



B.Sc. ALLIED HEALTH SCIENCE

REGULATIONS AND SYLLABUS - 2023

BIO-MEDICAL SCIENCES

B.Sc.(AHS) Biomedical Sciences

Introduction:

Biomedical Science deals with the scientific basis of health and disease in humans and animals and is currently the most rapidly developing area in basic biological science. It involves study of cellular, physical, biochemical, molecular structure and interaction of human cells with special emphasis to health and diseases in man. It adapts a multidisciplinary approach, which allows to investigate normal life processes and to study its mechanism of transformation to diseased state using most ultramodern methods involving molecular approaches in Bioinformatics, Biotechnology, Immunology, Molecular Biology and Human Genetics. Biomedical sciences in combination of various above said thrust areas have revolutionized research over the past decades, stimulating growth in a wide range of industries including agriculture, Pharmaceuticals, veterinary science and medical research. The B.Sc. Biomedical Sciences has been developed for able students with a strong interest in emerging areas of medical sciences such as molecular biology, immunology, genetics, bioinformatics, biotechnology, genomics and proteomics who aspire to fill leadership roles in biomedical research and development.

The four year B. Sc. (AHS) programme in Biomedical Science provides a very sound theoretical and practical foundation in a range of subjects that are used to aid in diagnosis of human diseases. Our main aim is to produce highly trained and skilled biomedical scientists who have flexible career opportunities, and can make valuable contribution to continuing growth in medical knowledge and to the future of development of new diagnostic tools, understanding the underlying mechanism(s) of action of various drugs and modulating their action using molecular methods, computer designing and gene therapy. The students can also be absorbed as highly skilled technologists in several R&D, Pharmaceutical companies, Genetics, Diagnostic laboratories, Biotechnology and Bioinformatics laboratories, Biotechnology and Bioinformatics laboratories. The program offers the students an opportunity to get trained in the thrust areas of millennium in the medical field of Bioinformatics, Biotechnology & Human Genetics.

Foundation teaching for Biomedical Science will be covered in the first three years of the program. At the end of the three years of basic science subjects, students will be given a chance to select an elective department where they would specialize either in the field of Biotechnology, Bioinformatics or Human Genetics. On completion of the program, they have a wide choice of courses to choose i.e., Biochemistry, Physiology, Anatomy, Microbiology, Immunology, Genetics, Biotechnology and Bioinformatics. A strong broad comprehensive understanding of biomedical research, reinforced by a strong practical laboratory component fosters a congenial environment and opening to pursue a doctorate degree which is available to those students who wish to go through the Master of Science subjects meeting the academic requirements for entry.

Rationale:

With the fusion of Biological Sciences with information technology, computer aided drug designing and completion of gene mapping of human DNA, there is an urgent need in India to prepare Indian students with biological background to have a very strong foundation in subjects like Human Genetics, Bioinformatics and Biotechnology. This program is designed to ensure that it also provides the students a very strong foundation in mathematical, Physical and chemical sciences with computer applications and even trains them in entrepreneurship. With this background and the objective of this program is to train and prepare the students to become leaders in the field of biomedical sciences.

Scope:

The students who complete this program will be very highly skilled technologists and can be immediately absorbed into diagnostic laboratories in various fields of Medical Genetics, Pathology, Microbiology, Bioinformatics, Biotechnology, Molecular Biology & Pharmaceutical laboratories and various research & development institutes across the globe. On completion, the students can join the universities both in India and abroad to pursue higher studies. The students can pursue other multidisciplinary courses through lateral entry to other M.Sc. programs offered by this university or other universities i.e., M.Sc. Anatomy, Physiology, Biochemistry, Microbiology, Biotechnology, Gene Technology, Immunology, Human Genetics, Bioinformatics etc.,

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Regulations for B.Sc. Allied Health Science – Biomedical Science-2022

Introduction

B.Sc. (Allied Health Science), a (31/2 -year course work + 6 month Project) program under the Faculty of Allied Health Sciences, is aimed at training students to prepare them as qualified physician assistants who will be able to meticulously assist the concerned specialist in handling the various illnesses. This program is a taught course that covers relevant topics and specialized areas of knowledge as opted. The aim of this B.Sc. Program is to provide a thorough training to the candidates through formal lectures and/or seminars and practical programs which culminate in a one year internship that finally prepares the student for the rigors of the medical world.

1. Short Title and Commencement

These Regulations shall be called the “Regulations for B.Sc. (Allied Health Science) Course” of BIHER. These regulations shall be deemed to have come into force from the academic year 2017-18. These regulations are subject to modifications as may be approved by the Academic council from time to time.

2. Eligibility for Admission

- a) A candidate desiring to join the (31/2-year course work + 6 month Project) programme, leading to the degree B.Sc. (Allied Health Science) should have passed the HSC/CBSE/ISC or equivalent examination with one of the following subject combinations:
 - i) Physics, Chemistry, Biology
 - ii) Physics, Chemistry, Botany and Zoology
- b) A candidate shall, at the time of admission submit to the Head of the Institution, a certificate of medical fitness from an authorized Medical Officer certifying that the candidate is physically fit to undergo the academic course and does not suffer from any disability or contagious disease.

3. Age limit for admission

A candidate should have completed the age of 17 years as on 31st December of the year of admission.

4. Eligibility Certificate

Candidates, who have passed any qualifying examination other than the Higher Secondary Course examination conducted by the Government of Tamil Nadu, shall obtain an Eligibility Certificate, from BIHER and produce the same at the time of admission.

5. Registration

A candidate admitted to the course shall register his/her name with the University by submitting the application form for registration, duly filled in along with the prescribed fee, through the Head of the Institution within the stipulated date.

6. Duration of the course

The duration of the B.Sc. (Allied Health Science) Degree Course shall be (31/2-year course work + 6 month project) comprising of 8 (eight) semester and 6 month (semester 8) of project. The candidate is required to pursue the course on a full time basis, and must complete the course within seven years from the date of provisional registration.

7. Commencement of the Course

The course shall ordinarily commence on 1st August of the academic year. Admission for the said course shall be completed by 31st August.

8. Curriculum

The first three years of the course will be utilized as follows:

The first two semesters will be spent on Pre and Para clinical subjects including Anatomy, Physiology, Biochemistry, Basics in Medical Physics, English, Computers, Microbiology, Pathology, Pharmacology, Environmental Science and Community Medicine and Nursing. At the beginning of the third semester students will be assigned to branch of Specialization, to which allotted and they will proceed with the specialty during the third, fourth, fifth and sixth semesters,

The fourth year of the course shall be compulsory internship in the respective specialty. The Syllabus for the course shall be as specified in the regulation.

9. Medium of Instruction

English shall be the medium of instruction for all the subjects of study and for the examination.

10. Working Days

In the case of I to VII semesters, each semester shall consist of not less than 100 working days and each academic year shall have a total of 200 working days or above. In the case of VIII semester, shall have 140 working days.

11. Attendance

The candidate shall have not less than **80%** attendance in Theory and Practical separately. Each semester shall be taken as a unit for the purpose of calculating the attendance. The candidate lacking attendance in a subject shall be denied permission to appear for the University Examination in that subject.

12. Condonation of Lack of Attendance

The discretionary power of condonation of shortage of attendance to appear for University Examination rests with the University.

Lack of attendance can be condoned up to a maximum of 5% of the minimum attendance required in the following exceptional circumstances:

- (i) Any illness / accident (for which Medical certificate from a registered medical practitioner must be produced)
- (ii) Any unforeseen tragedy in the family (should produce the letter from the parent/guardian)
- (iii) Participation in NCC/NSS and other co- curricular activities representing the Institution / University. (Certificate from competent authority is required)

For any of the above reasons, request shall be made by the candidate with prescribed fees to the Controller of Examination through proper channel, ten days prior to the commencement of the theory examination.

13. Commencement of the examinations

There shall be two sessions of University examinations in an academic year, viz., December and June.

14. Cut-off dates for admission to the examinations

The candidates admitted from 1st August to 31st August of the academic year shall be registered to take their first semester examination in the month of December of the academic year after fulfillment of the stipulated regulations.

15. Grading system

All assessments of a course shall be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain points, will be awarded as per the range of total marks (out of 100) obtained by the candidate, as detailed below:

Letter grade	Grade Points	Range of Marks
"O" Outstanding	10	86-100
A+ (Excellent)	9	70-85
A (Very Good)	8	60-69
B+ (Good)	7	55-59
B (Above Average)	6	50-54
C (Average)	5	45-49
D (pass)	4	40-44
F (Fail / RA (Reappear)	0	Below 40
AB (Absent)	0	-
NC – Not Completed	0	-

After results are declared, Grade Statement will be issued to each student which will contain the following details:

- The college in which the candidate has studied
- The list of subjects enrolled during the semester and the grades scored.
- The Credits awarded and accumulated.
- The Grade Point Average (GPA) for the semester and
- The Cumulative Grade Point Average (CGPA) of all subjects enrolled from first semester onwards.

GPA is the ratio of, the sum of the products of the number of credits of subjects (C) and the grade points scored in those subjects (GP), to the sum of the credits of all the subjects in that semester.

$$\text{GPA} = \frac{\text{Sum of [C} \times \text{GP]}}{\text{Sum of C}}$$

CGPA will be calculated using the above formula, considering all the subjects enrolled from first semester onwards. “RA”, “I” and “NA” grade will be excluded for calculating GPA and CGPA.

16. Classification of successful candidates

The CGPA arrived at the completion of the course shall be the criteria for the classification of successful candidates as below:

CGPA (Percentage)	Classification
10.0 (90-100%)	First class with honours
8.0-9.9 (75-89%)	First class with Distinction
6.5 to 7.9 (60-74%)	First class
4.5 to 6.4 (40-59%)	Second class

- a) Successful candidates who secure 75% marks and above as a course aggregate in the first appearance taking University theory, practical, project / dissertation evaluation and viva shall alone be awarded Distinction. This will also apply for award of University rank.
- b) Successful candidates who secure 60% marks and above as a course aggregate in the University theory, practical, project / dissertation evaluation and viva shall be awarded First Class.
- c) All others who secure 40-59% in gross percentage will be classified to have passed in Second Class.

17. Continuous (Internal) Assessment

- a. Continuous (Internal) Assessment for Theory shall be the average of the best two out of three.
- b. Continuous (Internal) Assessment for Practical's shall be the average of the best two out of three.
- c. The minimum Internal Assessment will be 40% separately for Theory & Practical

18. Semester – End Examination (University/Department)

- a) The examination in B.Sc. (Allied Health Science) shall consist of Written Theory examinations and Practical Examinations. The semester – End Examination (University/Department) shall be conducted at the end of each semester.
- b) Papers for which Internal Examination is recommended by the Board of Studies and approved by the Academic Council, the following criteria shall be followed.
 - i) The weightage for Continuous Internal Assessment and Internal Examination (to be conducted by the respective department) shall be in the ratio of 25% and 75% respectively.
 - ii) The Continuous (Internal) Assessment marks shall be the average of the best two out of three. The date of Semester – End Examinations (Internal examinations) shall be as per the University guidelines.

19. EXAMINATION PATTERN (for all specialties) (with practical) – UNIVERSITY EXAM.

A. Theory

Max. Marks – 60 Duration: 2 1/2hrs

I. Essay Questions (1×10)	10 Marks	} Ist & IInd Semesters alone
II. Short Notes (8×5)	40 Marks	
II. Short Answers (5×2)	10 Marks	

B. Theory

Max. Marks – 60 Duration: 2 1/2hrs

I. Essay Questions (2×10)	20 Marks	} III rd , IV th , V th , VI th & VII th Semesters
II. Short Notes (8×5)	40 Marks	

C. Practical

I. Practical (Including Oral) 20 Marks

D. Continuous (Internal) Assessment

I. Theory 10 Marks

II. Practical 10 Marks

Internal Examination

Short Notes or Short Answers 8×5 = 40

IA = 10

Total **50**

20. Marks Qualifying for a Pass

For passing the University / End-semester Examination from Semester I to Semester VII, the candidate shall secure the marks as stated below,

- a) **40% minimum in the End-Semester examination as well as 40% aggregate marks (continuous assessment and End – Semester examination). The minimum marks for internal assessment shall be 40%.**
- b) For papers which are internally evaluated the same distribution of 25% for Continuous (Internal Assessment and 75% for Semester –end Examination (which shall be conducted by the respective department) shall be followed.

Criteria to pass:

I and II SEMESTER

1.Theory – Minimum Pass - 40% .

**2.Theory& Practical – 40% of the aggregate(i.e)theory(60)+practical(20)=80,
40% of this (i.e) 32 is the minimum marks to pass.**

III and VIII SEMESTER

1.Theory –Minimum Pass - 40%,

2.Practical – Minimum Pass - 40%

21. Carry-over of failed subjects

A candidate who fails in any one or more of the first year subjects, shall be permitted to carry over the subjects to the second year. However a candidate should clear all the subjects of the second year along with the carried over subjects of the first year before getting promoted to the third year(V Semester).

Project to be done in the VIII Semester.

22. Revaluation of answer papers

There shall be no revaluation of answer papers of failed candidates. Failed candidates are however, permitted to apply to the University for re-totalling within fifteen days of publication of the results for re-totalling.

23. Temporary break of study

- a) A Candidate is not normally permitted to temporarily break the study.

- b) If a candidate is continuously absent from the institute for one year without any information / permission.
 - i) having notified the Dean/Director/Principal within this period, this absence shall be treated as "Temporary Break of Study".
 - ii) without notifying the Dean/Director/Principal, his/her name will be removed from the institute rolls.
- c) If a candidate is compelled to temporarily break the study for valid reasons (such as accident or hospitalization due to prolonged ill health), he/she shall apply for condonation of the break to the Dean/Director/Principal through the Head of the Department.
- d) For condonable break of study:
 - i) If the lack of attendance is within condonable limits as per Clause No. 12 the candidate shall be permitted to write the examination for the current semester.
 - ii) If there is non-condonable lack of attendance, the candidate shall rejoin the program at the respective semester as and when it is offered after the break and shall be governed by the rules and regulations in force at the time of rejoining.
- e) The total period for completion of the program reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period specified in Clause No. 6 irrespective of the period of break of study in order that he/she may be qualified for the award of the degree.
- f) In any case, a candidate shall be permitted to temporarily break the study only once during the entire duration of the program. The candidate shall forfeit the registration in case of a second break or in case of a non-condonable break of study.
- g) Without prejudice to the above rules, the candidate who has completed the attendance requirement for a semester, but has proceeded on a condonable break of study without appearing for the University Examination, shall be permitted to appear for the examinations without repeating the semester and thereafter continue the subsequent semester.

SCHEME OF EXAMINATION 2022
B.Sc .ALLIED HEALTH SCIENCES
SEMESTER - I (Common to all Branches)

S.No	Paper	Teaching Hrs		Evaluation-University Examination { marks }					
		L	P	I.A.		University Exam		Total	Credits
				T	P	T	P		
1.	Anatomy[UE]	60	20	10	10	60	20	100	5
2.	Physiology[UE]	60	20	10	10	60	20	100	5
3.	Biochemistry [UE]	60	20	10	10	60	20	100	5
4.	Medical Physics[I.E.]	60	20	10	-	40*	-	50	5
5.	English{I.E. }	60	-	10	-	40*	-	50	4
6.	Basics of Computers{I.E.]	30	30	10	-	40*	-	50	4
								Total	28

SEMESTER II

S. No	Paper	Teaching Hrs		Evaluation-UniversityExamination { marks }					
		L	P	I.A.		University Exam		Total	Credits
				T	P	T	P		
1.	Basic Microbiology[U.E.]	60	20	10	10	60	20	100	5
2.	Molecular Pathology [U.E.]	60	20	10	10	60	20	100	5
3.	Pharmacology [U.E.]	60	20	10	10	60	20	100	5
4.	Environmental Science & Toxicology[I.E.]	60	20	10	-	40*	-	50	5
5.	General Chemistry[I.E.]	60	-	10	-	40*	-	50	4
Total no. of credits								24	

U.E.-University Examination

*I.E.-Internal Examination.

*These examinations shall be conducted by the respective department.

SCHEME OF EXAMINATION 2022

BIOMEDICAL SCIENCES

SEMESTER – III

S.No	Paper	Hrs/Sem		Evaluation-University Examination {marks}					
		L	P	Internal Assessment		University Exams/Department*Exams		Total	Credits
				T	P	T	P		
1.	Basic Plant & Animal Biology Theory(UE)	60	-	20	-	60	-	80	4
2.	Basic Plant & Animal Biology - Practical (UE)	-	120	-	20	-	60	80	4
3.	Molecular Cell Biology - Theory(UE)	60	-	20	-	60	-	80	4
4.	Molecular Cell Biology -- Practical (UE)	-	120	-	20	-	60	80	4
5.	Developmental Biology(IE)	60	-	20	-	60*	-	80	4
6.	Communication & Soft skills(IE)	-	180	-	25	-	75*	100	5
Total no. of credits									25

U.E.-University Examination

*I.E.-Internal Examination.

*These examinations shall be conducted by the respective department.

SCHEME OF EXAMINATION 2022

BIOMEDICAL SCIENCES

SEMESTER – IV

S.No	Paper	Hrs/Sem		Evaluation-University Examination {marks}						
		L	P	Internal Assessment		University Exams/Department*Exams		Total	Credits	
1.	Medical Genetics - Theory (UE)	60	-	20	-	60	-	80	4	
2.	Medical Genetics – Practical (UE)	-	120	-	20	-	60	80	4	
3.	Enzyme Technology (UE)	60	-	20	-	60	-	80	4	
4.	Enzyme Technology -- Practical(UE)	-	120	-	20	-	60	80	4	
5.	Basic Biostatistics (IE)	60	-	20	-	60*	-	80	4	
6.	Comprehensive viva: (IE)	-	180	-	25	-	75*	100	5	
Total no. of credits									25	

U.E.-University Examination

*I.E.-Internal Examination.

*These examinations shall be conducted by the respective departments.

SCHEME OF EXAMINATION 2022

BIOMEDICAL SCIENCES

SEMESTER – V

S.No	Paper	Hrs/Sem		Evaluation-University Examination {marks}					
		L	P	Internal Assessment		University Exams/Department*Exams		Total	Credits
				T	P	T	P		
1.	Bioprocess Technology-Theory (UE)	60	-	20	-	60	-	80	4
2.	Bioprocess Technology- Practical (UE)	-	120	-	20	-	60	80	4
3.	Molecular Immunology -Theory (UE)	60	-	20	-	60	-	80	4
4.	Molecular Immunology- Practical (UE)	-	120	-	20	-	60	80	4
5.	Cancer Biology (IE)	60	-	20	-	60*	-	80	4
6.	Recombinant DNA Technology (IE)	-	180	-	25	-	75*	100	5
Total no. of credits									25

U.E.-University Examination

*I.E.-Internal Examination.

*These examinations shall be conducted by the respective departments.

SCHEME OF EXAMINATION 2022

BIOMEDICAL SCIENCES

SEMESTER – VI

S.No	Paper	Hrs/Sem		Evaluation-University Examination {marks}						
		L	P	Internal Assessment		University Exams/Department*Exams		Total	Credits	
				T	P	T	P			
1.	Biophysics & Bioinstrumentation Theory (UE)	60	-	20	-	60	-	80	4	
2.	Biophysics & Bioinstrumentation Practical (UE)	-	120	-	20	-	60	80	4	
3.	Tissue Engineering – Theory (UE)	60	-	20	-	60	-	80	4	
4.	Tissue Engineering – Practical (UE)	-	120		20	-	60	80	4	
5.	Computing & Web application(IE)	60	-	20	-	60*	-	80	4	
6.	Molecular epidemiology (IE)	-	180	-	25	-	75*	100	5	
Total no. of credits									25	

U.E.-University Examination

*I.E.-Internal Examination

*These examinations shall be conducted by the respective departments.

SCHEME OF EXAMINATION 2022

BIOMEDICAL SCIENCES

SEMESTER – VII

S.No	Paper	Hrs/Sem		Evaluation-University Examination {marks}					
		L	P	Internal Assessment		University Exams/Department*Exams		Total	Credits
				T	P	T	P		
1.	Clinical Biochemistry-Theory (UE)	60	-	20	-	60	-	80	4
2.	Clinical Biochemistry - Practical (UE)	-	120	-	20	-	60	80	4
3.	Stem cells & Regenerative medicine - Theory (UE)	60	-	20	-	60	-	80	4
4.	Stem cells & Regenerative medicine - Practical (UE)	-	120	-	20	-	60	80	4
5.	Genomics & Proteomics-Theory (IE)	60	-	20	-	60*	-	80	4
6.	Genomics & Proteomics-Practical (IE)	-	180	-	25	-	75*	100	5
Total no. of credits									25

U.E.-University Examination

*I.E.-Internal Examination.

*These examinations shall be conducted by the respective departments.

SCHEME OF EXAMINATION 2022**BIOMEDICAL SCIENCES****SEMESTER – VIII**

S.No	Programme	Hours Prescribed	Department Examination			
			Project Evaluation	Viva	Total	Credits
1.	Research Projects	180	80	20	100	6

- The project format should comply with the international standards and consists of the following components:

SL.NO:	CONTENTS	Page Number
1	Introduction	
2	Aims or Objectives and Hypothesis	
3	Methodology	
4	Experimental & Results	
5	Discussion	
6	Conclusion	
7	References (Vancouver style)	
8	Appendix (Copies of Institutional Ethics Committee approval, Informed consent, additional resources, Publications etc.,)	

B.SC. ALLIED HEALTH SCIENCE – 2022

Biomedical Sciences

An **ALLIED HEALTH SCIENCE** professional is an important part of a multidisciplinary Health care team who provide support service and rehabilitation measures for the patients in the hospital.

Duration of the course: Four years of which last semester will be for Project.

Medium of instruction: ENGLISH

The first Semester syllabi for Allied Health sciences is common for all the courses.

FIRST YEAR: (Semester I)

MAIN SUBJECTS:

Anatomy

Physiology

Biochemistry

Semester II - MAIN SUBJECTS:

Basic Microbiology

Molecular Pathology

Pharmacology

SUBSIDIARY SUBJECTS:

English, Computer, Medical physics, Environmental Science & Toxicology, Medicine & General Chemistry.

Exams in subsidiary subjects shall be conducted at the college level and marks forwarded to the university.

INTERNAL ASSESSMENT:

1. Written tests-average of 2 tests, viva, assignments, aptitude, punctuality and Attitude.
2. Log book-It will have the recordings, of all activities department and date wise including practical demonstrations. There will not be a practical record

INTERNAL ASSESSMENT MARKS:

1. Written test etc.....	10
2. Log book & Practical.....	10
Total	20

80% ATTENDANCE & 40% of INTERNAL ASSESSMENT marks are essential to appear for the University Examination

University Exams shall be conducted at the end of each semester. (JUNE & DEC)

B.SC. ALLIED HEALTH SCIENCE

SCHEME OF EXAMINATION - SEMESTER I

(Common To All Courses For Anaesthesia Technology, Cardiac Technology, Medical Laboratory Technology, Renal Dialysis Technology, Radiology And Imaging Science Technology, Perfusion Technology, Respiratory Care Technology, Biomedical Sciences)

S.No	Paper	Teaching Hrs		Evaluation University Examination [marks]					
		L	P	I.A.		University Exam		Total	Credits
				T	P	T	P		
1.	Anatomy[UE]	60	20	10	10	60	20	100	5
2.	Physiology[UE]	60	20	10	10	60	20	100	5
3.	Biochemistry[UE]	60	20	10	10	60	20	100	5
4.	Medical Physics[I.E.]	60	20	10	-	40*	-	50	5
5.	English[I.E.]	60	-	10	-	40*	-	50	4
6.	Basic of Computers[I.E.]	30	30	10	-	40*	-	50	4
Total									28

U.E University examination.

*I.E Internal examination.

*These examinations shall be conducted by respective departments.

B.SC. ALLIED HEALTH SCIENCE

SYLLABUS

SEMESTER – 1

1.ANATOMY (UE)

UNIT I: Organization of the human body

1. Introduction

- Introduction to human body
- Definition and subdivision of anatomy
- Anatomical position and terminology
- Region and systems of the body
- Cavities of the body and their contents
- Levels of organization of the body

2. Cell and genetics

- Parts of cell – cell membrane, cytoplasm, organelles, inclusion bodies, nucleus
- Structure of chromosome, DNA, RNA.
- Basics & fundamentals of Genetics, Karyotyping, Chromosomal disorders, prenatal diagnosis, genetic counseling and gene therapy.
- Cell division – Definition and main events that occur in different stages of mitosis and meiosis.
- Tissues – Definition, characteristic features and types with example.
- Types of glands with example

UNIT II: Systems of support and movement

1. Skeletal system

- Cartilage: Type and basic histological feature.
- Bones: definition, classification based on location, name and number of bones with general feature of important bones, function of bone, histological feature of a compact bone.

- Joints – Definition and types with example, Axis and movements. Shoulder, elbow, hip, knee joints – type, bones and ligaments involved, possible movements.

2. Muscular system

- Types of muscle with basic histological features
- Parts of skeletal muscle.
- Definition of origin and insertion
- Origin, insertion, nerve supply, action of sternocleidomastoid, pectoralis major, deltoid, gluteus maximus and diaphragm.

UNIT III: Controls systems of the body

1. Nervous system

- Subdivisions of the nervous system
- Spinal cord-location, extent, external features and blood supply
- Brain-subdivision, location, external features of Medulla oblongata, Pons, Midbrain, Cerebellum, and Cerebrum, Thalamus and Hypothalamus, Location and subdivision of ventricles of brain. Circle of Willis.
- Cranial nerves-name, number, attachment, area of distribution
- Spinal nerves-typical spinal nerve. Name and location of plexuses. Location and distribution of brachial and lumbosacral plexus.
- Autonomic nervous system-sympathetic and parasympathetic nervous system. Location of pre-ganglionic and post-ganglionic neurons.

2. Sense organs

- Location and features of nose, tongue, eye, ear and skin.

3. Endocrine system

- Names of the endocrine glands. Location and features of pituitary, thyroid, parathyroid, suprarenal, pancreas, ovaries and testis. Names of hormones produced by each gland.
- Microscopic features of thyroid and pancreas.

UNIT IV: Maintenance of the human body.

1. Cardio vascular system

- Types and general features of blood vessels. Structure and types of arteries and veins. Shape, size, location, covering, external and internal features of Heart. Conducting system of heart. Blood supply of the heart. Name, location, branches and main distribution of principal arteries and veins

2. Lymphatic system

- General features of Lymph node and lymphatic vessels. Name, location, external features, microscopic feature of tonsil and spleen.

3. Respiratory system

- Name the organs of respiration. Location and features of Nasal cavity, pharynx, larynx, trachea, lung & pleura. Mention the microscopic feature of lung.

4. Digestive system

- Name the parts of the alimentary canal and accessory organs. Location & features of esophagus, stomach, small and large intestine. Location and feature of tongue, salivary glands, pancreas, liver and gall bladder. Microscopic feature of liver.

5. Urinary system

- Names of urinary organs. Location and features of kidney, ureter, urinary bladder & urethra. Microscopic feature of kidney.

6. Reproductive system

- Names of male and female organs of reproduction. Location and features of testis, epididymis, vas deferens, prostate gland and spermatic cord. Location & features of uterus, uterine tube, ovary and breast.

7. Embryology

- Structure of gametes & gametogenesis. Fertilization to development of embryo till 3rd week. Derivatives of germ layers. Teratogens, Structure and Functions of placenta.

UNIT V: Anatomical regions

- Simple ideas about scalp, triangles of neck, axilla, cubital fossa, carpal tunnel, mediastinum, umbilicus, inguinal canal, femoral triangle
- subsartorial canal popliteal fossa

PRACTICALS/DEMONSTRATIONS

1. Demonstrations of dissected specimens.
2. Viewing of projection of microscopic slides of muscle, bone, cartilage, spleen, tonsil, lung, liver, kidney, thyroid and pancreas

REFERENCE BOOKS

1. Manipal manual for AHS by Dr. SampathMadhyastha, (Second Edition) Published by CBS Publishers.
2. Handbook of anatomy for nurses by Dr. P. Saraswathi
3. Ross and Wilson, Anatomy and physiology in health & illness.

2. PHYSIOLOGY (UE)

Unit-I

1. General Physiology:

- Concept of Homeostasis
- Cell structure and functions
- Transport across membranes

2. Body and body fluids:

- Body fluid volumes, compartments and composition
- Blood composition and functions
- Plasma proteins – Types and functions
- Erythrocytes – functions, Erythropoiesis, anemias
- Leucocytes – classification and functions
- Platelets – morphology and functions
- Blood coagulation – Mechanism and name of anticoagulants
- Blood groups – Basis of ABO & Rh grouping, Erythroblastosis Foetalis

3. Muscle physiology:

- Muscles – Classification & structure of striated, nonstriated & cardiac muscle
- Neuromuscular junction
- Mechanism of skeletal muscle contraction

4. Digestive system:

- Salivary glands, functions of saliva
- Parts of stomach, composition & functions of gastric juice
- Pancreatic Juice – composition & functions
- Bile – composition & functions of bile & bile salts
- Functions of Small intestine & large intestine

Unit-II

1. Skin

- Structure & Functions

2. Excretory system:

- Kidney: Basic physiological anatomy (Including JGA)
- Formation of urine – GFR
- Formation of urine – Reabsorption & secretion
- Micturition Reflex
- Dialysis – Principle, types
- Renal function tests

Unit-III

1. Endocrine system:

- Hypothalamohypophyseal inter relationship
- Posterior pituitary hormones and its actions
- Anterior pituitary hormones, Growth hormone – Actions
- Dwarfism, gigantism, acromegaly
- Thyroid hormones – Actions
- Cretinism, Myxoedema, Grave's disease (clinical features)
- Parathyroid hormones – Functions, Tetany
- Insulin, Glucagons – Actions, Diabetes mellitus
- Adrenal medullary hormones & their actions
- Adrenal cortex hormones & their actions

2. Reproductive system:

- Male reproductive organs – Spermatogenesis, Testosterone actions
- Female reproductive organs – menstrual cycle (endometrial and ovarian cycles) and its hormonal control
- Contraceptive methods in male and female

Unit-IV

1. Respiratory system:

- Basic physiological anatomy
- Surfactant
- Mechanics of respiration
- Lung volumes and capacities
- Oxygen transport, Carbon-di-oxide transport
- Nervous and chemical regulation
- Pulmonary function tests.

2. Cardiovascular system:

- Basic physiological anatomy, innervations of heart
- ECG – normal waves, intervals and their significance
- Cardiac cycle – mechanical events, Heart sounds
- Blood pressure – Definition, measurement, normal values, factors maintaining BP Regulation

Unit-V

1. Nervous system:

- Structure of neuron, neuroglial cells, synapse and transmission across it
- Reflex – Components of reflex arc, examples.
- Functions of ascending tracts – anterior, lateral spinothalamic tracts, Dorsal column
- Functions of Corticospinal (Pyramidal) tract-Descending tract
- Functional areas of cerebral cortex
- Functions of basal ganglia, thalamus, hypothalamus, limbic system and cerebellum

2. Special senses:

- Receptors for various special senses

Practical Demonstration

Haematology:

1. Enumeration of RBC count.
2. Enumeration of WBC count.
3. Differential Count.
4. Estimation of Hemoglobin.
5. Determination of blood group.
6. Determination of bleeding time and clotting time.

Clinical physiology:

1. Measurement of blood pressure.
2. Determination of Radial pulse

Reference Book

1. Human Physiology for BDS by A.K.Jain, 4th Edition, Avichal publishing co

3. BIOCHEMISTRY (UE)

Unit I – Cell and its molecules

- **Cell** – Cell organelles, Fluid Mosaic Model, functions of cell membrane, Brief description of transport across the cell membrane.
- **Carbohydrates** – Definition, Classification with examples, Sources, physiological significance and HbA1c.
- **Lipids** – Definition, Classification with examples, Sources, Types of lipids present in the body, storage form, storage site, free cholesterol structure, functions of lipids, lipoprotein structure and its functions.
- **Nucleic acids** – Nucleotide, Nucleoside, types of nucleic acids, secondary structure of DNA & Its functions; Types of RNA & its functions.

UNIT II – Proteins and Enzymes

- **Proteins** – Definition, Classification, functions of proteins, Plasma proteins; Classification of Aminoacids with examples
- Hemoglobin structure, Functions of hemoglobin, hemoglobin derivatives, Abnormal hemoglobin
- **Enzymes:** Definition, Classification, coenzymes, Metalloenzymes, Factors affecting enzyme activity, Regulation of enzymes, over view of Mechanism of enzyme action, Isoenzymes and Clinical importance of enzymes

UNIT III-Vitamins, Minerals, Nutrition

Vitamins: Definition, Classification of Vitamins

Sources, RDA, Function & Deficiency symptoms of

- Fat Soluble Vitamins (A, D, E & K);
- Water Soluble Vitamins (Thiamine, Riboflavin, Niacin, Biotin, Pantothenic acid, Pyridoxine, Folic acid, Cobalamine) and Vitamin C

Minerals: Definition, Classification of Minerals

Sources, RDA, Function, Reference levels & Deficiency Symptoms of

- Calcium, Phosphorus, Iron Copper, Zinc, Sodium, Chloride, Iodine, Potassium, Fluorine and Selenium.

Nutrition: BMR, SDA, Dietary fibres, protein Energy Malnutrition and Obesity

UNIT IV – Bioenergetics and Metabolism

Bioenergetics: Electron Transport chain and Oxidative Phosphorylation

Metabolism

- **Carbohydrates:** Digestion and absorption, Glycolysis, TCA cycle, Metabolism of Fructose and Galactose.
- **Lipids:** Digestion and absorption, Beta oxidation of fatty acids, Regulation of Cholesterol level in the cell and outline of lipid transport.
- **Proteins:** Digestion and Absorption, Formation and Disposal of Ammonia, Urea Cycle, Special Products of Glycine, Tyrosine and Tryptophan.

UNIT V – Miscellaneous

Outlines of DNA organization, Replication, Transcription, Genetic code and Translation

Organ function Tests: Liver, Renal and Bone.

PRACTICAL

- Spotters

Reference Book

1. Essentials of Biochemistry by Satyanarayana, Current edition and Allical publishers.

4. BASICS IN MEDICAL PHYSICS AND ELECTRONICS (IE)

Unit I: Laser

Nature of light-Reflection-Refraction-Total internal reflection-Optical fibers-Applications in Medicine – Laser-Principles-Action-Types of laser, Basic principles of laser in Medical Application – Argon-Iron laser photo coagulator-Photo thermal-Photochemical application-Applications of laser in Medicine-Laser hazards and safety measures

Unit II: Radiation Physics

Introduction to nuclear physics and radioactivity, Radioactive radiations – X-ray, production of x-ray, Properties of x-ray radiations – Biological effects of radiation, Radiation damage in matter, Radiation protection principles, radiation detection and measurement – Ultrasound and generation of ultrasound.

Unit III: Introduction to Imaging Technique

Principles of Microscope: Simple microscope and compound microscope-Radiography: Making and X-ray image-Fluoroscopy. CT Scans, MRI – Ultrasonography: Ultrasound picture of Body-A-Scan-M-Scan-Ultrasound diathermy-Phonocardiography – Radio isotopes: Uses of Radio isotopes – ^{99m}Tc Generator – Scintillation detectors – Application of scintillation detectors – Gamma Camera – Positron Camera

Unit IV: Semiconductor devices

Principles of diodes and Transistors – Integrated circuits – Amplifiers – Basic configuration and types – differential and operational amplifiers – Waveform generators – Timer – A/D and D/A converters – Active filters – Transducers – Basic configuration and types.

Unit V: Biopotential Recording Systems

Introduction to bioelectric potential – Electrodes and surfaces – Biopotential amplifier – Frequency ranges of various biopotential signals – Working principles of bio potential recording systems – Electrocardiography – Electroencephalograph –Electromyography.

Reference Books:

1. New Understanding physics for advanced level – Jim Breithaupt.
2. Advanced Physics for you by Keith Johnson, Simmons hewett, Sue holt, John miller
3. Christensen's Physics of diagnostic Radiology by Thaomas S. Curry III, M.D., Robert C Murry, Jr. Phd., Dow Dey, Phd.
4. Applied Electronics, A. Subramanyam, The National Publishing co., Madras (1996).
5. Design and Development of Medical Electronic Instrumentation, David Prutchi and Michael Norris, John Wiley & Sons (2005).

5. ENGLISH (IE)

Unit I : Spoken Communication

- Learning to read the phonetic symbols
- Stress
- Intonation
- Rhythm
- Commonly mispronounced words
- Correct pronunciation of important commonly used words in hospital practice

Unit II : Vocabulary and Reading

- Special features of English vocabulary
- Common errors in choice of word
- Semi technical vocabulary
- Collecting material from library on scientific topics
- Comprehensive exercises

Unit III : Writing

- Writing letters regarding permission, leave, opening bank account etc.
- Taking notes from lecture / reading materials
- Writing reports on patient care
- Summarizing scientific passages

Unit IV : Grammatical and Idiomatic Usage

- Correction of errors
- Types of interrogative sentences
- Active-Passive voice
- Tense
- Principles of procession, clarity and specificit

6. BASIC OF COMPUTERS (IE)

UNIT I: INTRODUCTION

Computer basics – Types of computers – hardware components – input devices – output devices – storage devices – memory – units and sizes – factors affecting performance – operating systems – applications software – networking – LAN and WAN – Accessories – backup – computer virus – software copyright.

UNIT II: WORD PROCESSING

Windows – Office automation – WORD processor – open a new document – toolbars – menus – font dialog box – enter text – scroll – spelling checker – Autocorrect – undo and redo – bullets and numbered lists – indenting – moving and copying – find and replace – autosshapes – saving document – preview and print.

UNIT III: ELECTRONIC SPREADSHEET AND DATA PRESENTATION

EXCEL spreadsheet – grid of rows and columns – active cell – selecting range – entering data – editing data – row and column labels – adjusting width – creating and copying formulae – relative – logical functions – lookup function – creating chart – bar chart – pit chart – print and save.

POWERPOINT presentation – creating slide shows- building outline – switching levels in outline – adding pictures – slide designs – design templates – formatting – color scheme – customized backgrounds – inserting content – hyperlink – revolution in education.

UNIT IV: DATABASE MANAGEMENT SYSTEM

ACCESS database – concept – template –primary key – records and fields – Student roster database – input mask – adding records – viewing data – updating entries – searching and querying – sorting – Table, forms and reports.

UNIT V: APPLICATIONS IN HEALTH CARE AND MEDICINE

INTERNET – e-governance – access to information – communication facility – mechanics of E-mail – social transformation – electronic billing – drug information – information flow in lab and radiology – storage of medical records – networking the organization – patient care – intelligent monitoring – scholarly information – health informatics – robotic assisted surgery – Clinical decision support systems – Telemedicine.

REFERENCES BOOKS

1. Peter Norton., Introduction to Computers. 7th Edition, Tata Mcgraw hill Education Private Limited 2010.
2. Gary B. Shelly, Thomas J. Cashman, Misty E. Vermaat., Microsoft Office 2007. 1st Edition, Delmar Cengage Learning 2010.

B.SC. ALLIED HEALTH SCIENCE**SCHEME OF EXAMINATION 2022****SEMESTER – II**

S.No	Paper	Teaching Hrs		Evaluation-University Examination [marks]					
		L	P	I.A.		University Exam		Total	Credits
				T	P	T	P		
1.	Basic Microbiology[U.E.]	60	20	10	10	60	20	100	5
2.	Molecular Pathology [U.E.]	60	20	10	10	60	20	100	5
3.	Pharmacology [U.E.]	60	20	10	10	60	20	100	5
4.	Environmental Science & Toxicology[I.E.]	60	20	10	-	40	-	50*	5
5.	General Chemistry[I.E.]	60	-	10	-	40	-	50*	4
Total no. of credits									24

U.E.-University Examination

*I.E.-Internal Examination

*These examinations shall be conducted by the respective departments.

B.SC. ALLIED HEALTH SCIENCE SYLLABUS
SEMESTER – II

1. BASIC MICROBIOLOGY (UE)

UNIT – I: General Bacteriology

Introduction & History of Microbiology, Classification & Morphology of Bacteria, Growth & nutrition, Culture Media & Methods, Sterilization & Disinfection, Fundamental aspects of antibacterial agents and antimicrobial susceptibility testing.

UNIT – II: Immunology

Infection, Immunity, Immunization schedule, applications of antigen antibody reactions, Hypersensitivity, Tumor & Transplantation Immunology.

UNIT – III: Virology

Introduction to virology, viral hepatitis, poliomyelitis, Rabies, Human immunodeficiency virus.

UNIT – IV Mycology & Parasitology

Introduction to mycology, pathogenic yeasts & fungi, Introduction to parasitology, Amoebiasis, Malaria, Helminthic infections.

UNIT – V : Applied Microbiology

Outline of common bacterial diseases, treatment & prevention-Respiratory tract infections (upper & lower), Meningitis (septic & aseptic), Enteric infections (food poisoning & gastro enteritis), Anaerobic infections, Skin & soft tissue infections, Urinary tract infections, Sexually transmitted diseases, Tuberculosis & Leprosy, Hospital acquired infections, Biomedical waste management.

PRACTICAL EXERCISES: Spotters, Gram staining.

Practical :

To understand the types, principles of microscopy

To understand the functioning and application of microscopes as can be utilized to study biological material

1. Operation of Light Microscope; use of oil-immersion objective.\
2. Basic laboratory Practices in microbiology laboratory
3. Preparation of culture media
 - a. Preparation of broth
 - b. Agar plates
 - c. Agar slants
4. Culture technique- Spread plate method, pour plate method, surface streaking (plant and slant stabbing technique), quadrant streaking
5. Staining techniques for examination of microorganism
 - a. Simple Staining
 - b. Differential Staining
6. Bacterial motility
7. Enumeration of microbes- isolation of pure culture from natural resources.

Reference Books

1. Textbook of Microbiology by Ananthanarayan & Panicker's, 8th edition-Universities Press (India) PVT LTD.
2. Textbook of Microbiology by C. P. Baveja, 4th edition, Arya Publications.
3. Textbook of Medical Parasitology, CK Jayaram Paniker, 5th edition, Jaypee Publications.
4. Medical Parasitology by C. P. Baveja & V. Baveja, 2nd edition, Arya Publications.
5. Publications.

2. MOLECULAR PATHOLOGY (UE)

UNIT-I:

Cell injury, adaptation and death. Various mechanisms and morphology, reversible and irreversible cell injury, apoptosis. Inflammation and repair. Hemorrhage, Shock, Embolism and thrombosis.

UNIT-II: Infectious Diseases

AIDS, Other sexually transmitted diseases, tuberculosis, Leprosy and Typhoid. Air pollution, industrial exposure, tobacco smoke and diseases in human. Alcohol and diseases in human.

UNIT-III: Neoplasia

Tumors – terminologies, nomenclature, classification, molecular basis of carcinogenesis, molecular basis of metastasis. Carcinogens and carcinogenesis.

UNIT-IV: Heart, Lung, Gut, Liver and Pancreas diseases

Atherosclerosis, coronary Heart Disease. Pulmonary infections, community acquired acute pneumonias, atypical pneumonias, Nosocomial pneumonias. Etiopathogenesis including molecular mechanisms of cancer oesophagus, stomach and intestine. Viral hepatitis, cirrhosis, Pancreas- Diabetes mellitus, acute pancreatitis.

UNIT-V: Genital system, Kidney, Bone, Musculoskeletal, Central Nervous System and Hematology.

Etiopathogenesis including molecular mechanism of cancer cervix, ovaries, endometrium and testis. Molecular mechanism of introduction to glomerular diseases, Osteoporosis, muscular dystrophies, bone tumors. Degenerative diseases of CNS and tumors of CNS. Leukemias, anemias and bleeding disorders.

Molecular Pathology Practical:

To understand the principles, basic staining procedures which are applied in clinical diagnostics

1. Paraffin section tissues
2. Fixatives and processing, H & E, special stains—PAS and AFB
3. Immunohistochemistry in the diagnosis of tumors
4. Principle, Procedure and Interpretation.
5. Immunofluorescence, principle- role in diagnosis
6. Rapid diagnosis of tumors- Frozen sections
7. Hematology auto analyzers, leishman staining, Hb, QBC

REFERENCE BOOKS

1. Pocket companion to Pathologic Basis of Disease by Robbins and Cotran, 7th edition,

3. PHARMACOLOGY (UE)

UNIT-I: General Pharmacology

Introduction to pharmacology-various terminologies-sources & routes of drug administration – Absorption & Factors modifying drug absorption – Distribution of drugs – Metabolism: Phase II, - Excretion: routes, modes & kinetics of elimination – Excretion – Mechanism of drug action in brief, synergism & antagonism and Factors modifying drug action – Adverse drug reactions – ADR reporting & monitoring – Drug interactions.

UNIT-II: Central Nervous System & Respiratory System

Introduction to CNS and Neurotransmitters, drugs used in insomnia, Sedatives and hypnotics – diazepam – alprazolam, anti anxiety drugs, Antiepileptics – phenytoin, carbamazepine, sodium valproate, General Anesthetics – halothane, isoflurane, sevoflurane – Local Anesthetics – lignocaine – list of other drugs, Alcohols – ethyl alcohol – disulfuram, Anti parkinsonians – levodopa – carbidopa, Opioids – morphine – naloxone – tramadol – pentazocine, NSAIDs – aspirin – diclofenac – ibuprofen – paracetamol – cox 2 inhibitors. Drugs used in bronchial asthma and cough

UNIT-III: Cardio vascular system & blood

Drugs used in Ischemic Heart Disease-nitrates-Calcium channel blockers-nifedipine, verapamil-list of other drugs – Beta blockers – propranolol, atenolol – metoprolol and antiplatelets – aspirin, clopidogrel, and names of other drugs-fibrinolytic drugs-streptokinase and other drugs, Drugs used in CCF-digoxin and list of other drugs useful in CCF, Shock. Diuretics: 4 groups – Thiazides, Loop diuretics, Potassium sparing and osmotic diuretics. Hypertension – outline of drugs used in hypertension, Renin angiotensin system – ACE inhibitors – captopril, ramipril and names of other drugs – Receptor antagonist – losartan and list of other drugs, Antiarrhythmic drugs-classification – Quinidine, Lignocaine and amiodaron – Drugs for Hypercholesterolemia – statins. Drugs for anemia – oral & parenteral iron preparations, folic acid, vit B12 and erythropoietin. Coagulants and anti coagulants

UNIT-IV: Hormones and GIT

Contraceptives – oral and injectable, Corticosteroids – glucocorticoids – hydrocortisone-prednisolone-dexamethasone and names of topical steroids – Insulin – Oral hypoglycemic – sulphonylureas, biguanides and others, Thyroid and Antithyroid drugs, Sex Hormones-Estrogen and anti estrogens, Progestin and Anti progestins, Androgen And anti androgens.

Emetics and anti emetics-metoclopramide and domperidone, Drugs used in peptic ulcer, constipation-lactulose & Diarrhea-ORS-Loperamide.

UNIT-V: Chemotherapy and Miscellaneous

Introduction – Beta lactum antibiotics: Penicillins – natural, semi synthetic penicillins – amoxicillin – cloxacillin-clavulanic acid – sulbactam – Cephalosporins – cephalexin – cefuroxime – cefixime – ceftriaxone-cefipime, Broad spectrum antibiotics – Doxycycline – chloramphenicol-imipenem-Macrolides – erythromycin, azithromycin and others – Quinolones- ciprofloxacin and list of other drugs and sulfonamides- cotrimoxazole-Amino glycosides-gentamycin, amikacin and names of other drugs Anti TB-first line drugs, Anti leprosy-dapsone and clofazimine Anti malarial- chloroquine- mefloquine and artemisinins, Anti fungal- amphotericin B- fluconazole and topical drugs & Anti viral drugs- acyclovir and anti HIV, Anti protozoals- metronidazole – Anthelmintics-albendazole- praziquantel.

Anti cancer drugs-Introduction – Anti metabolites- methotrexate- 6 mercapto purine-Alkylating agents- cyclophosphamide- busulphan and cisplatin – Plant products-vinblastine- vincristine- taxanes, antibiotics-actinomycin D- monoclonal antibodies.

Immuno modulators- cyclosporine, tacrolimus, azathioprine and steroids.

Toxicology-Drugs used in common poisoning, organophosphates, methyl alcohol, Benzodiazepam.

PRACTICALS:- SPOTTERS / CHARTS

REFERENCE BOOKS:

1. Lippincott's Illustrated Reviews: Pharmacology, 5th edition, by Richard A. Harvey and Pamela C. Champe, Lippincott Williams & Wilkins Publisher
2. Essentials of Medical Pharmacology: K.D. Tripathi, 6th edition, Jaypee Publishers.

4. ENVIRONMENTAL SCIENCE AND TOXICOLOGY (IE)

UNIT – I: Multidisciplinary nature of environmental studies and ecosystem:

Scope of environmental sciences, Physical, Chemical and Biological factors in the environment, structure and composition of atmosphere, meteorology, energy flow in the ecosystem, ecological pyramids, natural resources: Forest; Water, Mineral, Food, land and ocean resources- Use and Benefits, over utilization, degradation, Exploitations and associated problems, alternate energy sources, conservation of natural resources, Biodiversity at global, National and local levels, Conservation of biodiversity, Current environmental issues in India.

UNIT – II: Environmental Pollution and Acts:

Source, cause, effects of pollution, water pollution, soil pollution, marine pollution, food contaminants, noise pollution, thermal pollution, nuclear hazards. Hazardous and solid wastes- Municipal wastes, Biomedical wastes, Electronic wastes, plastic wastes, industrial chemicals. Environment protection related acts, issues involved in enforcement of environmental legislation.

UNIT – III: Introduction to toxicology:

Introduction to principles of toxicology, Types of toxicity, Environmental toxicology- Food additives and contaminants. Fundamentals of genetic toxicity, mutagenesis, carcinogenesis, toxicology risk assessment and regulatory toxicology, dose response calculations, applied toxicology, analytical toxicology.

UNIT – IV: Introduction to occupational Environment & Health:

Global & Indian Agenda, Burden of disease. Environmental health hazards – water and sanitation, hazardous waste, ozone depleting substances, green house gases and climate change, common occupation and environmental diseases. Industrial hygiene- recognition evaluation and control of occupational hazards. Industrial safety- Mechanical safety,

Electrical safety , chemical safety, material handling, industrial accidents. Legal requirements of safety, health & environment. Ethics & code of good practices in occupational safety & health.

Unit – V: Control of Environment Pollution

Air pollution –indoor, Automobile & industry , water pollution – industry, public health sanitation. Information technology in control of environment & human health. Disaster management, personal protective equipments. Resettlement, Rehabilitation, Environmental education & awareness

REFERENCE BOOKS

1. A text book of Environmental Science, Arvind Kumar, APH Publishing,
2. Environment, 9th Edition, Peter H. Raven, David M. Hassenzal, Mary Catherine Hager, Nancy Y. Gift, Linda R Berg, December 2014, © 2015
3. Genes and the Environment, Roy H Burdn, Taylor and Francis; 1999

5.GeneralChemistry [IE]

UNIT-I: Thermo chemistry

Exothermic and Endothermic reaction, Enthalpy, types of heat reaction, Hess law& its application, Measurement of heat of reaction

UNIT-II: Adsorption & Catalysis

Types of adsorption, comparison of physical and chemical adsorption, Freundlich&Langmuir adsorption isotherm, application of adsorption.

UNIT-III: Acids, bases and buffers

Theories of acids and bases, relative strength of acids and bases, pH and pH scale, buffer solution and buffer action, physiological buffers.

UNIT-IV: Application of metal ions in Biomedical sciences:

Antacids, Cathartics, Topical agents, intra and extra-cellular electrolytes, radiopharmaceuticals. Structure, nomenclature of organic compounds- Aromatic and Non-aromatic compounds.

UNIT-V: Polynuclear hydrocarbons and heterocyclic compounds:

Polynuclear hydrocarbons: Napthalene, Phenanthrene, Anthracene. Heterocyclic compounds: Pyrrole, furan, thiophene, pyridine, indole, imidazole, quinolone and phenothiazine

Text books

- 1 . Text boo of Pharmaceutical Chemistry, L. Artherden, Benley and Drivers, Oxford University press London
2. Advanced organic chemistry, B,S Bahl and ArunBanl, S. Chand and company limited, New Delhi.

Reference Books

1. Organic Chemistry, T.R.Morrison and R. Boyd, Prentice Hall of India Pvt.Ltd, New Delhi
2. Inorganic Chemistry, G.R.Chatwal, Vol I, Himalaya publishing house.

Web Links

1. www.chemspider.com
2. www.chemweb.com

LIST OF BOOKS

Anatomy

1. Manual of Anatomy and Physiology – Prof. P.Saraswathi (Vengadam Publishers, Phone no: 044-26263469)
2. B D Chaurasia: Gemera; human anatomy

Physiology

1. Basics of Medical Physiology (Third edition) by D. Venkatesh/H.H. Sudhakar

Psychology

1. Textbook of Biochemistry for Paramedical Students By Dr. P. Ramamoorthy
2. Essentials of Biochemistry by U. Sathyanarayana

Psychology

1. Psychology – The Sciences of Behaviour – Fifth edition 1982 – Neil Carlson – William Bulkist – Allyn and Bacon.
2. Psychology made simple – Abraham Sperling, Ph. D -Advisory editor – M.S. Gill. MA, Ph D- ‘Made simple books’ –W.H. Allen, London.

Elements of health and nursing principles

1. Clint & Geraldine, 2011, Potter and Perry’s fundamentals of Nursing, Elsevier publications.

English

1. Effective English Communication by Krishna Mohan and Meenakshi Raman, Tata McGraw – Hill Publishing Company Limited, New Delhi. (Approx. Cost Rs. 200)

2. English for colleges and Competitive Exams by Dr. R. dyvadatham, Emerald Publishers (Approx. cost Rs. 150)

Microbiology

1. Prof C P Baveja – Text book of Microbiology.
2. SatishGupte – Text Book of Microbiology

Pathology

1. Textbook of Pathology, Harsh Mohan, 3rd edition

Pharmacology

1. Prep Manual for Undergraduates in Pharmacology by Tara V Shanbag, 2nd edition
2. Pharmacology for Dental and Allied Health Sciences by PadmajaUdaykumar, 3rd edition

Medical Physics

1. Basic Radiological physics – K. Thayalan, Jaypee Brothers, Medical Publishers (P) Ltd, New Delhi.
2. Lasers and optical fibre communications-P. Sarah, I.K. Internation publishing House Pvt, Ltd. New Delhi.

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B.SC. ALLIED HEALTH SCIENCE**BIO-MEDICAL SCIENCES****SCHEME OF EXAMINATION 2022****[SEMESTER – III]**

S.No	Paper	Hrs/Sem		Evaluation-University Examination {marks}					
		L	P	Internal Assessment		University Exams/Department*Exams		Total	Credits
				T	P	T	P		
1.	Basic Plant & Animal Biology Theory(UE)	60	-	20	-	60	-	80	4
2.	Basic Plant & Animal Biology - Practical (UE)	-	120	-	20	-	60	80	4
3.	Molecular Cell Biology - Theory(UE)	60	-	20	-	60	-	80	4
4.	Molecular Cell Biology -- Practical (UE)	-	120	-	20	-	60	80	4
5.	Developmental Biology(IE)	60	-	20	-	60*	-	80	4
6.	Communication & Soft skills(IE)	-	180	-	25	-	75*	100	5
Total no. of credits									25

U.E.-University Examination

*I.E.-Internal Examination.

*These examinations shall be conducted by the respective departments.

1.Basic Plant & Animal Biology Theory (UE)

Unit I: Plant Morphology and Anatomy

Description of the body of a flowering plant: seed, root systems (modifications), stem, leaf, inflorescence, flower, fertilization, fruits, floral diagram and formula. Structure of a typical plant cell, plant cell wall and plastids. Plant tissue types: Meristems, Parenchyma, Collenchyma, Sclerenchyma, vascular tissues (Xylem and Phloem), Glandular and Lacticiferous tissues.

Unit II: Plant Physiology

Structure of root hairs and absorption mechanism. Mineral nutrition (micro and macro), Photosynthesis, Respiration, Nitrogen cycle. Phytohormones: Auxins, Gibberlins and Cytokinins.

Unit III: Algae and Fungi

General characters and classification of algae and fungi. Differences between algae and fungi. Type study and economic importance of Nostoc, Chlorella, Sargassum, Yeast, Penicillin and Agaricus. Structure and life histories of Lycopodium (Pteridophyta), Funaria (Bryophyta) and Cycas (Gymnosperm).

Basic Animal Biology

Unit IV: Invertebrates and Vertebrates

General characters and classification of invertebrates and chordates up to classes. Type study- Marine Prawn (*Penaeus indicus*), Freshwater Mussel and Star fish.

Unit V: Vertebrates

Type study- Frog and Rat (Digestive, Respiratory, Circulatory, Nervous and Urinogenital systems).

Unit VI: Invertebrate parasites in relation to human welfare

Bionomics and control of *Entamoeba* spp., *Plasmodium* spp., *Trypanosoma gambiense*, *Taenia solium*, *Ascaris lumbricoides*, *Ancylostoma duodenale* and *Wuchereria bancrofti*.

Reference books

Text Books

1. General Botany - Vol I & II, Ganguly A.K and Kurnar N .C, Emkay Publications, Delhi
2. Systematic Botany, Dutta S.C. Wiley Eastern Limited, New Delhi
3. Invertebrate Zoology, Jordan E. L. and P. S. Verma; 1993: 12th Ed., Chand & Co. Ltd., New Delhi

2. Basic Plant & Animal Biology Practical (UE)

Unit I: Taxonomy

Monocotyledons - Musaceae, Liliaceae; Dicotyledons-Malvaceae, Rutaceae, Fabaceae, Solanaceae, Caesalpinaceae, Astraceae.

Unit II: Anatomy

T.S. of Dicot Root , T.S. of Monocot Root, T.S. of Dicot Stem, T.S. of Monocot Stem.

Unit III: Physiology

Osmosis Experiment, Auxanometer, Light screen experiment

Unit IV: Spotters

Tissues: Parenchyma, Colenchyma, Sclerenchyma, Xylem vessels, Sieve tube and companion cells - Nostoc, Chlorella, Sargassum, Yeast, Agaricus, Lycopodium, Funaria, Cycas, T.S. of Anther and L.S. of ovule.

Animal Biology

Unit I: Dissections (Demonstration)

Prawn: Digestive system and Nervous System. Cockroach: Digestive, Nervous System

Unit II: Mounting

Prawn: Appendages. Cockroach: Mouthparts

Unit III: Spotters

Simple sponge, Obelia (Colony and Medusa), Taenia (Entire, Scolex, Ripe proglottis,), Ascaris (Entire male and female), Microfilaria, Hook worm, Marine Prawn (Entire; Nauplius, Zoea, and Mysis larvae), Freshwater Mussel (Entire and Glochidium larva), Star fish (Entire, Pedicellaria, and Bipinnaria larva).

3. Molecular Cell Biology –Theory (UE)

Unit I: Introduction to Cell structure & Growth

Introduction to cell structure, differences between prokaryotes and eukaryotes. Cell cycle, cell division, mitosis, meiosis. Cytoskeleton and Cell Death.

UnitII: Principles of tissue Fixation and Staining

Microtome – instrumentation, working, preparation of tissue sections, staining techniques - General staining, fluorescent staining, histopathological staining.

Unit III: Cell membrane

Structure of cell membrane - fluid mosaic model, membrane fluidity, Membrane composition - Carbohydrates, Lipids and Proteins assembly.

Unit IV: Cell organelles

Mitochondria, Golgibodies, Endoplasmic reticulum, Ribosomes, Lysosomes, Nucleus, Molecular structure of genes and chromosomes, packing of Nuclear Chromosome

Unit V: Cellular transport and Signaling

Membrane transport - Basic mechanisms, Calcium pump, proton pump, internalization of macromolecules. Mechanism of hormone action. Receptors-G protein as signal transducers, second messenger (CAMP and IP3), protein kinase mediated signal transduction. Cell junctions – Tight junctions, Desmosomes and Hemidesmosomes; Gap junction.

Text Books

1. Cell Biology and Molecular Biology, De Robertis
2. Cell Biology, S.C. Rastogi, Third Ed.

References Books

1. Molecular Cell Biology, Lodish, Sixth Edition
2. Molecular Cell Biology, Bruce Albert's, Fourth Edition

4. Molecular Cell Biology – Practical (UE)

1. Micrometry
 - a) Ocular micrometer
 - b) Stage micrometer
2. Measurement of cell diameter
3. Slide Finder
4. Hemocytometer
5. RBC, WBC counting
6. Isolation of lymphocytes using Ficoll
7. Testing the viability of lymphocytes using Tryphan blue
8. Mitotic studies in onion root tips
9. Subcellular fractionation– Isolation of mitochondrial fraction and assay of marker enzyme

5. Developmental Biology (IE)

Unit I: Concepts and Principle

Basic concepts in developmental Biology, Cell fate and commitment. Mechanisms of developmental commitment, mosaic and regulative development, maintenance of differentiation, pattern formation and compartments, morphogenesis.

Unit II: Spermatogenesis

Spermatogenesis: formation of spermatids-multiplication phase, growth phase, maturation phase, Spermiogenesis, formation of head of spermatozoan, changes in nucleus, acrosome formation, tail formation and other events, Structure of sperm cell

Unit III: Oogenesis

Oogenesis: multiplication phase, Growth phase - Previtellogenesis, Growth of nuclear substance, vitellogenesis, cortical differentiation, maturation of egg, Menstrual cycle, structure of Ovum.

Unit IV: Fertilization and Embryonic Development

Acrosome reaction, fertilization, fertilization membrane formation, posts fertilization changes, zygote.

Unit V :Embryonic Development

Cleavage and Gastrulation - Cleavage, blastula, morula, gastrulation, Formation of three germ layer ectoderm, endoderm, mesoderm. Fate of the ectoderm, endoderm, mesoderm.

Unit VI : Human Embryology

Implantation and placentation - Placental types, implantation, Human embryo development: first, second & third trimester. Monozygotic and dizygotic twins, teratogens and birth defects.

6. Communication & Soft skills (IE)

Unit I: Aspects of communication:

Importance of communication, Process, Barriers; Non verbal Communication.

Unit II Speaking:

Opening and Closing conversations; Introductions and Address Systems; Expressing Courtesy; Giving Compliments and replying to Compliments; Presentation Skills; Telephonic conversation and telephone etiquette

Unit III: Prescribed Reading:

White washing the Fence – Episode from Tom Sawyer by Mark Twain; Bacon's Essays: - Of Goodness and goodness of nature.

Unit IV: Writing and Soft Skills:

Letter writing - Letter of Complaints, Inviting and declining an invitation, Memos and Email; Editing- Grammar, Spelling & Punctuation, Use of Dictionary & Thesaurus. Active Listening Skills; Assertive Skills; Negotiation and Persuasive Skills; Interview Skills

LEARNING OUTCOME:

This course is designed to help the students to Foster healthy attitude.

Develop effective inter and intra personal skills to be an effective team worker.

Communicate effectively in both academic and professional setup

Suggested text Book:

Developing Communication Skills by Krishna Mohan and Meera Banerji, II edition, Macmillan.

Reference Books:

1. Communication Skills for Engineers and Scientists by Sangeeta Sharma and Binod Mishra, PHI Learning Private Limited, New Delhi.
2. English and soft skills by S.P. Dhanavel, Orient Black Swan
3. Effective English Communication by Krishna Mohan and Meenakshi Raman, Tata McGraw – Hill Publishing Company Limited

B.SC. ALLIED HEALTH SCIENCE

BIO-MEDICAL SCIENCES

SCHEME OF EXAMINATION 2022

[SEMESTER – IV]

S.No	Paper	Hrs/Sem		Evaluation-University Examination {marks}					
		L	P	Internal Assessment		University Exams/Department*Exams		Total	Credits
				T	P	T	P		
1.	Medical Genetics - Theory (UE)	60	-	20	-	60	-	80	4
2.	Medical Genetics -- Practical (UE)	-	120	-	20	-	60	80	4
3.	Enzyme Technology (UE)	60	-	20	-	60	-	80	4
4.	Enzyme Technology -- Practical (UE)	-	120	-	20	-	60	80	4
5.	Basic Biostatistics (IE)	60	-	20	-	60*	-	80	4
6.	Comprehensive viva: (IE)	-	180	-	25	-	75*	100	5
Total no. of credits									25

U.E.-University Examination

*I.E.-Internal Examination.

*These examinations shall be conducted by the respective department.

1. Medical Genetics – Theory [UE]

I Heredity – Principles

Mendel's Laws of Inheritance, Patterns of inheritance: Dominant, recessive, Sex linked inheritance, mitochondrial inheritance, Multifactorial. Single Gene disorders, Probability Theory, Pedigree analysis. Genetic Interactions

II The Biochemical Basis of Heredity :

Nucleic Acid, Protein Structure, genetic Information Flow, Protein Synthesis, DNA Replication, Mutation and DNA repair.

III Cytogenetics

Human Cytogenetics: Chromosome structure, Classification of unbanded chromosomes and Banded chromosomes, ISCN Nomenclature of the banded mitotic chromosomes. Karyotyping and ideogram: Numerical and structural chromosomal abnormalities and clinical phenotypes. Sex Determining mechanism Variations of Sex Linkage, Sex – Influenced traits.

IV Clinical Genetic Disorders

Aneuploides-Down's, Patau's, Edward's, Klinefelter's and Turner's Syndromes-Genetics and clinical features. Duchene muscular dystrophy, Cystic fibrosis, Huntington's disease, Fragile X-syndrome, Phenylketonuria, Glucose 6-phosphate dehydrogenase deficiency.

V Quantitative Genetics

Qualitative vs quantitative traits, Polygenic trait, Normal distribution, Types of gene action, Heritability, selection method and mating method.

VI Population Genetics

Hardy Weinberg Equilibrium. Calculating gene Frequencies, testing a Locus for Equilibrium, Natural Selection and Evolution

Learning outcome:

□□ To understand the implications of genes in human health from the subject area concepts, theory, experimental, research and health-care perspectives

References Books

1. Emery Elements of Medical Genetics, Robert F. Mueller & Ian D. young;1995, 9th Ed., Churchill Livingstone.
2. Human Chromosomes, Principles & Techniques, Ram S. Verma&ArvindBasu; 1995, 2nd Ed. or more McGraw-Hill Inc.
3. Medical Genetics, Lynn B. Jorde, John C. Carey, Michael J. Bamshad, & Raymond L. White; 2003, 3rd Ed., Mosby.

2. Medical Genetics – Practical [UE]

Learning objectives:

□□ To understand the principles, basic structure of chromosomal aberrations and their implications in genetic disorders

1. Fluorescent microscopy
2. Fluorochromes
3. Culture of Human Chromosome
4. Mitotic Index
5. Measurement of Chromosome Size
6. Identification of Human Chromosome
7. Image analysis of Human Chromosome
8. Drosophila Culture, Wild and Mutants
9. Various cross to study inheritance pattern

Learning Outcome:

The students will be familiar with microscopy techniques and chromosome analysis

3.Enzyme Technology [UE]

I Introduction to Enzymes

Enzymes – Definition, units, nomenclature and classification of enzymes, general properties of enzymes. Definition and example of coenzyme (NAD,FAD, Biotin and pyridoxal phosphate) and their biochemical role, apoenzyme , cofactors, Isoenzymes.

II Isolation and Purification of Enzymes

Homogenization, Differential centrifugation, Dialysis, Precipitation (salting in and salting out) and Electrophoresis, Enzyme specificity, Energy of activation, Active site, Induced fit theory and Lock & key mechanism.

III Enzyme Kinetics

MichaelisMenten equation, Lineweaver-Burk plot, Enzyme inhibition- Competitive, Non competitive, uncompetitive (kinetic derivations not required).Feedback inhibition and Allosteric inhibition.

IV Enzyme Technology

Immobilised enzymes, Methods of preparation & application, designer enzymes-abzymes, ribozymes, biosensors.

V Application of Enzymes

Applications of enzymes in food industry, pharmaceutical industry and Medicine and Enzymes of Clinical importance

Learning outcomes:

□□ Students would be able to understand general properties of enzymes& its relevance with their functions

Text Books

1. Fundamentals of Enzymology by Price and Stevens
2. Enzymology – Dixon & Webb.
3. Enzymes – Palmer.

References Books

1. Biochemistry - Geoffrey L, Zubay, 1998, 4th edition.
2. Fundamentals of Biochemistry - Donald Voet, Judith Voet and Pratt, 1995, 2nd edition.
3. Harper's Biochemistry - Murray et al, 2000, 25th edition, Appleton and Lange Publishers.
4. Principles of Biochemistry with human focus - Garrett and Grisham, 2002, HarcourtCollege Publishers, Orlando, Florida, USA.
5. Principles of Biochemistry - Lehninger, Nelson and Cox, 2005, 4th edition, WH Freeman and Company, New York, USA

Web Links

1. www.lsbu.ac.uk/biology/enztech/
2. www.lsbu.ac.uk/biology/enzyme
3. <http://www.aetltd.com/tech/applications.html>

4. Enzyme Technology – Practical[UE]

Learning objectives:

- ☐ ☐ To learn the strategies in isolating the enzyme from plant and animal sources theories and approaches to study/analyze enzymes.
- ☐ ☐ To learn the various techniques/assays commonly used to study the enzyme functions.

1. Preparation of buffers
2. Homogenization
3. Extraction
4. Purification of Protease
5. Assay of specific activity of protease
6. Determination of substrate concentration of alkaline phosphatase
7. Assay of specific activity of alkaline phosphatase
8. Determination of optimum pH of alkaline phosphatase
9. Determination of optimum Temperature of alkaline phosphatase
10. Assay of activity of SGOT
11. Assay of activity of SGPT
12. Immobilization of Amylase
13. Electrophoretic separation of serum proteins by SDS-PAGE

Learning outcomes:

- ☐ ☐ Students would gain knowledge on the procedure of isolation commonly used to study/analyze enzymes
- ☐ ☐ Students would learn the interpretation of enzyme activities through kinetic studies

5. Basic Biostatistics [IE]

I -Introduction to Probability, distributions and sampling: Probability, addition and multiplicative theorems, problems, Probability distribution-Binomial, Poisson, Normal, Applications to health sciences, Sampling methods, uses of sampling, Sample size.

II -Introduction to Descriptive Statistics: Introduction, Summarizing and describing a collection of data, Univariate and bivariate analysis, Mean, mode and standard deviation, Percentages and Ratios, Histograms, Identifying randomness and uncertainty in data, Summarizing biological data, Identifying the dependent and independent variables, Confidence levels

III -Introduction to Inferential Statistics: Drawing inference from data, Estimation, Testing of hypothesis, Type I & type II errors, power and p-value, Modeling assumptions, Identifying Patterns, Regression analysis, t-test, Analysis of Variance, Correlations, Chi-square, Non-parametric tests

IV-Epidemiological Methods: Measuring disease frequency, Descriptive and analytical studies-observational and experimental studies and Biases in Epidemiological Studies.

Learning outcome:

- ☐ ☐ To understand statistics concepts, theories and formulae
- ☐ ☐ To be able to utilize the bio-mathematics and biostatistics tools for applications in the areas of life sciences in general and human health in particular

Text Books

1. Introduction to Biostatistics and Research Methods by Sunder Rao PSS Y Richard J .PHI publishers 2012.
2. Biostatistics: A Foundation for Analysis of Health Sciences by Danial WW. John Wiley Publishers.
3. Primer of Biostatistics by Galantz SA. McGraw Hill Press, 2011
4. Essentials of Medical Statistics by Kirkwood BR and Sterne JAC. Blackwell Publishers
5. Fundamentals of Biostatistics by Rosner B & Rosner R. Cengage Learning Inc. 2010

6.Comprehensive viva: (IE)

B.SC. ALLIED HEALTH SCIENCE

BIO-MEDICAL SCIENCES

SCHEME OF EXAMINATION 2022

[SEMESTER – V]

S.No	Paper	Hrs/Sem		Evaluation-University Examination {marks}					
		L	P	Internal Assessment		University Exams/Department*Exams		Total	Credits
				T	P	T	P		
1.	Bioprocess Technology-Theory (UE)	60	-	20	-	60	-	80	4
2.	Bioprocess Technology- Practical (UE)	-	120	-	20	-	60	80	4
3.	Molecular Immunology - Theory (UE)	60	-	20	-	60	-	80	4
4.	Molecular Immunology - Practical (UE)	-	120	-	20	-	60	80	4
5.	Cancer Biology (IE)	60	-	20	-	60*	-	80	4
6.	Recombinant DNA Technology (IE)	-	180	-	25	-	75*	100	5
Total no. of credits									25

U.E.-University Examination

*I.E.-Internal Examination.

*These examinations shall be conducted by the respective department.

1. Bioprocess Technology-Theory [UE]

I Biological Transport in Bioprocesses

Introduction to transport phenomena, Diffusion, Facilitated diffusion, Active transport, concept of mass transfer, oxygen transfer, heat transfer, transport bottlenecks.

II Kinetics and Fermenters

Reaction kinetics, process flow sheets. Parameters to be considered during fermenter design (viscosity, type of organism etc), brief outline of Types of fermenters: pilot fermenters,

III Scale up

Introduction – Principles of scale up; scale up method, simple calculations based on material and energy balance of fermentation processes.

IV Recovery and Purification of Fermentation Products

Principles and methods of purification- filtration, centrifugation, cell disintegration, solvent extraction and chromatographic separations with examples.

V Safety

Biosafety and treatment of effluents from Industrial Bioprocesses

VI Industrial Production of Chemicals

Alcohol (ethanol), acids (citric)

Learning outcomes:

□□ To understand bioprocesses for industrial applications and ways in which industrial productivity can be enhanced

References Books

1. Industrial Microbiology, Casida; 1997.
2. Principles of fermentation technology, Peter F. Stanbury; 2003.

2. Bioprocess Technology-Practical [UE]

1. Growth of microorganisms- Growth curve and biomass estimation
2. Sterilization characteristics – Thermal Death Point and Thermal Death Time determination
3. Isolation of microorganisms for microbial processes
4. Determination of substrate degradation profile of the isolated organism
5. Determination of specific growth rate and yield coefficient
6. Whole cell Immobilization
7. Fermentative production of ethanol by yeast
8. Sauerkraut fermentation

Learning outcomes:

To gain a hands-on experience in techniques used in bioprocess technology and their applications

3. Molecular Immunology – Theory [UE]

Learning objectives:

- To understand the relevance, basic concepts, theories and functions of the human immune system
- To utilize the knowledge on the relevance, basic concepts, theories and functions of the human immune system to understand the mechanisms of immune system functioning

I Introduction

History of Immunology; Landmarks in Immunological research; an overview of the Immune system

II Types of Immunity

Innate and Acquired Immunity – their properties and effective functions – evolution of Immune mechanisms; Humoral and Cell-mediated Immunity; Cells, tissues and Organs of Human Immune System; Major Histocompatibility Complex.

III Antigens & Antibodies

Properties, factors governing antigenicity; Haptens; Tumor, Viral, Bacterial Antigens; Blood Group Antigens; Antigen recognition; Antigen Processing and Presentation; Fundamental mechanisms of Humoral and Cell-mediated antigenic recognition and processing. Antibodies- Properties; Functions; Structure; Biosynthesis; Theories of formation; Immunoglobulin Genes; Antigen- antibody interactions. Immuno-techniques – principles and applications

IV Cytokines

The Complement System and Hypersensitive Reactions

V Vaccination

Active and Passive immunity; production of Vaccines; Types of Vaccines;
Immunosuppressive mechanisms; Immunodeficiency and Autoimmunity.

VI Advance Immunology

Transplantation Immunology; Cancer Immunology; Antibody engineering.

Learning outcome:

- To understand the implications of human immune system functioning from the subject area concepts, theory, experiments, research and health-care perspectives

Text Books:

1. William L. Anderson, 1999, Immunology, First edition , Fence Creek Publishing LLC, Madrsn.
2. Ivan Roitt, Jonathan Brostoff and David male, 1989, Immunology, Churchil Livingstone, Edinburg, London.

References Books

1. Immunology, J. Kuby; 2007, 6th Ed., W H Freeman & Co.
2. Roitt's Essential Immunology; 2006, 11th Ed., Wiley-Blackwell.
3. A Handbook of Practical and clinical Immunology, G.P. Talwar & S.K. Gupta ; 1992, 2nd Ed., Vol.1 & 2, CBS Publishers & Distributors.

Web Link <http://gslc.genetics.utah.edu/teachers/index.cfm>

4. Molecular Immunology – Practical [UE]

Learning objectives:

To utilize the knowledge on the relevance, basic concepts, theories and functions of the human immune system to understand the mechanisms of immune system functioning

1. Ouchterlony double diffusion
2. Titre studies
3. Antisera concentration
4. Slide documentation
5. Counter Current Immunelectrophoresis
6. Immunelectrophoresis
7. Single Radial Immunodiffusion
8. Rocket Immunelectrophoresis
9. Crossed Immunelectrophoresis
10. Identification of T- Cells
11. Identification of B-Cells
 - a. FITC labeling
 - b. HRP labeling
12. Blood typing
13. ELISA

5. Cancer Biology – Theory [IE]

I Carcinogenesis

Introduction-Terms and definition; Types of cancer-cellular differentiation, Carcinogenesis-Initiation, promotion, progression. Carcinogens-Physical, chemical and biological factors (viral oncogenesis). Metastasis-stages of cancer and types of spreading.

II Cancer Related Genes

Oncogenes, Tumor Suppressor Genes, Oncogene activation, growth factors and receptors, Signal Transduction-EGFR as a model system (MAb therapy). Deregulation of cell cycle; apoptosis in cancer., Transcription Factors, Cancer Cell Cycle: Control and Regulation

III Cancer as a Disease

Free radicals, antioxidants and cancer, Aberrant metabolism during cancer development, Paraneoplastic syndromes; ER in breast cancer; common gene arrangements-Philadelphia chromosomes-leukemias.

IV Predisposition

Genetic screening for predisposition of cancer, premalignant lesions, inheritance patterns in various cancers

V Diagnosis and Cancer Therapies

Serum markers for cancer, Genetic diagnosis - Cancer Cytogenetics& Molecular diagnosis in cancer, Application of FISH in cancer diagnosis and Prognosis.

Chemotherapeutic and Radiotherapeutic strategies for cancer treatment, Different classes of chemotherapeutic agents and their mechanisms of action.Basis principles of CT and RT. Chemotherapeutic agents-Cisplatin (CDDP) and Methotrexate-Mechanism of action.

Learning outcome:

□□To understand cancers, the mechanisms involved from theory concept, experimental, research and human health-care perspectives

Text Books

1. Human Cytogenetics Malignancy & Acquired Abnormalities, A Practical Approach, D.E. Rooney; 2001, 3rd Ed., Oxford University Press.

Reference Books

1. A Practical Guide to Human Cancer Genetics, Shirley V. Hodgson & Eamonn R. Maher; 1999, 2nd Ed., Cambridge University Press.
2. Gene VII, Benjamin Lewin; 2000, Oxford University Press.

Web Links

www.insidecancer.org

<https://www.uab.edu/gbs/cancerbiology>

6. Recombinant DNA Technology [IE]

I Introduction and Tools in Recombinant DNA Technology

Introduction to Recombinant DNA technology; Principles and outline of cloning; Purification of Plasmids; Agarose Gel Electrophoresis. Restriction modification: Restriction enzymes – types and applications. Restriction digestion and ligation; modification of cut ends of DNA.

II Vectors and Strategies Employed in Cloning

Vectors - Plasmid vectors, Phage vectors, Special vectors- Cosmids, Phagemids, Artificial mini-chromosomes, Shuttle vectors and Expression vectors.

Cloning strategies with simple vectors; Construction of Genomic and cDNA Library

III Genetic Transformation of Prokaryotes

Transformation: DNA delivery methods – physical and biological methods, chemical induction, electroporation.

IV Selection of Recombinants and Screening:

Strategies - Antibiotic resistance markers and α complementation, Method for clone identification: direct screening (insertional inactivation of marker gene, visual screening methods), Indirect screening (immunological techniques, colony hybridization and dot blot hybridization).

V Tools in rDNA technology:

Hybridization techniques - Southern blotting, Northern Blotting, Western Blotting. Polymerase Chain Reaction - Methodology, types and applications. Sequencing- dideoxy chain termination method.

VI Application of Recombinant DNA Technology

Application of gene cloning in Agriculture, industry, medicine, environmental biotechnology. Site- directed Mutagenesis and its applications

Learning outcome:

□□ To understand the implications of rDNA techniques from the subject area concepts, theory, experimental, industrial, research and health-care perspectives

Text Books

1. Recombinant DNA, James D. Watson, Michael Gilman, Jan Witkowski, Mark Zoller; 1992, 2nd Ed., Scientific American Books.
2. Molecular Cloning A Laboratory Manual, Sambrook and Russell; 2001, Vol. 1–3, 3rd Ed., Cold Spring Harbor Laboratory Press.
3. Essential Molecular Biology – A Practical Approach, T.A. Brown; 1991, Vol. I&II, Editor T.A. Brown, IRL Press.

Reference Books:

1. Gene Cloning- Principles and Applications; Lodge j, Lund P, Minchin S, 2007. Taylor and Francis, UK, 462p.
2. Gene Cloning and DNA analysis, T.A. Brown, 4th Ed; 1998.

Web Links

www.britannica.com/EBchecked/topic/493667/recombinant-DNA-technology

B.SC. ALLIED HEALTH SCIENCE

BIO-MEDICAL SCIENCES

SCHEME OF EXAMINATION 2022

[SEMESTER – VI]

S.No	Paper	Hrs/Sem		Evaluation-University Examination {marks}					
		L	P	Internal Assessment		University Exams/Department*Exams		Total	Credits
				T	P	T	P		
1.	Biophysics & Bioinstrumentation-Theory (UE)	60	-	20	-	60	-	80	4
2.	Biophysics & Bioinstrumentation - Practical (UE)	-	120	-	20	-	60	80	4
3.	Tissue Engineering-Theory (UE)	60	-	20	-	60	-	80	4
4.	Tissue Engineering - Practical (UE)	-	120	-	20	-	60	80	4
5.	Computing & web application (IE)	60	-	20	-	60*	-	80	4
6.	Molecular epidemiology (IE)	-	180	-	25	-	75*	100	5
Total no. of credits									25

U.E.-University Examination

*I.E.-Internal Examination.

*These examinations shall be conducted by the respective departments.

1. Biophysics& Bioinstrumentation – Theory [UE]

I. spectroscopic Techniques and Microscopy

Basic principles of electromagnetic radiation. Stereochemistry and chirality's: optical activity – polarimeter. Beer-Lambert law, Principle, instrumentation and applications of Colorimeter ,UV-VIS spectroscopy, Fluorescence spectroscopy, IR spectroscopy, Raman spectroscopy, Atomic Absorption Spectroscopy and X-ray diffraction.Basics of microscopy, Types of microscopy: Bright field, Dark Field, Phase contrast, Confocal, Fluorescence, Electron microscopy - TEM & SEM. Applications and limits of resolution

II. chromatographic and electrophoresis techniques

Introduction and basics of separations of molecules and their analysis.Principle, working principle and applications of Paper chromatography, Thin Layer Chromatography, Column Chromatography, Gas Chromatography, HPLC, Ion exchange Chromatography, Molecular exclusion Chromatography and Affinity chromatography.Theory and application of Polyacrylamide gel electrophoresis and Agarose gel electrophoresis; Disc gel electrophoresis; Gradient electrophoresis; Pulsed field gel electrophoresis, SDS PAGE.

III. Basic Concepts of Medical Instrumentation.

The terminology of instrumentation systems, Signals-sources of biomedical signals, Principles of instrumentation-Classification of Biomedical instruments-Interfering and modifying inputs, Regulation of medical devices, Amplifiers and Signal Processing-Ideal Op amplifiers-inverting and non-inverting amplifiers-differential amplifiers-Comparators-Logarithmic amplifiers, Analog & Digital signals, Rectifiers-Integrators-Differentiators-Active filters-instrumentation amplifier design.

IV Biosensors Devices

Sensors and biosensors- components and working principle, factors affecting the performance of sensors, blood-gas monitoring, blood glucose sensors

V Therapeutic Devices

Cardiac pacemakers, defibrillators, haemodialysis, ventilators, infant warmers- workingprinciple, instrumentation and application.Nanodevicesinmedicine. Lasers- principle and operation, types

of lasers-ND-YAG, He-Ne laser, Argon laser, CO₂ laser, diagnostic applications of lasers in medical fields.

VIRadiation and Medical Imaging

Introduction to ionizing radiations, Laws of radioactivity, radioactive constant, half-life of radioactive elements, units of radioactivity, Radiocarbon dating, Effect of radiations, radiation detection, damage and protection repair, GM counter, scintillation counter, liquid scintillation counters, application of radioisotopes in Biology.x ray, fluoroscopy, ultrasound Imaging, computed Tomography, magnetic Resonance imaging- principle, formation of image, Instrumentation, applications.

Text books

1. A Text Book of Biophysics, RN. Roy, New Central Book Agency; 2007
2. Biophysics principles and techniques, M.A. Subramanian, MJP Publishers; 2005.
3. Biomedical Instrumentation by Arumugam, Anuradha Publishers.
4. Handbook of Biomedical Instrumentation by R.S Khandpur, McGraw-Hill Education, 2003

Reference Books

1. Practical Biochemistry, Principles and Techniques, Keith Wilson and John Walker, 5th Ed.; 2002
2. Biophysical Chemistry, Cantor, Vol I–III
3. Biophysics, VasanthaPattabi
4. Medical Instrumentation: Application and Design; 1998, 3rd Ed., John Wiley & Sons, NY.
5. Principles of biomedical instrumentation and measurement, Astin; 1990, Prentice Hall Publishers.
6. Biomedical instruments, Deutsch S, Welkowitz W, Akay M; 1991, Academic Press.

2.Biophysics& Bioinstrumentation – Practical [UE]

1. Verification of Beer Lambert law.
2. pH meter principle, calibration and measurement of pH for various biological fluids.
3. Determination of iso-electric point for strong acid against strong base using pH meter.
4. Determination of concentration of protein by Bradford method using colorimeter
5. Separation of amino acids by paper chromatography.
6. Separation of water soluble vitamins using thin layer chromatography.
7. Separation of plant pigments by column chromatography.
8. Centrifugation principle and demonstration.
9. Operational amplifier as adder and subtractor.
10. Operational amplifier as differentiator and integrator.
11. Operational amplifier as a sign changer.
12. X ray and fluoroscopy-working, instrumentation and image formation demonstration.
13. MRI and CT working, instrumentation and image formation demonstration.
14. Nerve conduction studies.

3.Tissue Engineering-Theory [UE]

I Introduction to Tissue Engineering

Tissue engineering in perspective, History of tissue engineering, Ethical issues, Tissue engineering as a health care resource.

II Biology of Engineering Tissues

Molecular organization of cells, Control of organogenesis – natural and engineered organogenesis, role of cytokine signaling in tissue engineering, influence of mechanical effects on cells, Epithelial to Mesenchymal transition, Cell-matrix and cell-cell interactions

III Biomaterials and scaffolds in tissue engineering

Design Principles in Biomaterials and Scaffolds, Naturally occurring scaffold materials, Synthetic Polymers, Hybrid, composite, and complex biomaterials for Scaffolds, Surface modification of biomaterials

IV Molecular level Tissue engineering

Engineering at molecular level – genetic modification, post transcriptional gene silencing, role of bio molecules in tissue engineering.

V Engineering at cellular level

Cellular level engineering – fetal, embryonic and adult stems cells, culture of cell and tissues, 3D cultures and bioreactors.

VI Tissue engineering in clinical application

Tissue engineered liver, pancreas, heart, breast, urinary bladder. Application of tissue engineering in neurology, dental, orthopedic and plastic surgery

Reference Books

Text Books

1. Principles of Regenerative Medicine, Anthony Atala, Robert Lanza, Robert Nerem, James A. Thomson, 2008, Academic Press
2. Fundamentals of Tissue Engineering and Regenerative Medicine, Ulrich Meyer, Thomas Meyer, Jörg Handschel, Hans Peter Wiesmann, 2009, Springer

Reference Books

1. Principles of Tissue Engineering, Robert P. Lanza, Robert Langer and Joseph Vacanti, 2nd Ed., and 3rd edition Academic Press.
2. Animal Cell Culture, A Practical Approach, John R.W. Masters; 2000, 3rd Ed., Oxford University Press.
3. Cell and Tissue Culture for Medical Research, Alan Dolyle & J. Bryan Griffiths; 2001, John Wiley & Sons Ltd.

Web links

1. <http://www.nibib.nih.gov/science-education>
2. <http://web.mclink.it/MC8445/tissueng.htm>
3. <http://termis.org/>

4.Tissue Engineering –Practical [UE]

- ☐ ☐ To understand the relevance, basic concepts, theories and approaches in tissue engineering
- ☐ ☐ To be able to integrate the theory concepts and the techniques

1. Good laboratory practices
2. Passaging and maintenance of adherent cells
3. Culturing of suspension cells
4. Cell culture in 3D matrices – Synthetic polymer and collagen scaffolds
5. Cell culture in Bioreactors
6. Cell growth assays – MTT assay
7. Cell viability assays – Trypan blue exclusion/LDH assay
8. Advanced microscopic techniques

Learning outcome:

- ☐ ☐ To understand the implications of tissue engineering from the subject area concepts, theory, experimental, research, drug discovery and health-care perspectives

5.Computing& Web Application [IE]

I Introduction to computers & Hardware

Importance of computers – characteristics of computers - computer history & generations - types of computers – classification of computers – computer organization – peripherals and its types – internet & Email - Technologies

II Software

Software – types of software – programming languages – execution modes - Windows - File system - working with file and directories – path – Graphical applications – Office packages – MS Word – MS Excel – MS PowerPoint – MS Access.

IIIHTML

Web pages (Types) – Static Web page - HTML – HTML Basic tags – elements – attributes – Paragraph tags – formatting tags – Styles – colors – lists and its types - links – Images - tables – its attributes.

IV Web Applications

Frames – Forms – CSS Introduction - Syntax - Style sheet Types - CSS Selectors - CSS Text Properties - CSS Shorthand Properties - CSS Background Properties - CSS Positioning – CSS Image.

V ‘C’ programming

Introduction to c programming – preprocessor directive - declarations – Input/output statements – control structures – its types – conditional or branching statements – its types – looping structures.

Learning outcomes:

□□To enhance with the emerging trends of information technology.

Text Books:

1. Brian W. Kernigham& Dennis M. Ritchie.The C Programming Language. Second Edition, Prentice Hall 1988.

2. Special Edition Using Microsoft Office 2007 by Ed Batt& Woody Leonard, First Edition, ISBN-10 0789735172, January 1, 2007

3. Thomas A.Powell, The Complete Reference HTML & XHTML, Fourth Edition, Tata McGraw Hill (2006).

References Books

1. C Programming: A Modern Approach by K.N King

Web Links:

1. <http://www.w3schools.com>

2. <http://fresh2refresh.com>

6.Molecular Epidemiology [IE]

I Introduction

Epidemiology

Historical context

Definition and scope of epidemiology

II Health and Disease

Definition of health and disease

Measures of disease

Using secondary data

Comparing disease occurrence

Prevalence and Incidence

III Types of Epidemiological Study

Observations and experiments

Cross-sectional, Case-Control, Cohort and Experimental studies

IV Errors in Epidemiology

Potential errors in epidemiological studies

Ethical issues

V Causation in Epidemiology and Prevention

Concept of cause

Establishing the cause of a disease

Scope of prevention

Levels of prevention

Screening

Sensitivity, Specificity, PPV and NPV

Learning outcomes:

□□To understand the significance and gain experience in using the tools of epidemiology in human health-care.

Text Books

1. Basic Genetics, Daniel L. Hartl; 1991, 2nd Ed., Joneand Bartlett Publisher.
2. Lecture notes on Epidemiology and Public Health Medicine, Richard Farmer & David Miller; 1991, 3rd Ed., Blackwell Scientific Publications.

Reference Books:

1. Basic epidemiology 2nd edition authored by R Bonita, R Beaglehole and T Kjellström publisher; World Health Organization 2006
2. An Introduction to Epidemiology for Health Professionals, Jorn Olsen, Kaare Christensen, Jeff Murray and Anders Ekbohm; Springer Science 2010
3. A Short Introduction to Epidemiology Second Edition (2005) by Neil Pearce; Occasional Report Series No 2 Centre for Public Health Research

Web Links

1. <http://www.who.int/topics/epidemiology/en/>
2. <http://journals.lww.com/epidem/Pages/default.aspx>

B.SC. ALLIED HEALTH SCIENCE
BIO-MEDICAL SCIENCES

SCHEME OF EXAMINATION 2022

[SEMESTER – VII]

S.No	Paper	Hrs/Sem		Evaluation-University Examination {marks}					
		L	P	Internal Assessment		University Exams/Department*Exams		Total	Credits
				T	P	T	P		
1.	Clinical Biochemistry-Theory (UE)	60	-	20	-	60	-	80	4
2.	Clinical Biochemistry - Practical (UE)	-	120	-	20	-	60	80	4
3.	Stem cells & Regenerative medicine - Theory (UE)	60	-	20	-	60	-	80	4
4.	Stem cells & Regenerative medicine - Practical (UE)	-	120	-	20	-	60	80	4
5.	Genomics & Proteomics-Theory (IE)	60	-	20	-	60*	-	80	4
6.	Genomics & Proteomics-Practical (IE)	-	180	-	25	-	75*	100	5
Total no. of credits									25

U.E.-University Examination

*I.E.-Internal Examination.

*These examinations shall be conducted by the respective departments.

1.Clinical Biochemistry-Theory [UE]

I Basic concepts

A brief review of units and abbreviations used in expressing concentrations in clinical labs. Specimen collection and processing (blood, urine and faeces). Anticoagulants and preservatives for blood and urine.

II Diseases related to carbohydrate metabolism

Blood glucose – fasting and post prandial levels, Maintenance of blood glucose by hormones. Diabetes mellitus – types, clinical features, metabolic changes, Glycosuria, GTT, Galactosemia and Fructosuria. Glycogen storage diseases.

III Diseases related to lipid metabolism

Triglyceridemia, hypo and hyper cholesterolemia. Clinical features of atherosclerosis, fatty liver and coronary heart disease.

Clinical Enzymology: Isozymes and diagnostic tests, enzyme patterns in pancreatitis, liver damages and myocardial infarction.

IV Diseases related to amino acids and nucleic acid metabolism

Etiology and clinical manifestation of phenylketonuria, cystinuria, alkaptonuria, tyrosinemia, Hartnup's disease, Fanconi's syndrome, albinism and tyrosinemia, hypo and hyper uricemia, gout.

V Liver Function Tests

Metabolism of bilirubin, jaundice-types, clinical features and test based on bile pigments, level in blood and urine, plasma protein changes, differentiation of three types of jaundice.

VI Renal Function Tests

Clearance tests-urea, creatinine, insulin, PAH tests, concentration and dilution tests.

Gastric Function Tests – Collection of gastric contents, examination of gastric residuum, FTM, simulation tests, tubeless gastric analysis.

Learning outcomes:

□□ To enable the students to understand the disorders of carbohydrate, lipid and protein metabolism and blood disorders.

Text books

1. Text book of Medical Biochemistry-M.N.Chatterjee and RaneShinde, Jaypee Brothers.
2. Clinical Biochemistry-Shauna C.Anderson
3. Clinical Chemistry in diagnosis and treatment-Philip D.Mayne
4. Practical Clinical Biochemistry-Harold Varley

Reference books

1. Text book of clinical Biochemistry-Carl A. Burtis and EdwarR.Ashwood. 5thEdn.
2. Clinical Biochemistry- William Hoffmann, 4thEdn.

Web Links

http://www.temple.edu/medbiochem/medical_review.html

2.Clinical Biochemistry –Practical [UE]

Serum Analysis

1. Estimation of Urea – DIACETYL MONOXIME method.
2. Uric acid
3. Cholesterol – ZAK“S method
4. Triglyceride
5. Hdl-cholesterol
6. Free fatty acid
7. Creatinine – JAFFE’’S method
8. Determination of Serum Sodium / Potassium By Flame Photometry

II. Assay of Activity of Liver Enzymes

1. SGOT
2. SGPT
3. LDH
4. Alkaline Phosphatase
5. Alpha – GlutamylTransferase

III. Qualitative Analysis of Urine for Normal and Abnormal Constituents (sugar, ketone bodies, protein, aminoacids)

Learning outcome:

☐ ☐ Students could analyze, interpret and infer the clinical abnormalities and their related metabolism

3.Stem cells & Regenerative medicine – Theory [UE]

I Introduction Definition of stem cells and Regenerative medicine, current and future perspectives of Regenerative Medicine

II Biology of stem cells Stem Cell Niches, Mechanisms of Self-Renewal, Pluripotency, stem cell markers, transdifferentiation, immune suppression, homing mechanisms, cloning and reprogramming

III Embryonic, induced pluripotent and Adult stem cells Embryonic stem cells – Isolation, maintenance and characterization, Stem Cells in Extraembryonic lineages, Properties and culturing of Hematopoietic stem cells, Mesenchymal stem cells, Neural stem cells, Cancer stem cells, induced pluripotent stem cells

IV Therapeutic application Preclinical evaluation of stem cells, commercial stem cell therapies, Therapeutic applications in Neurodegenerative Diseases, cardiology, orthopedics, oncology, vision restoration, stem cells for treatment of diabetes, autoimmune disease, Stem Cell Gene Therapy, Stem cells and aging

V Regulation and ethics Ethics of Human Stem Cell Research, Guidelines of stem cell research in India and in other countries, Religious consideration and Regulatory consideration.

Learning outcome:

☐ ☐ Students understand about the biology, therapeutic application and ethical regulations related to stem cells

References

Text Book

1) Essentials of Stem Cell Biology, Robert Lanza (Ed), 2005, Elsevier Academic Press

Reference books

1) Principles of Regenerative Medicine, Anthony Atala, Robert Lanza, James A. Thomson, Robert M. Nerem, First edition 2008, Elsevier Academic Press

2) Current Protocols in Stem Cell Biology, Andrew Elefanty, Susan J. Fisher, 2011, Willey publishers

4. Stem cells & Regenerative medicine – Practical [UE]

1. Good manufacturing practices
2. In vitro tumorigenicity assay
3. Cell proliferation assay
4. Senescence assay
5. Transfection techniques
6. Gene expression analysis by Real time PCR

5.Genomics& Proteomics-Theory [IE]

I Introduction to Genomics

Organization & Structure of Genomes: Prokaryotes, Eukaryotes & Organelles – Human Genome Project – Evolution of Genomes – SNPs – Mutations – Suppressors & Enhancers – Gene Loss & Duplication

II Genome Evolution & Comparative Genomics

Microarray – Genomic Concepts of Aging – Cancer Genomics – Molecular Phylogenetics – Molecular Clock – Minimal Genomes – Orthologs&Paralogs – Horizontal Gene Transfer Concept

III Introduction to Proteins & Protein Databases

Amino acids- Characteristics &Classification,Protein-Structure : Isoelectric point & focusing – Proteomics vs. Protein Chemistry– PIR, SWISS-PROT, PDB, PPi, CATH, SCOP

IV Protein Purification/Separation

Physical & Chemical Methods of Protein Extraction – Chromatography, Electrophoresis & Centrifugation: Instrumentation, Principle & Types – Two Dimensional SDS PAGE, Mass Spectrometry-MALTi.ToF.

V Applications of Genomics & Proteomics

Functional Genomics – Pharmacogenomics–Microbial Genomics, Comparative Genomics - Protein Microarrays – Applications of Proteomics

Learning Outcomes

- a) The student will be able to understand the all concepts associated to Genomics
- b) The student will be able to understand the characteristics of various genes & genomes
- c) The student will be able to understand the concepts associated to Proteomics
- d) The student will be able to comprehend the applications of proteomics in varied fields

Reference Books

1. Principles of Genome Analysis & Genomics, S. B. Primrose & R.M. Twyman, 3rd edition, 2003, Blackwell Publishing.
2. Introduction to Computational Genomics: A Case Studies Approach, Nello Cristianini and Matthew W. Hahn, Cambridge University Press, 2007.
3. Microbial Functional Genomics – 2004 Jizhong Zhou, Dorothea K. Thompson, Ying Xu & James M. Tiedje (Publication) Wiley-Liss
4. Functional Proteomics, Peipei, Ph.D. Ping- 2005
5. Proteomics : From Protein sequence to function –Springer
6. Proteomics – Kluwer – Academic Press

6.Genomics& Proteomics-Practical [IE]

To understand the various concepts associated to Genomics

1. Genome Maps
2. Genome Browsers
3. Mutation Databases
4. Cancer Databases
5. Model Organism Databases
6. Pharmacogenomics Databases
7. Protein Databases
8. Primary & Secondary Structure Analyses of Proteins
9. Tertiary Structure Prediction & Analysis
10. Tertiary Structure Visualization Tools
11. PPi

Research Project

- To understand the relevance, basic concepts and importance of research projects.
- To utilize the knowledge on the relevance, basic concepts and importance of research projects to perform a research project.
- To utilize the understanding of the research methodology concepts to successfully complete a short-time, experiment-based research project.
- All candidates registered to undergo B.Sc. (Hons) Biomedical Sciences Degree course shall have to submit a project as part of the degree programme. Each candidate would be assigned a recognized guide at the end of 7th semester and the topics assigned to the candidates will be intimated to the respective research committee for conduct of the chosen research at the beginning of the project in the institution.
- The project work will be **individual** and will consist of experimental work, insilicoresearch and data collection.
- The project shall be in a bound volume not exceeding 150 pages (one and half line spacing and on one side of A4 size paper only) excluding references.

SL.NO:	CONTENTS	Page Number
1	Introduction	
2	Aims or Objectives and Hypothesis	
3	Methodology	
4	Experimental & Results	
5	Discussion	
6	Conclusion	
7	References (Vancouver style)	
8	Appendix (Copies of Institutional Ethics Committee approval, Informed consent, additional resources, Publications etc.,)	

Learning outcome :

- **To understand the importance of research methodology concepts and to put them in practice while working on projects.**
- **To acquire the technical writing skills and presentation skills apart from practically utilizing all aspects of research methodology that they had learnt earlier.**
- **To be able to integrate all aspects of the research project into a project of print form as can be evaluated by internal experts.**

B.SC. ALLIED HEALTH SCIENCE

BIO-MEDICAL SCIENCES

SCHEME OF EXAMINATION 2022

[SEMESTER – VIII]

S.No	Programme	Hours Prescribed	Department Examination			
1.	Research Project	6months	Project Evaluation Max:80	Viva Max :20	Total Max:100	Credits
						6