॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'B++' grade

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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० नुसार पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २७ मे २०२५ रोजी संपन्न झालेल्या मा. विद्यापरिषद बैठकीतील विषय क्रमांक १६/६१–२०२५ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण–२०२० नुसारचे पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यास मा. विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी. एस्सी द्वितीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यात येत आहेत.

01	B.Sc. II year Biophysics

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी/विवत्रंविपदवी/२०२५–२६/162
दिनांक १७.०७.२०२५

सहाय्यक कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत : माहितीस्तव तथा कार्यवाहीस्तव.
१) मा. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
२) मा. प्र. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
३) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
४) मा. संचालक, परीक्षा व मुंल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
५) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, परिपत्रक अभ्यासक्रम संकेतस्थळावर प्रसिध्द करण्यात यावेत.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED - 431 606 (MS)

(Credit Framework and Structure of Four Year UG Program with Multiple Entry and Exit Option as per NEP-2020)

UNDERGRADUATE PROGRAMME OF SCIENCE & TECHNOLOGY

B. Sc. Second Year

Major in **BPH (Biophysics)** and Minor in **DSM**

Under the Faculty of Science & Technology

Effective from the Academic year 2025-26

(As per NEP-2020)

From the Desk of the Dean, Faculty of Science and Technology

Swami Ramanand Teerth Marathwada University, Nanded, enduring to its vision statement "***Enlightened Student: A Source of Immense Power***", is trying hard consistently to enrich the quality of science education in its jurisdiction by implementing several quality initiatives. Revision and updating curriculum to meet the standard of the courses at national and international level, implementing innovative methods of teaching-learning, improvisation in the examination and evaluation processes are some of the important measures that enabled the University to achieve ***the 3Es, the equity, the efficiency*** and ***the excellence*** in higher education of this region. To overcome the difficulty of comparing the performances of the graduating students and also to provide mobility to them to join other institutions the University has adopted the cumulative grade point average (CGPA) system in the year 2014-2015. Further, following the suggestions by the UGC and looking at the better employability, entrepreneurship possibilities and to enhance the latent skills of the stakeholders the University has adopted the Choice Based Credit System (CBCS) in the year 2018-2019 at graduate and post-graduate level. This provided flexibility to the students to choose courses of their own interests. To encourage the students to opt the world-class courses offered on the online platforms like, NPTEL, SWAYAM, and other MOOCS platforms the University has implemented the credit transfer policy approved by its Academic Council and also has made a provision of reimbursing registration fees of the successful students completing such courses.

SRTM University has been producing a good number of high caliber graduates; however, it is necessary to ensure that our aspiring students are able to pursue the right education. Like the engineering students, the youngsters pursuing science education need to be equipped and trained as per the requirements of the R&D institutes and industries. This would become possible only when the students undergo studies with an updated and evolving curriculum to match global scenario.

Higher education is a dynamic process and in the present era the stakeholders need to be educated and trained in view of the self-employment and self-sustaining skills like start-ups. Revision of the curriculum alone is not the measure for bringing reforms in the higher education, but invite several other initiatives. Establishing industry-institute linkages and initiating internship, on job training for the graduates in reputed industries are some of the important steps that the University would like to take in the coming time. As a result, revision of the curriculum was the need of the hour and such an opportunity was provided by the National Education Policy 2020. National Education Policy 2020 (NEP 2020) aims at equipping

students with knowledge, skills, values, leadership qualities and initiates them for lifelong learning. As a result, the students will acquire expertise in specialized areas of interest, kindle their intellectual curiosity and scientific temper, and create imaginative individuals.

The curriculum given in this document for BSc SY Biophysics has been developed following the guidelines of NEP-2020 and is crucial as well as challenging due to the reason that it is a transition from general science based to the discipline-specific-based curriculum. All the recommendations of the ***SukanuSamiti*** given in the **NEP Curriculum Framework-2023** have been followed, keeping the disciplinary approach with rigor and depth, appropriate to the comprehension level of learners. All the Board of Studies (BoS) under the Faculty of Science and Technology of this university have put in their tremendous efforts in making this curriculum of international standard. They have taken care of maintaining logical sequencing of the subject matter with proper placement of concepts with their linkages for better understanding of the students. We take this opportunity to congratulate the Chairman(s) and all the members of various Boards of Studies for their immense contributions in preparing the revised curriculum for the benefits of the stakeholders in line with the guidelines of the **Government of Maharashtra regarding NEP-2020**. We also acknowledge the suggestions and contributions of the academic and industry experts of various disciplines.

We are sure that the adoption of the revised curriculum will be advantageous for the students to enhance their skills and employability. Introduction of the mandatory ***On Job Training, Internship program*** for science background students is praise worthy and certainly help the students to imbibe firsthand work experience, team work management. These initiatives will also help the students to inculcate the workmanship spirit and explore the possibilities of setting up of their own enterprises.

Dr. M. K. Patil

Dean

Faculty of Science and Technology

Preamble:

The education system is India has acquired a new form with inclusion of job oriented work skill in combination with traditional fundamental core subjects along with multiple entries and choice based exit system. The development of vocational work skill amongst the aspirants being one of the major goal for seeking the livelihood in short spam while competing with the world class education systems. Inclusion of multifold courses as clubbing of majors, minors, electives with skills must take cognizant for following the education quality mandates too. To achieve this, the thrust of quality needs to be addressed, discussed and carried forward in a systemic manner. Accreditation is the principle means of quality assurance in higher education and reflects the fact that in achieving recognition, the institution or program of study is committed and open for external review to meet certain minimum specified standards. The major emphasis of this accreditation process is to measure the outcomes of the program that is being accredited.

Program outcomes are essentially a range of skills and knowledge that a student will have at the time of graduation from the program. A graduate program must ensure that, the passing students understand the basic concepts of Biophysics, have gone through one field in department of appreciate and use its methodologies of analyses and design, and have acquired skills for life-long learning. The transformation of students from one program to other at any level of education exit must make him/herself reliable. UG program in Biophysics must therefore have a mission statement which is in conformity with program objectives and program outcomes that are expected for specific educational process. The outcomes of a program must be measureable and must be assessed regularly through proper feedback for improvement of the program. There must be a quality assurance process in place within the Institute to make use of the feedback for improvement of the program. The curriculum must be constantly refined and updated to ensure that the defined objectives and outcomes are achieved. Students must be encouraged to comment on the objectives and outcomes and the role played by the individual courses in achieving them. In line with this Faculty of Science and Technology of Swami Ramanand Teerth Marathwada University, Nanded has taken lead in incorporating philosophy of outcome based education in the process of curriculum development. I, as Board of Studies in Biophysics Swami Ramanand Teerth Marathwada University, Nanded, happy to state that, course objectives, expected outcomes were finalized in a meeting and are stated as below:

- To provide students with a strong foundation in the scientific and Biophysical fundamentals necessary to formulate, solve and analyze problems and to prepare them for graduate studies.
- To prepare students to demonstrate an ability to identify, formulate and solve problems pertaining to biophysical science concepts and fundamentals.
- To prepare students to demonstrate ability to understand the responsibility towards biodiversity conservation and utilization of various resources for livelihood.
- To promote awareness among students for the life-long learning and to introduce them to professional ethics and codes of professional practice.
- To develop ability for resolving the fundamental aspects relating to general biophysical concepts and theories related issues of different techniques.
- To make them aware about working of different biophysical instruments and capability to increase the working efficiency of the same.
- To make them responsible citizens through making aware about the importance of utilizing proper science at applicable places.

In addition to Program Objectives, for each course of undergraduate program, objectives and expected outcomes from learner's point of view are also included in the curriculum to support the philosophy of outcome based education. I believe strongly that small step taken in right direction will definitely help in providing quality education to the stake holders.

Dr. V. A. Jadhav
BOS (Ad-Hoc Board) Biophysics,
Swami Ramanand Teerth
Marathwada University, Nanded

B. Sc. Second Year Semester III *(Level 5)*

Teaching Scheme

Subject	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	SBPHCT1201	Molecular Biology -I	02	--	**08**	02	--
	SBPHCT1202	Molecular Enzymology	02	--		02	
	SBPHCP1201	Practical –1	-	02			04
	SBPHCP1202	Practical –2	-	02			04
Optional 2	SDSCMT1201	Membrane Biophysics-I	02	--	**04**	02	--
	SDSCMP1202	Practical	-	02			04
Generic Electives *(from other Faculty)*	SDSCGE1201	Biophysics in Daily Life-I	02	--	**02**	02	--
Vocational Course (related to Major)	SBPHVSC1201	Bioengineering: Interface for Biology & Medicine	--	02	**02**	--	04
Ability Enhancement Course	AECENG1201	Compulsory English	02	--	**02**	02	--
Language	ACEMIL1201		02	--	**02**	02	
CCC	NCC/NSS/SPT /CLS/HWS/YGE/FIT)		02	--	**02**	02	--
Total Credits			**14**	**08**	**22**	**14**	**16**

B. Sc. Second Year Semester III *(Level 5)*

Examination Scheme

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits assigned to individual paper)

Subject (1)	Course Code (2)	CourseName (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Average of T1 & T2 (6)	Total (7)	CA (8)	ESA (9)	
Optional 1	SBPHCT1201	Molecular Biology -I	10	10	10	40	--	--	50
	SBPHCT1202	Molecular Enzymology	10	10	10	40	--	--	50
	SBPHCP1201	Practical –1					20	30	50
	SBPHCP1202	Practical –2	--	--	--	--	20	30	50
Optional 2	SDSCMT1201	Membrane Biophysics	10	10	10	40	--	--	50
	SDSCMP1202	Parctical	--	--	--	--	20	30	50
Generic Electives *(from other Faculty)*	SDSCGE1201	Biophysics in Daily Life-I	10	10	10	40	--	--	50
Vocational Course (related to Major)	SBPHVSC1201	Bioengineering: Interface for Biology & Medicine	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1201	Compulsory English	10	10	10	40	--	--	50
Language	ACEMIL1201		10	10	10	40	--	--	50
CCC	(NCC/NSS/SPTCLS/HWS/YEG/FIT)		10	10	10	40	--	--	50

B. Sc. Second Year Semester IV*(Level 5)*

Teaching Scheme

Subject	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	SBPHCT1251	Physiological Biophysics-II	02	--	**08**	02	--
	SBPHCT1252	Basic Immunology	02	--		02	
	SBPHCP1251	Practical –3	-	02			04
	SBPHCP1252	Practical –4	-	02			04
Optional 2	SDSCMT1251	Biomathematics and Biostatistics	02	--	**04**	02	--
	SDSCMP1252	Parctical	-	02			04
Generic Electives *(from other Faculty)*	SDSCGE1251	Biophysics in Daily Life-II	02	--	**02**	02	--
Vocational Course (related to Major)	SBPHVSC1251	Biomedical Nanotechnology	--	02	**02**	--	04
Ability Enhancement Course	AECENG1251	Compulsory English	02	--	**02**	02	--
Language	ACEMIL1251		02	--	**02**	02	
	EVS		02	--	**02**	02	--
Total Credits			**14**	**08**	**22**	**14**	**16**

B. Sc. Second Year Semester IV*(Level 5)*

Examination Scheme

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits assigned to individual paper)

Subject (1)	Course Code (2)	CourseName (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Average of T1 & T2 (6)	Total (7)	CA (8)	ESA (9)	
Optional 1	SBPHCT1251	Physiological Biophysics-II	10	10	10	40	--	--	50
	SBPHCT1252	Basic Immunology	10	10	10	40	--	--	50
	SBPHCP1251	Practical –3					20	30	50
	SBPHCP1252	Practical –4	--	--	--	--	20	30	50
Optional 2	SDSCMT1251	Biomathematics and Biostatistics	10	10	10	40	--	--	50
	SDSCMP1252	Parctical	--	--	--	--	20	30	50
Generic Electives *(from other Faculty)*	SDSCGE1251	Biophysics in Daily Life-II	10	10	10	40	--	--	50
Vocational Course (related to Major)	SBPHVSC1251	Essentials of Physiology and Immune System	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1251	Compulsory English	10	10	10	40	--	--	50
Language	ACEMIL1251		10	10	10	40	--	--	50
	EVS		10	10	10	40	--	--	50

SEM III

Teaching Scheme

SBPHCT1201 (Major-1): **Molecular Biology - I**

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHCT1201	**Molecular Biology - I**	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SBPHCT1201	**Molecular Biology - I**	10	10	10	40	50

Course pre-requisite:

1. Knowledge of molecular biology.
2. Introductory idea of Molecular central dogma.
3. Basics of gene expression studies.
4. Basic knowledge of biotechnological process.

Course objective:

- Understand the molecular mechanisms of gene expression and regulation.
- Explore the structure and function of nucleic acids and proteins
- Gain hands-on knowledge of molecular biology techniques
- Analyze and interpret molecular data

Course outcome:

- They will gain an understanding of chemical and molecular processes that occur in and between cells.
- They will gain insight into the most significant molecular and cell-based methods used today to expand our understanding of biology
- It will able to provide inspiration among student about basic molecular biology and its applications.

Curriculum Details: Molecular Biology - I

Module No.	Unit No.	Topic	Hrs
1.0		Unit I - DNA replication	
	1.1	The Central Dogma, DNA Structure and Chemistry, The Molecular Nature of Genes	
	1.2	DNA Replication: E nzymes of DNA synthesis, DNA Repair, DNA Recombination.	**08**
2.0		Unit II- Transcription Process	
	2.1	RNA Structure, RNA Types, genetic code	
	2.2	Transcription: Initiation, Elongation and Termination	
	2.3	RNA Processing: Splicing, Capping and Polyadenylation, Ribozymes, Activators, Inhibitors, transcriptional Control.	**07**
3.0		unit III Translation Machinery & Processes	
	3.1	The Mechanism of **Translation**: Initiation, Elongation and Termination	
	3.2	Post transitional modifications.Control of genetic expression: Lac operons, regulation of protein synthesis.	**08**
4.0		Unit – IV Principles Methodology & Applications	
	4.1	Steps involved in r-DNA Technology.	
	4.2	Gene Expression studies using PC R,RT-PC R,	**07**
	4.3	Applications of molecular Biology and Biotechnology	
			30

Text Books:

1. Molecular & Cellular Biology, D Roberties,
2. Biophysical Aspects of Transmembrane signaling, Sandor D (2005), Springer
3. Biophysics, Vasant Pattabhi, Gautam (2002), Narosa .

Reference Books:

1. Molecular & Cellular Biology, D Roberties.
2. Biophysics, Hopp, Lohman, Mark and Ziegler.
3. Molecular and Cellular Biophysics, Meyer B Jackson (2006), Cambridge).

SBPHCT1202 (Major-2): Molecular Enzymology

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHCT1202	Molecular Enzymology	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SBPHCT1202	Molecular Enzymology	10	10	10	40	50

Course pre-requisite:

- Understanding of Biomolecules and metabolic pathways.
- Knowledge of chemical structures and reaction mechanisms.
- Familiarity with enzymes, DNA/RNA, and cellular processes.

Course objective:

- To understand a structural and functional features and kinetics about enzymes
- To determine the optimum pH, temperature and concentration of an enzyme for a certain reaction.
- To acquire skill based knowledge in the use of the enzymes
- To learn methods of Enzyme inhibition and their applications.

Course outcome:

- Describe elaborately and critically the basic properties of enzymes.
- Understand and discuss the role of enzymes in metabolism.
- Understand and discuss the role of enzymes in industry,medicine

Curriculum Details: Molecular Enzymology

Module No.	Unit No.	Topic	Hrs.
1.0	Unit 1: Introduction to Enzymes		
	1.1	General and unique features of enzyme.	
	1.2	Nomenclature and classification of enzymes,	
	1.3	Lock & key hypothesis, induced fit hypothesis, Active site structure	**07**
2.0	Unit 2: Kinetics of enzyme & Enzyme Inhibitions		
	2.1	Michaelis-Menton equation and steady state hypothesis	
	2.2	Factors affecting enzyme activity-pH, temperature, pressure.	**08**
	2.3	Reversible, irreversible, competitive, non-competitive, uncompetitive and mixed types of inhibition.	
3.0	Unit 3: Enzyme Purification and immobilization		
	3.1	Extraction and purification of enzymes by using various techniques.	
	3.2	Tests for purification and characterization.	
	3.3	Techniques of enzyme immobilization	**08**
4.0	Unit 4: Biocatalytic Applications		
	4.1	Bio-transformation-basic reaction mechanisms	
	4.2	synzymes, Industrial and clinical applications of enzymes.	
	4.3	Use of enzymes in food, Feed, dairy, leather, textile and drug industries.	**07**
		Total	**30**

TextBooks:

1. Principles of Biochemistry - L. Stryer (W.H. Freeman & Co.)
2. Principles of Biochemistry - A.L.Lehninger, D.W.Nelson & M.M.Cox(Macmillan)
3. Biochemistry - D.Voet & J.G.Voet (John Willey)
4. Harper's Illustrated Biochemistry - R.K.Murray et al. (McGraw Hill)
5. Understanding Enzymes Palmer Protein Science - A.M. Lesk (Oxford Univ. Press)

Reference Books:

1. Principles of Biochemistry by A.L. Lehninger, D.L. Nelson and M.M. Cox, CBS Publishers, New Delhi, 1993.
2. Biochemistry by L. Stryer, W.H. Freeman and Co., Newyork 1997.

Course Structure:

SBPHCP1203 (Major-3): Practical-1

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHCP 1203	Practical-1	--	04 (60 Hr)	--	02	02

Assessment Scheme

Course Code	Course Name	Theory				Practical		Total [CA+ESA]
		CA			ESA			
		Test I	Test II	Avg (T1+T2)/2		CA	ESA	
SBPHCP 1203	Practical-1	--	--	--	--	20	30	50

Course pre-requisite:

1. Knowledge of Principles of Fundamental molecular biology.
2. Basic information about instruments, techniques etc.
3. Knowledge of precautionary measures.

Course objectives:

- To engage the student in the subject and help them get a better understanding of the topic studies in Molecular biology and biophysics.
- To allow hand on experiments to learn and understand fundamental principle of Gene expression.
- To develop the scientific attitude amongst student.

Course outcomes:

- ✓ Students will be able to understand different concepts and principles of Molecular biology instrumentations.
- ✓ Student will learn about validity of concepts by doing the experiment.

Curriculum Details: **Practical-1**

1. UV spectra of DNA
2. UV spectra of DNA
3. Colorimetric Anlysis of nucleic acid.
4. Isolation of chromosomal DNA from *E.coli*.
5. Isolation of RNA.
6. Pippetting of masetr mixing for RT-PCR.
7. Isolation of plasmid DNA from transformed *E.coli*
8. Characterization of isolated DNAs by agarose gel electrophoresis.
9. Extractions of nucleic acids from gels.
10. Artificial transformation of *E.coli* by plasmid DNA.
11. Study of bacterial conjugation.
12. SDS-PAGE of protein.

**STUDENT NEED TO PERFORM 10 (TEN) EXPERIMENTS.*

*****Note: Any two experiments can be added as per availability of instruments at the College.***

Course Structure:

SBPHCP1204 (Major-4): Practical-2

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHCP 1204	Practical-2	--	04 (60 Hr)	--	02	02

Assessment Scheme

Course Code	Course Name	Theory				Practical		Total [CA+ESA]
		CA			ESA			
		Test I	Test II	Avg (T1+T2)/2		CA	ESA	
SBPHCP 1204	Practical-2	--	--	--	--	20	30	50

Course pre-requisite:

1. Understanding of bio molecules (proteins, carbohydrates, lipids, nucleic acids) and metabolism.
2. Knowledge of chemical bonding, reactions, and structures of organic compounds..
3. Familiarity with cell structure, enzymes, DNA/RNA, and protein synthesis.

Course objectives:

- To engage the student in the subject and help them get a better understanding of Enzymology.
- To allow hand on experiments to learn and understand fundamental principle of Immobilization and purification.
- To develop the scientific attitude among student.

Course coutumes:

- ✓ Students will be able to understand different concepts and principles of enzyme.
- ✓ Student will learn about validity of concepts by doing the experiment.

CurriculumDetails: **Practical-2**

1. Kinetic characteristics of Enzyme (i) Progress curve; (ii) pH optima; (iii) temperature optima
2. Effect of Mg2+ ion on the activity of alkaline phosphatase
3. Effect of metal ion on the activity of alkaline phosphatase
4. Kinetic & Clinical Assay of lactate dehydrogenase (LDH).
5. Kinetic Assay of α-amylase.
6. Kinetics Assay of invertase.
7. Immobilization of enzyme.
8. Preparation of enzyme crystals & their microscopic analysis.
9. Enzyme Specificity Test.
10. Action of Salivary Amylase on Starch.
11. Effect of pH on Enzyme Activity
12. Effect of Temperature on Enzyme Activity.

**STUDENT NEED TO PERFORM 10 (TEN) EXPERIMENTS.*

*****Note: Any two experiments can be added as per availability of instruments at the College.***

SBPHMT1201 (Minor-1): Membrane Biophysics

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHMT1201	Membrane Biophysics	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SBPHMT1201	Membrane Biophysics	10	10	10	40	50

Course pre-requisite:

1. Aspirant should have basic knowledge of concepts of Membrane.
2. Should be able to understand the membrane and its applications in Research.

Course objective:

- To deal with all functional and structural aspects of Membrane.
- To understand membrane dynamics and signal transduction through membrane transport.
- To explore micro domains that formed interactions between lipids and proteins.

Course outcome:

- Student able to understand functional and structural aspects of Membrane.
- Membrane transport understanding with dynamics and signal transduction.
- Able to underlie Physical Properties of membrane.

Curriculum Details: Membrane Biophysics

Module No.	Unit No.	Topic	Hrs.
1.0	Membrane structure and Models		**07**
	1.1	Membrane architecture: Fluids mosaic model	
	1.2	Membrane properties: Membrane permeability, Membrane Channels, transmembrane helices,hydropath Plot, Membrane Asymmetry, Membrane fluidity.	
	1.3	Functional reconstitution of membranes. Models of membrane fusion: bilayer fusion,viral fusion, cellular fusion, cell- cell fusion.	
2.0	Physical Properties of membrane		**07**
	2.1	Elastic properties and Elastic constants,	
	2.2	Charge-induced microstructures and domain.	
	2.3	selective lipid protein interactions,	
	2.4	Membrane melting.	
3.0	Membrane transport		**09**
	3.1	Transport with chemical reaction system: Primary and secondary active transport.	
	3.2	Transports of molecules by simple and facilitated diffusion Transport by flux coupling.	
	3.3	Electron Transport & Oxidative phosphorylation: Reduction potentials and free energy changes in redox reaction	
	3.4	chemiosmotic coupling, proton gradient drive and synthesis of ATP, P/O ratio for oxidative hosphorylation	
4.0	Membrane potentials		**07**
	4.1	Cell surface charge, Resting membrane potential	
	4.2	Action potential, properties of action potential	
	4.3	Trans-membrane potential	
	4.4	Patch clamp and Voltage Clamp Technique	
		Total	**30**

Books Recommended:

1. Biophysical Aspects of Transmembrane signaling, Sandor D (2005), Springer
2. Biophysics, Vasant Pattabhi, Gautam (2002), Narosa .
3. Biomembrane structure and Function, Chapman D.
4. Introduction to Biological Membrane, Jain R K
5. Biophysics, Hopp, Lohman, Mark and Ziegler
6. Biological Membranes, Dr Jadhav V A, Adevent Publication.

Course Structure: SBPHMP1201 (Minor-2): Practical

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHMP 1201	Practical	--	04 (60 Hr)	--	02	02

Assessment Scheme

Course Code	Course Name	Theory				Practical		Total [CA+ESA]
		CA			ESA			
		Test I	Test II	Avg (T1+T2)/2		CA	ESA	
SBPHMP 1201	Practical	--	--	--	--	20	30	50

Course pre-requisite:

1. Knowledge of Principles of Fundamental Biophysics and properties of matters.
2. Basic information about instruments, gadgets etc.
3. Knowledge of precautionary measures.

Course objectives:

- To engage the student in the subject and help them get a better understanding of the topic studies in Biophysics lesson.
- To allow hand on experiments to learn and understand fundamental principle of operation.
- To develop the scientific attitude amongst student.

Course outcomes:

- ✓ Students will be able to understand different concepts and principles of Physical instrumentations.
- ✓ Student will learn about validity of concepts by doing the experiment.

Curriculum Details: Practical

1	Study of membrane fluidity.
2	Effect of hypertonic/ hypotonic/isotonic on RBC membrane.
3	Purification of substances by dialysis
4	Study of volume regulation of erythrocyte and osmotic fragility.
5	Ionophore effect on erythrocyte.
6	Osmolarity: Determination of osmotic pressure of salts.
7	Verification of fick's law of diffusion.
8	Study of phase transition of membrane phospholipids.
9	To study of membrane potential using fluorescence spectroscopy
10	ESR studies

**STUDENT NEED TO PERFORM 10 (TEN) EXPERIMENTS.*

*****Note: Any two experiments can be added as per availability of instruments at the College.***

SBPHGE1201: **Biophysics in Daily Life-I**

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHGE1201	Biophysics in Daily Life-I	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SBPHGE1201	Biophysics in Daily Life-I	10	10	10	40	50

Course pre-requisite:

None; this course is open to all the students and do not have any prerequisite.

Course objectives:

- To introduce students to the fundamental concepts of biophysics.
- To explore real-world applications of biophysics in health, sports, environment, and technology.
- To encourage interdisciplinary thinking and appreciation of the physical principles behind biological systems.

Course outcomes:

After successful completion of the course the learners will be able:

- Understand fundamental biophysical principles and their application to human physiology.
- Apply biophysical concepts to analyze health and medical technologies.
- Participate in experiments, discussions, and projects linking biophysics with daily experiences.

CurriculumDetails:Biophysics in Daily Life-I

Module No.	Unit No.	Topic	Hrs
1.0	Biophysics and the Human Body		
	1.1	Biophysics	08
	1.2	Scope and relevance in daily life	
	1.3	function of biological molecules (proteins, DNA, membranes	
2.0	**Biomechanics**		
	2.1	Biomechanics: Forces, motion, and stability in the human body (e.g., walking, lifting)	07
	2.2	Thermoregulation: How the body maintains temperature	
	2.3	Vision and optics: How eyes work, lenses, and common eye defects.	
3.0	Biophysics in Health and Medicine-I		
	3.1	Biophysics of the circulatory system	07
	3.2	blood flow, pressure	
	3.3	heart function	
	3.4	Basics of medical imaging: X-ray,	
	3.5	ultrasound, MRI.	
4.0	Biophysics in Health and Medicine-II		
	4.1	Hearing and sound mechanism	08
	4.2	The physics of hearing and hearing aids	
	4.3	Radiation	
	4.4	uses in diagnosis and therapy (e.g., cancer treatment)	
		Total	**30**

Text Books:

1. Biophysics in Everyday Life: Dr V A Jadhav, Advent Publication(2025).
2. Biophysics:Vasantha Pattabhi & N. Gautham
3. Biophysics: Tools and Techniques;M.A. Subramanian
4. Essentials of Biophysics: P. Narayanan.
5. A textbook as per NEP-2020: Degree physics: Dr B G Nemmaniwar, S A Panchal, S M chavan

Reference Books:

1. Biophysics: An Introduction" – Roland Glaser
2. Physics in Daily Life, Jo Hermans, EDP Sciences
3. Bhatia, K.B., Elements of Electrical Gadgets, Arya Book Depot, 1993.
4. College Practical physics by Khanna and Gulati, S. Chand and Co., (1999)

Course Structure:

SBPHVSC1201 (Vocational):-Bioengineering: In Biology and Medicine

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHVSC1201	Bioengineering : In Biology and Medicine	--	04	--	02	02

Assessment Scheme

Course Code	Course Name	Theory				Practical		Total [CA+ESA]
		CA			ESA			
		Test I	Test II	Avg (T1+T2)/2		CA	ESA	
SBPHVSC1201	Bioengineering: In Biology and Medicine	--	--	--	--	20	30	50

Course pre-requisite:

1. Knowledge of basic Bioengineering.
2. Wiring principles and Mechanism in Biology and Medicine.
3. Aware about the safety measures and handling of tools in Biophysical Laboratory.

Course objective:

- To explain basic understanding of biological concepts, mechanisms and processes in the light of reason why understanding biology is crucial for several applications.
- To reveal the interdisciplinary, trans-disciplinary and multidisciplinary nature of biology.
- To understand biology a material science and unveil its medico-engineering principle.
- To learn biology as a quantitative analytical science and perceive its complexity.
- To acquaint with bio-tools, complex bio-mechanisms, bio-information trends so as to explore its understanding and utility in terms of bioengineering and biomedicine perspectives

Course outcome:

- Acquire the through understanding of biology fundamentals in terms its complexity,trends and its applicability in various fields
- Project the quantitative understanding of biology principles and processes in terms of biomedical and bioengineering directions
- Account for compiled and stored bioinformation data so as to reveal trends existing in bio-information data using software tools

Curriculum Details: Bioengineering: In Biology and Medicine

1. Record and analyze ECG (Electrocardiogram)
2. Use colorimetric or biosensor-based methods for biological sample analysis
3. Measure limb angles, joint motion using a goniometer or mobile app.
4. Measure skin temperature using infrared thermometer under different conditions
5. Observe brainwave patterns using low-cost EEG headset
6. Study visual acuity, astigmatism, and lens correction using a Snellen chart or basic optics kit
7. Observe and analyze cell morphology using compound/light microscope
8. To identify and name the electronics components
9. To familiarize with CRO & observe wave forms
10. To familiarize with signal generator
11. To study characteristics of microprocessors
12. To perform a small electronic project
13. Calibrate and interpret output from a medical instrument (e.g., sphygmomanometer, spirometer).

**STUDENT NEED TO PERFORM 10 (TEN) EXPERIMENTS.*

*****Note: Any two experiments can be added as per availability of instruments at the College.***

SEM IV

SBPHCT1251 (Major-05): Physiological Biophysics-II

Teaching Scheme

Assessment Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHCT1251	Physiological Biophysics-II	02	--	02	--	02

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SBPHCT1251	Physiological Biophysics-II	10	10	10	40	50

Course pre-requisite:

1. Aspirant should have basic knowledge of concepts of physiology processing.
2. Should be able to understand the terminologies of physiological biophysics and its applications in everyday life.
3. The pre-requisite for this course is knowledge of physiological mechanism in Biophysics, and its application in medical application.

Course objective:

- To understand the Biophysical, chemical, electrical, and structural aspects of biological systems at the cell and organism Level.
- To provide a course of study principally human systems physiology, building on knowledge of basic physiological principles.
- To develop further practical biological skills introduced in Physiology of Human.

Course outcome:

- Have an enhanced knowledge and appreciation of Human physiology
- understand the functions of important physiological systems including the cardio-respiratory, renal, reproductive and metabolic systems;
- Understand how these separate systems interact to yield integrated physiological responses to Different Physiological Condition.
- Be able to perform, analyze and report on experiments and observations in physiology.

Curriculum Details: Physiological Biophysics-II

Module No.	Unit No.	Topic	Hrs.
1.0		Digestive & Excretory systems	**07**
	1.1	Digestive system – oesophagus, stomach and small and large intestine and liver.	
	1.2	Process of digestion.	
	1.3	Excretary system – structure of kidney	
	1.4	Functions of kidney	
2.0		Cardivascular & Respiratory system	**08**
	2.1	**Circulatory system**: Heart as a pump, cardiac cycle	
	2.2	Haemodynamic principles.	
	2.3	**Respiratory system** – Respiratory tract	
	2.4	Process of respiration.Transport and exchange of oxygen and carbon dioxide in body.	
3.0		Nervous system & Sence organs	**08**
	3.1	Central nervous system an d Peripheral nervous system	
	3.2	Structure of neuron, Myelinated and unmyelinated nerve fibers	
	3.3	Action potential, Properties of nerve fibers :excitability, conductivity, all-or none law, accommodation, adaptation, summation refractory period, synaptic potentials, synaptic transmission of the impulse,	
	3.4	**Sense organs** -Physiology of Vision, audition, olfaction, taste,tactile sensation	
4.0		Unit IV- Endocrine & Reproductive systems	**07**
	4.1	Endocrine glands	
	4.2	Role of hypothalamus, functions of pituitary, thyroid, adrenal glands, parathyroid and gonads.	
	4.3	Reproductive Systems-Structure & physiology, concepts of IVF, IUI, sperm analysis.	
		Total	**30**

TextBooks:

1. **Essentials of Human Physiology** – Sembulingam & Sembulingam
2. **Textbook of Physiology** – A. K. Jain
3. Guyton & Hall: Textbook of Medical Physiology (Short or Pocket edition)
4. **Introduction to Immunology** – C.V. Rao
5. **Practical Physiology Book** – C.L. Ghai

SBPHCT1252 (Major-06): Basic Immunology

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHCT1252	Basic Immunology	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SBPHCT1252	Basic Immunology	10	10	10	40	50

Course pre-requisite:

1. Aspirant should have basic knowledge of concepts of immune system.
2. Should be able to understand the terminologies of immune techniques and its applications in everyday life.
3. The pre-requisite for this course is knowledge of in Biophysics, and its application in immunology.

Course objective:

- To understand the overview of immune system including cells, organs and receptors.
- To learn structure and functions of different classes of immunoglobulins, the basis of antibody diversity and the importance of humoral, cell-mediated and innate immune responses in combating pathogens.
- To get acquainted with the importance of antigen-antibody interaction in disease diagnosis and various immunotechniques.

Course outcome:

- Have an enhanced knowledge and appreciation of Human physiology
- understand the functions of important physiological systems including the cardio-respiratory, renal, reproductive and metabolic systems;
- Understand how these separate systems interact to yield integrated physiological responses to Different Physiological Condition.
- Be able to perform, analyze and report on experiments and observations in physiology.

CurriculumDetails: Basic Immunology

Module No.	Unit No.	Topic	Hrs.
1.0	Introduction to Immunology		**08**
	1.1	Concept and principles of immune system	
	1.2	Innate immunity, Barriers of innate immunity, Anatomical, physiological and chemical barriers	
	1.3	Adaptive Immunity	
	1.4	active and passive immune system.	
2.0	Cells and Organs of the Immune System:		**07**
	2.1	The lymphatic system,	
	2.2	lymphoid organs	
	2.3	B-lymphocytes and T-lymphocytes	
	2.4	Hematopoiesis	
3.0	Antigen-Antibody & their interaction		**08**
	3.1	Concepts of antigen, Antigenic determinant, Antigenicity, Immunogen and Immunogenicity,	
	3.2	Factors affecting Antigenicity, Exogenous antigens, Endogenous antigen, Alloantigen, Hapten, Carrier effect, Cross reactivity.	
	3.3	Immunoglobulin: Structure of Immunoglobulin, Classes and subclasses of Immunoglobulins,	
	3.4	Physico-chemical basis of Ag-Ab interaction, Avidity, strength of binding between Ag and Ab and its measurement.	
4.0	Immunotechniques		**07**
	4.1	Detection of Ag-Ab interaction	
	4.2	Precipitation, Agglutination , Concept of Monoclonal and polyclonal Antibodies	
	4.3	Immunization, Antibody assays : Precipitation Double, Single, immunoprecipitation, Prozone effect, Radioimmunoassay, ELISA.	
		Total	**30**

Books for Study:

1. Elementary Microbiology Vol.I and II Dr. A.H Modi. Akta Prakashan.
2. Medical Microbiology. N.C.Dey and T.K. Dey. Allied agency, Culcutta.
3. A text book of Immunology. C.V.Rao.,Narosa Publishing House,New Delhi.
4. Molecular biology by David Freidfelder, Narosa Pub house, New Delhi.
5. Text book of Immunology by B.S.Nagoba and D.V.Vedpathak. BI publications, New Delhi.
6. Text book of Microbiology by R. Anantharayanan, C.K. Jayaram Panikar,

Course Structure:

SBPHCP1253 (Major-7): Practical-3

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHCP 1253	Practical-3	--	04 (60 Hr)	--	02	02

Assessment Scheme

Course Code	Course Name	Theory				Practical		Total [CA+ESA]
		CA			ESA			
		Test I	Test II	Avg (T1+T2)/2		CA	ESA	
SBPHCP 1253	Practical-3	--	--	--	--	20	30	50

Course pre-requisite:

1. Knowledge of Principles of Fundamental Biophysics
2. Basic information about physiological instruments, gadgets etc.
3. Knowledge of precautionary measures.

Course objectives:

- To engage the student in the subject and help them get a better understanding of the topic studies in Biophysics lesson.
- To allow hand on experiments to learn and understand fundamental principle of physiology.
- To develop the scientific attitude amongst student.

Course outcomes:

- ✓ Students will be able to understand different concepts and principles of Physiolosical instrumentations.
- ✓ Student will learn about validity of concepts by doing the experiment.

Curriculum Details:Practical-3

1. Study of Neubauer's Counting Chamber.
2. Red blood cell count/µl of blood
3. White blood cell count/ µl of blood
4. Haemoglobin content estimation
5. Differential count of White blood cells
6. Determination of ESR
7. Determination of Clotting time
8. Determination of Bleeding time
9. Determination of Blood groups
10. Determination of fragility of erythrocytes
11. Oscilloscope Experiments
12. Spirometry- Measurement of vital capacity, tidal volume, different timed volumes, peak flow rate.
13. Anatomical study of different body systems by using virtual CD Rom/ DVDs (Educational Software).
14. Research laboratory / Clinical laboratory visits to observe neurophysiology and Cardiovascular experiments and instrumentation.
15. Blood pressure measurement
16. Pulse measurement.
17. Interpretation of kymograph records.
18. Spo2 Measurement.

**STUDENT NEED TO PERFORM 10 (TEN) EXPERIMENTS.*

*****Note: Any two experiments can be added as per availability of instruments at the College.***

Course Structure:

SBPHCP1254 (Major-8): Practical-4

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHCP 1254	Practical-4	--	04 (60 Hr)	--	02	02

Assessment Scheme

Course Code	Course Name	Theory				Practical		Total [CA+ESA]
		CA			ESA			
		Test I	Test II	Avg (T1+T2)/2		CA	ESA	
SBPHCP 1254	Practical-4	--	--	--	--	20	30	50

Course pre-requisite:

1. Knowledge of Principles of Immunology.
2. Basic information Immunotechnique
3. Knowledge of precautionary measures.

Course objectives:

- To engage the student in the subject and help them get a better understanding of the topic studies in Immunology.
- To allow hand on experiments to learn and understand principles of Immunology.
- To develop the scientific temperament amongst student.

Course outcomes:

- ✓ Students will be able to understand different concepts and principles of Practical Immunology.
- ✓ Student will learn about validity of concepts by doing the experiment.

CurriculumDetails:Practical-4

1. Demonstration of Immunization
2. To perform immunodiffusion .
3. Single radial immunodiffusion
4. Analysis of the immunodiffusion
5. Counter-current Immunoelectrophoresis
6. Characterization of the Blood Group by agglutination
7. To perform ELISA checkerboard experiment.
8. To perform Complement fixation assay
9. To perform Immuno affinity chromatography.
10. To perform Agglutination inhibition Assay
11. To perform sandwich ELISA.
12. To perform Immunoprecipitation
13. To perform Coomb's test.
14. . Hemolytic plaque assays.
15. Antigen-Antibody Assay.
16. Antigen-Antibody testing method.

**STUDENT NEED TO PERFORM 10 (TEN) EXPERIMENTS.*

*****Note: Any two experiments can be added as per availability of instruments at the College.***

SBPHMT1251 (Minor-3):

Teaching Scheme

Assessment Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHMT1251	Basics of Biomathematics and Biostatistics	02	--	02	--	02

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SBPHMT1251	Basics of Biomathematics and Biostatistics	10	10	10	40	50

Course pre-requisite:

None; this course is open to all the students and do not have any prerequisite

Course objectives:

- To introduce the basics of bio-mathematics and bio statistics in Biophysics.
- To understand the data analysis.
- Understand the fundamental concepts of mathematics and statistics as applied to biological sciences.
- Develop skills in collecting, organizing, and interpreting biological data using statistical tools.
- Evaluate the reliability and significance of biological data using hypothesis testing and regression techniques.

Course outcomes:

After successful completion of the course the learners will be able to:

- Differentiate between types of biological data and represent them using appropriate graphical and statistical methods.
- : Apply basic mathematical modeling techniques to represent biological systems and processes.
- Utilize probability distributions (Binomial, Poisson, Normal) to model biological events and interpret outcomes.
- : Integrate biostatistical tools with mathematical reasoning to support research and decision-making in life sciences.

Curriculum Details: Basics of Bio-mathematics and Biostatistics

Module No.	Unit No.	Topic	Hrs.
1.0	Introduction to Bio-mathematics		
	1.1	Introduction and scope of Bio-mathematics in Biophysics	**07**
	1.2	Basic Graph Theory: Graph, vertex, edge, degree	
	1.3	Types of graphs: Simple, directed, undirected, cyclic (Feedback loops), phylogeny trees	
	1.4	Subgraphs, paths, walks, circuits	
2.0	Biological Applications		
	2.1	Application: - Food chains and food webs -	08
	2.2	Genetic networks, Disease transmission	
	2.3	Ecosystem and protein interaction graphs,	
3.0	Introductory Biostatistics		
	3.1	Introduction to Biostatistics: Scope and importance	**07**
	3.2	Data: Collection,classification and Types of data: Qualitative vs. Quantitative	
	3.3	Graphic Representation of Data	
	3.4	Central Tendency: Mean Median Mode	
	3.5	Dispersion, Correlation & regression	
4.0	Probability		
	4.1	Important Terms and Concepts, Sample point, Sample space, Trial and Event; Probability Distributions.	**08**
	4.2	Frequency Definition of Probability, Rules of Probability (Addition Rule and Multiplication Rule),	
	4.3	Binomial Distribution, Poisson Distribution and Normal Distribution. Test of Significance	
		Total	**30**

Text Books:

1. Dr V A Jadhav, Dr O K Berdewad and Dr M R Fegade, A Textbook of 'Essentials of Biophysics with Biomathematics and Biostatistics' - Advent Publication,Mumbai (2025).
2. "Biostatistics: A Foundation for Analysis in the Health Sciences" *Author:* Wayne W. Daniel, Chad L. Cross.
3. "Mathematical Biology" (Vol. I & II) *Author:* J.D. Murray

Reference Books:

- Biomathematics *Author:* J. N. Kapur *Publisher:* CRC Press / Narosa.
- Biostatistics: Basic Concepts and Methodology for the Health Sciences"

  Authors: Marc M. Triola & Mario F. Triola,*Publisher:* Pearson.

Course Structure:

SBPHMP1252 (Minor-4): Practical

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHMP 1252	Practical	--	04 (60 Hr)	--	02	02

Assessment Scheme

Course Code	Course Name	Theory				Practical		Total [CA+ESA]
		CA			ESA			
		Test I	Test II	Avg (T1+T2)/2		CA	ESA	
SBPHMP 1252	Practical	--	-	--	--	20	30	50

Course pre-requisite:

1. Basic information about instruments, gadgets etc.
2. Knowledge of precautionary measures.

Course objectives:

- To develop the ability to represent biological systems using graph-theoretical concepts and models.
- To equip students with skills in collecting, organizing, visualizing, and interpreting biological data using statistical tools.
- To enable students to apply probability distributions and hypothesis testing methods in analyzing biological experiments.

Course outcomes:

- CO1: Students will be able to construct and analyze graph-based models (e.g., food webs, genetic networks, phylogenetic trees) representing biological interactions.

- CO2: Students will be able to collect real or sample biological data, apply statistical techniques (mean, median, standard deviation, regression), and represent the data graphically.

- CO3: Students will be able to apply probability rules, generate and interpret distributions (binomial, Poisson, normal), and perform significance testing (e.g., t-test, chi-square) for biological case studies.

Curriculum Details :Practical

1 Presentation of Statistical data by Histogram, Ogive curves, Pie diagram. frequency tables, graphs (5)

3. Measurement of central tendencies: - Arithmetic & Geometric mean, Mode and Median. (5 assignments)
4. To calculate the measures of dispersion.:(6 assignments) Mean deviation. Quartile deviation ,Standard deviation and Coefficient of variation.
5. Test of Significance. (6 assignments):Chi-Square test, t- test.
6. 5. Calculating the Correlation coefficients.
7. Finding Regression coefficients and Regression lines.
8. Plot and analyze basic graphs (vertices, edges, degree of nodes).
9. Create and differentiate graph types: simple, directed, undirected, cyclic graphs.
   → Represent feedback loops and phylogenetic trees.
10. Identify subgraphs, paths, walks, circuits in given biological networks.
    → Example: Protein-protein interaction map.
11. Construct food chains and food web graphs from real-life ecosystems
    → Represent trophic levels using directed graphs.
12. Simulate genetic networks and disease transmission models
    → Example: SIR model or Boolean genetic networks.
13. Build ecosystem interaction networks and visualize protein interaction graphs
14. Collect sample biological data (e.g., plant height, blood pressure) and classify it
    → Qualitative vs. quantitative, discrete vs. Continuous
15. Graphical representation: Histograms, pie charts, bar graphs using Excel or R
16. Calculate mean, median, mode for sample datasets.
17. Calculate and interpret standard deviation, variance, and coefficient of variation.
18. Perform correlation and regression analysis using sample biological data
    → Plot scatter diagram and compute correlation coefficient (r)
19. Simulate simple probability experiments: coin toss, dice roll, etc.
20. Perform test of significance (t-test/chi-square)

**STUDENT NEED TO PERFORM 10 (TEN) EXPERIMENTS.*

*****Note: Any two experiments can be added as per availability of instruments at the College.***

SBPHGE1251: **Biophysics in Daily Life-II**

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHGE1251	Biophysics in Daily Life-II	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SBPHGE1251	Biophysics in Daily Life-II	10	10	10	40	50

Course pre-requisite:

None; this course is open to all the students and do not have any prerequisite.

Course objectives:

- To facilitate the students to achieve a clear conceptual understanding of technical aspects of Biophysics in daily life.
- Discuss how changes in pressure, temperature, and density affect atmospheric properties and behavior.
- Teach applications of optical instruments in scientific research, education, and entertainment.

Courseoutcomes:

After successful completion of the course the learners will be able to:

- ✓ To facilitate the students to achieve a clear conceptual understanding of technical aspects of Biophysics in daily life.
- ✓ Discuss how changes in pressure, temperature, and density affect atmospheric properties and behavior.

CurriculumDetails:Biophysics in Daily Life-II

Module No.	Unit No.	Topic	Hrs.
1.0	Environmental Biophysics		
	1.1	Biophysical aspects of air and water pollution	**08**
	1.2	Light and photosynthesis: Relevance to food and oxygen production	
	1.3	Biophysics of cooking	
	1.4	food preservation (e.g., microwaves, refrigeration)	
2.0	Biophysics in Human Body		
	2.1	Temperature: effects on the human body	**07**
	2.2	**Temperature** using skin-contact thermal sensors	
	2.3	humidity, and climate:effects on the human body	
	2.4	**Oxygen saturation (SpO_2)** using red and infrared light	
3.0	Biophysics in Sports & Wearables		
	3.1	Biomechanics in sports	**07**
	3.2	Biomechanics in exercise (jumping, running, swimming)	
	3.3	Biophysics of wearable devices (e.g., heart rate monitors, pedometers)	
	3.4		
4.0	Biophysics in Technology,		
	4.1	Robotics	**08**
	4.2	Prosthetics;Physics behind artificial limbs	
	4.3	Future trends: Bioelectronics, nanobiophysics	
	4.4	and bioengineering	
		Total	**30**

Text Books:

1. Biophysics: An Introduction – Roland Glaser.
2. Biophysics: Vasantha Pattabhi & N. Gautham.
3. Essentials of Biophysics : P. Narayanan.
4. Human Physiology: From Cells to Systems: Lauralee Sherwood
5. A textbook as per NEP-2020: Degree physics: Dr B G Nemmaniwar, S A Panchal, S M chavan

Reference Books:

1. Biophysics in Daily Life, Jo Hermans, EDP Sciences
2. Biophysics: Tools and Techniques" – M.A. Subramanian.

Course Structure:

SBPHVSC1251 (Vocational): Biomedical Nanotechnology

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHVSC1251	Essentials of Physiology and Immune System	--	04	--	02	02

Assessment Scheme

Course Code	Course Name	Theory				Practical		Total [CA+ESA]
		CA			ESA			
		Test I	Test II	Avg (T1+T2)/2		CA	ESA	
SBPHVSC1251	Essentials of Physiology and Immune System	--	--	--	--	20	30	50

Course pre-requisite:

1. Knowledge of basic.
2. Aware about the safety measures and handling of tools.

Course objective:

- Understand the basic concepts of human physiology.
- Gain practical knowledge about blood and circulation
- Learn the fundamentals of the immune system
- Relate immunity to daily life and health

Course outcome:

- ✓ After completing this course the students will gain knowledge of basic physiological concepts
- ✓ Demonstrate practical skills related to blood and circulation.
- ✓ Hand on experiments will provide them an expertise for physiological and immunotechniques.

Curriculum Détails: Essentials of Physiology and Immune System

1. Measurement of pulse rate
2. Measurement of blood pressure
3. Determination of hemoglobin content (Sahli's method or any simple method)
4. Counting red blood cells using a hemocytometer (demonstration or actual practical)
5. Counting white blood cells using a hemocytometer (demonstration or actual practical)
6. Estimation of packed cell volume (PCV) by centrifugation
7. Determination of blood group (ABO and Rh typing)
8. Observation of prepared slides of blood smear to identify blood cells
9. Demonstration of clotting time and bleeding time
10. Study of human heart model and tracing the pathway of blood circulation
11. Study of immune organs using charts and models (spleen, lymph nodes, thymus)
12. Observation of lymphocytes and monocytes in blood smear
13. Demonstration of antigen–antibody reaction (e.g., blood group testing or slide agglutination test)
14. Preparation of a simple health chart to record student's BP, pulse, and hemoglobin
15. Case study / chart making on common immune disorders (allergy, autoimmune disease, etc.)
16. Testing antigen antibody reaction on basis of kits.

**STUDENT NEED TO PERFORM 10 (TEN) EXPERIMENTS.*

*****Note: Any two experiments can be added as per availability of instruments at the College.***

Guidelines for the Course Assessment:

A. Continuous Assessment (CA) (20% of the Maximum Marks) of theory and practical courses:

i. **For Theory Course:** CA shall form 20% of the Maximum Marks and shall be carried out over the entire semester. It shall be done by conducting **Two Tests** (Test I on 40% curriculum) and **Test II** (on remaining 40% syllabus) and average of the marks scored by a student in these two tests of a particular paper shall be taken as the **CA** score.

ii. **For Practical Course:** CA score of the practical course shall be marks scored by a student in the internal practical examination conducted by the concerned teacher.

B. End Semester Assessment (80% of the Maximum Marks) of theory and practical courses:

(For illustration a paper of 02 credits, 50 marks has been considered and shall be modified appropriately depending upon credits of the individual paper)

Question Paper Pattern of the ESA:

i. **ESA Question paper shall consist 6 questions, each of 10 marks**

ii. **Question No.1 shall be compulsory and shall be based on the entire syllabus**

iii. Students shall have to solve ***ANY THREE*** of the remaining Five Questions (i.e. from question 2 to 6)

iv. **Students shall have to solve a TOTAL of 4 Questions.**

C. Assessment of On Job Training (OJT) Course (for 04 credits):

a. Continuous assessment part (**40%, 40 marks out of 100**) of this course shall be done by the mentor of the student, where he /she is supposed to complete his On Job Training. This shall be based on the regularity, participation and performance of the students at the place of OJT.

b. Semester End Assessment (ESA) (**60% of the total marks, 60 marks out of 100**) of this course shall be done by a panel of examiners in two parts

i. based on the work report submitted by the student (**50% i.e. 30 marks)** and

ii. **Remaining 50%** (30 marks) shall be based on his presentation and viva-voce on the work carried to be assessed by the panel of examiners. This assessment shall be done along with practical examinations of respective courses / subjects.

D. Assessment of Field Project (FP) and Research Project (RP) (e.g. for 02 credits)

a. Continuous assessment part (**40%, 20 marks out of 50**) of this course shall be done by the mentor of the student and shall be based on regularity, experimental work and performance of the student.

b. Semester End Assessment (ESA) (**60% of the total marks, 30 marks out of 50**) of this course shall be done shall be done by a panel of examiners in two parts

i. based on the work report submitted by the student (**50% i.e. 30 marks)** and

ii. **Remaining 50%** (30 marks) shall be based on his presentation and viva-voce on the work carried out by the student. This assessment shall be done along with practical examinations of the respective courses / subjects.

E. Assessment of Co-Curricular courses (CCC):

i. Assessment of the CCC course shall be done by the respective course coordinator as a part of CA and be based on the regularity, performance of a student and his participation in various activities as prescribed in the regulations prepared in this regard.

ii. The End Semester Assessment (ESA) of the CCC courses shall be done as per the regulations prepared in this regard and shall be done on the basis of the write-up, presentation by the student on the activities that he has carried out in a semester.

iii. Students shall have freedom to opt for more than one CCC courses. However, score of the best performing CC shall be considered for preparing his result.

F. Syllabi, Teaching and Examination Scheme for the courses in Column 7 and Column 8 (AEC, VEC, IKS, CI, EVS, CCCs, etc.) shall be common for all the students from different faculties.

Note:

Number of lectures required to cover syllabus of a course depends on the number of credits assigned to a particular course. One credit of theory corresponds to 15 Hours lecturing and for practical course one credit corresponds to 30 Hours. For example, for a course of two credits 30 lectures of one hour duration are assigned, while that for a three credit course45 lectures.

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