding the role of incentives, scientific virtue, decent work and pillars of organization efficiency
P08	Communication	Practice effective oral and written communication to be able to convey advanced Biochemical, molecular techniques and models in a different paper of B.Sc. students.
P09	Project Management	Predict and analyze the role of different instruments and policies on overall Biomedical science areas performance of using tools.

B.Sc. (Hons) Biomedical Science) program.

Program Specific Outcomes (PSOs)

Program Specific Outcomes (PSOs): PSOs are statements that describe what the students of B.Sc. (Hons) Biomedical Science program should be able to do.

PSO1: The student at the completion of the course will be able to: Understand structure of biomolecules, tools and techniques of biological importance and the structure and function of the cell organelles and the process of cell division.

PSO 2: Knowledge of various immunological mechanisms, their functioning, roles in providing defense against the antigens, related disorders and their treatments.

PSO3: To give students in depth knowledge into special fields of choice like Pharmacy and pharmaceuticals, Clinical Biochemistry, Medical microbiology, Pathology, Human Physiology, Drugs industry, laboratory diagnostics and community medicines.

PSO4: To make students familiar with Biomedical Sciences and their relevance with other streams, qualitative and quantitative techniques and applied research in a wide variety of fields within Biomedical Sciences.

PSO5: In Biomedical courses include more complex concepts of mechanisms of achieving regulated functioning of the biological systems, biophysical principles of biological systems, genetics, genome organization, medical biotechnology and biochemistry and some of the recent excitement in biology and the application of bioinformatics in Biomedical Science as part of Discipline specific elective (DSE) courses along with project work.

PSO6: Enumerate the objectives of preformulation studies, Describe physical properties of drugs considered for preformulation of dosage forms and preformulation studies to evaluate chemical properties of drug.

PSO7: Knowledge of various Physiological systems, their functioning, roles in Homeostasis, related disorders and changes caused in different diseases.

M.Sc (Life Science) program.

Program Outcomes (POs)

Program Outcomes (POs): It represents the knowledge, skills and experiences the students should have at the end of M.Sc (Life Science) program.

P01	Domain Knowledge	The M.Sc (Life Science) program started in year 2017- 18, as an interdisciplinary course at Institute of Biomedical Sciences, Bundelkhand University Jhansi. The course has been very successful in terms of the career options taken up by the students after post graduation over the years. The course is running in semester mode since its beginning, it has been structured to reinforce the basic exposure that students get in the higher secondary school then graduation and to gradually build on this knowledge-base in Life Sciences. The proposed syllabus has taken advantage of the credit system to gradually make the transition from simple to complex concepts relevant to the interdisciplinary nature of undergraduate and post graduate program in Life Science
P02	Practical Analysis	Students are given practical training in a range of techniques that are fundamental in Life Science research. The practical component of these courses is complemented by a series of Seminar and workshops which provide an opportunity to explore wider application of advanced phytochemicals analytical techniques in the literature. This provides essential preparation for those who intend to progress towards further advanced study in the field of Life Sciences.
P03	Developments of solution	After successful completion of this course, student should be able to demonstrate knowledge and understanding of isolation, extraction & purification of herbal formulation /phytochemicals as drug screening and development, clinical trial structure.
P04	Advance techniques Uses	There are different techniques used to

		demonstrate & analyse phytochemicals and practical work for students to develop knowledge. Therefore different instrument like chromatography, Spectrophotometer, PCR, Gel Electrophoresis are used in Life Sciences research.
P05	Beneficiary of citizen and society	Enable students to become informed and responsible citizens by inculcating the practice of practical, ethical thinking and optimal decision-making to minimize resource wastage. Development of drugs design by enhancement of welfare-oriented policy formulation covered under welfare for society.
P06	Ethics	Apply the existing ethical guidelines in everyday Life Sciences, research thinking and community development.
P07	Individual and teamwork	Manage and build high performance teams by understanding the role of incentives, scientific virtue, decent work and pillars of organization efficiency
P08	Communication	Practice effective oral and written communication to be able to convey advanced phytochemicals analytical techniques and models in a different paper of M. Sc Life Sciences students.
P09	Project Management	Predict and analyze the role of different instruments and policies on overall Life science areas performance of using tools.

M. Sc Life Sciences

Program Specific Outcomes (PSOs)

Program Specific Outcomes (PSOs): PSOs are statements that describe what the students of M. Sc Life Sciences should be able to do.

PSO1: The student at the completion of the course will be able to: Understand structure of biomolecules, tools and techniques of Life Sciences /biological importance and the structure and function of the plant cell organelles and the process of cell division in plant.

PSO 2: To give students in depth knowledge into special fields of choice like medicinal plants and their pharmaceuticals uses, Plant Physiology, Herbal Drugs industry.

PSO3: To make students familiar with Life Sciences, its various areas and their relevance with other medicinal & Herbal plant, qualitative and quantitative techniques and applied research in a various areas of Life Sciences.

PSO4: In M. Sc Life Sciences include more complex concepts of mechanisms of achieving regulated functioning of the biological systems, biophysical principles of biological systems, Plant genetics, plant genome organization, biotechnology and plant biochemistry and some of the recent excitement in biology/ Life Sciences and with project work/ field training.

PSO5: Enumerate the objectives of preformulation studies herbal drugs , preformulation studies to evaluate chemical properties of herbal drugs.

PSO6: Knowledge of various plant pathophysiological systems, related disorders and changes caused in different diseases and application in isolation, extraction & purification of herbal formulation.