॥ 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

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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 प्रथम वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, या विद्यापीठा अंतर्गत येणा–या सर्व संलग्नित महाविद्यालयामध्ये शैक्षणिक वर्ष २०२४–२५ पासून पदवीस्तरावर राष्ट्रीय शैक्षणिक धोरण –२०२० लागू करण्याच्या दृष्टीकोनातून विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत येणा–या अभ्यासमंडळांनी तयार केलेल्या पदवी प्रथम वर्षाचे अभ्यासक्रमांना मा. विद्यापरिषदेने दिनांक १५ मे २०२४ रोजी संपन्न झालेल्या बैठकीतील विषय क्रमांक १५/५९–२०२४ च्या ठरावाअन्वये मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील खालील बी. एस्सी प्रथम वर्षाचे अभ्यासक्रम (Syllabus) लागू करण्यात येत आहेत.

Sr. No.	Name of the Course Subject
01	B. Sc. I 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/२०२४–२५/130
दिनांक २६.०६.२०२४

डॉ. सरिता लोसरवार
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत : १) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मुंल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
३) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, सदर परिपत्रक संकेतस्थळावर प्रसिध्द करण्यात यावे.

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

Major in **BPH(Boiphysics)** and Minor in **DSM** (Subject)

Under the Faculty of Science & Technology

(Revised as per the Govt. of Maharashtra circular dt. 13th March 2024)

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, SWAYM, 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 calibre 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 New 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 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 ***Sukanu Samiti*** 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

Details of the Board of Studies Members in the subject Biophysics under the faculty of Science & Technology of S.R.T.M. University, Nanded

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

General Guidelines for Selection of Courses

i. The **Major subject** is the discipline or course of main focus, bachelors' degree shall be awarded in that Discipline / subject.

ii. **Minor Subject(s)** is/are the subjects from the same discipline / faculty and shall act as supporting subjects to the Major.

iii. At the entry level of the 3/4-year UG program students shall be required to choose any THREE of the available subjects in a college/institute as **Major (Optional 1), Minor 1 (Optional 2) and Minor 2 (Optional 3) subjects, respectively**

iv. No. of credits assigned to the **Major (Optional 1), Minor 1 (Optional 2) and Minor 2 (Optional 3) shall be same in Semesters I and II.**

v. **In the second year of the degree program students shall select one of the three subjects (Optional 1, 2 and 3) as a Major Subject and one as Minor Subject, while third optional shall be discontinued.**

vi. Students shall have an option to switch over from **Major to Minor or vice-versa after first year**.

vii. Once they finalize their **Major subject** in the beginning of the second year of the programme, they shall pursue their further education in that particular subject as the **Major** subject. Therefore, from second year onwards curriculum of the **Major** and **Minor** subjects shall be different.

viii. Students are required to select **Generic /Open Elective** (**vertical 3 in the credit framework**) compulsorily from the **faculties different than that of their Major / Minor subjects** (select from **Basket 3**).

ix. Content and other details of the GE are available in the document prepared by the respective BOS from which the candidate has chosen his/her GE.

x. Students shall be required to complete the Skill based courses of 06 credits in the first two years.

xi. Vocational Courses (VSEC or VSC) shall be related to the **Major** course

xii. Ability Enhancement Courses (AEC):

a) English Communication Course (Language) of 2 credits shall be offered in Semester I and III

b) Modern Indian Languages shall be of 2 credits and shall be offered in Semester II and IV

xiii. Courses marked as VEC, CI, IKS and CCC in Column Nos. 7and 8 shall be common for all the students irrespective of their faculties of studies.

xiv. Curriculum of VEC, CI, IKS and CCC shall be provided by the University separately.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED - 431 606

Summary of the Credits Assigned to various courses to be proposed by the Board of Studies under the Faculty of Science and Technology

A. No. Of Credits assigned to various courses:

Sr No.	Heads	Credits assigned in each Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Major Subject	4	4	8	8	16	16	18/14	18/14	92/84
2	Minor 1 Subject	4	4	2	2	--	--	--	--	12
3	Minor 2 Subject	4	4	--	--	--	--	--	--	08
3	Generic Electives / Research Methodology	2	2	4	2	--	--	4	--	10 + 4 (14)
4	Vocational and Skill Enhancement Course / Indian Knowledge System	2	2	2	2	4	2	--	--	8+6 (14)
5	Ability Enhancement Course L1 (English)	2	--	2	--	--	--	--	--	4
6	Ability Enhancement Course L2 (SL)	--	2	--	2	--	--	--	--	4
7	Value Added Course /IKS (Constitution of India / EVS)	2	2	--	2	--	--	--	--	6
8	Community Engagement Services NCC/NSS/Sports/Culture	2	2	2	2	--	--	--	--	8
9	Project/ Field Work/ OJT /Internship	--	--	2	2	2	4	--/4	4/8	14/22
10	Total Credits	22	22	22	22	22	22	22	22	176

1. **Major Courses *(92 / 84 credits, Basket-1)*:** Each BOS shall suggest **Major Courses** of 04 credits **(02 credit Theory and 02 credit practical papers)** for semesters I and II
As the University has adopted Three Optional credit framework, therefore, every student have a freedom to chose three courses of his choice from among the options made available by a particular college / institute. As number of credits assigned to all the three optional are same, therefore, he / she have a freedom to select any one of them as Major and one as Minor course from second year onward.

2. **Minor Courses *(20 + 04 credits, Basket-2)*: Total numbers of credits assigned to the Minor Courses are 20** and a course on Research Methodology of 4 credits in VIIth semester.

[Note: *i.* Each Board of studies is required to develop curriculum of **two theory papers and a practical course each of 02 credits**. This would be **common for major and minor courses** during semesters I and II. **No need of preparing Minor courses separately for First Year**.
ii. Students have option to select any of the three optional as **Major** and one **Minor** at the beginning of the **Third Semester (Second Year)** of their degree programme.]

3. **Generic Electives *(10 credits; for students from faculties other than Science and Technology, Basket-3)*:** One paper each of **02/04 credits to be offered in semester I to VI** as Generic Electives. As these papers shall be opted by the students from other faculties; therefore, difficulty level of these courses shall at beginners' level (4.0). Each BOS shall **suggest a minimum of one and a maximum of four Generic Elective papers** to be offered during semesters I to VI. Students have freedom to choose one **Generic Elective** paper from **Basket-3** (common for all faculties) in each semester, provided these GE courses are from other faculty.

4. **Ability Enhancement Course (AEC) *(08 credits; common for all faculty students, Basket-4)*:** One Language course each of 02 credits in the first four semesters.
L1 – First Language English *(Compulsory for all disciplines)* *(02 credits each in semesters I and III)*
L2 – Second Language (Students have option to choose second language from the **Language Basket-IV**) *(02 credits each in semesters II and IV)*

5. **Vocational and Skill Enhancement Courses (VC/SC) *(08 +06 credits, shall be related to the Major Course)*:**
Each BOS shall suggest four Vocational and three Skill Enhancement Courses each of 02 credits to be offered in semesters I to VI. These courses shall be related to the **Major subject**.

6. **Indian Knowledge System (IKS) (Generic) *(02 credits, common for all faculties, Basket-5)*:** Students have a freedom to choose a course on **Indian Knowledge System** of 02 credits from ***Basket-5*** and shall be common for the students from all faculties of study.

7. **Value Education Courses (VEC) *(04 credits, common and compulsory for all faculty students)*:** Students have to complete two Value Added courses each of 02 credits during semester V and VI and are compulsory for students of all faculties.
a*. Constitution of India *(02 credits) – in Semester V
b*. Environmental Studies *(02 credits) – in Semester VI

8. **Community Engagement Services (CES / CCC)*(08 credits, common for all faculty students)*:** Students need to complete four **Community Engagement Services** courses like **NCC, NSS, Sports, Cultural Studies** each of 02 credits in first four semesters I, II, III and IV and are common across the faculty.
Grades of NCC/NSS/Sports/Cultural courses shall be awarded to the students on the basis of their participation in University, Regional, National, International, Inter-University and Intra-University level activities. Guidelines for the award of grades for NCC/NSS/Sports/Cultural studies shall be prepared by a Committee constituted by the University.

9. **Field Work / Projects/ OJT/ Internship/Apprenticeship related to DSC major subjects *(14 credits for Honours and 22 credits for Honours with Research credits)*:** The students shall have to complete Field Work, Project, Case Study, Internship or Apprenticeship, etc. as per the credit framework.

10. **Bachelor of Science in DSC Honors and Minor in DSM.**

For the award of **Bachelor of Science in DSC Honors and Minor in DSM** students have to complete **92 credits** from Major, **20** credits of Minor and the required number of credits of Field Work / Projects/ Internship/Apprenticeship/Case study **related to Major subject**.

11. **Bachelor of Science in DSC Honors with Research and Minor in DSM.**

For the award of **Bachelor of Science in DSC Honors with Research and Minor in DSM** students have to complete **84 credits** theory courses of Major subject, **20 credits** of Minor and required number of credits of Field Work / Projects/ Internship/Apprenticeship/Case study **related to Major subject**.

12. **These guidelines are as per the present instructions from Government of Maharashtra and are subject to change time-to-time as per the guidelines from Govt. of Maharashtra.**

MULTIPLE EXIT Options for Students:

1. **Exit Option after First year**

Students may take exit after completion of first year with **Certificate in Major (DSC) and Minor (DSM) subject** on completion of minimum 44 credits and additional 4 credits of NSQF skill / vocational in major/minor subject or internship during summer vacation.

2. **Exit Option after Two years**

Students may take exit after completion of second year of the programme with **Diploma in Major (DSC) and Minor (DSM)** subject on completion of minimum 88 credits and additional 04 credits on NSQF skill / vocational or Internship on major/minor courses during summer vacation.

3. **Exit Option after Three years**

Students may take exit with a Degree as **Bachelors of Science in Major (DSC) and Minor (DSM)** after earning minimum of 132 credits.

4. **Exit Option after Four Years** after completing 176 credits

(a) Bachelor of Science in DSC Honours and Minor in DSM.

(b) Bachelor of Science in DSC with Research and Minor in DSM.

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology (Three Optional in the First Year)

Credit Framework for Four Year Multidisciplinary Degree Program with Multiple Entry and Exit

Subject: DSC (Major) /DSM (Minor 1 and Minor 2)

(For illustration BPH, CHE and ELE combinations are considered, which may change for different combinations)

Year & Level	Semester	Optional 1 (Major) *(From the same Faculty)*	Optional 2 (Minor 1) *(From the same Faculty)*	Optional 3 (Minor 2) *(From the same Faculty)*	Generic Elective (GE) (select from Basket 3 of *Faculties other than Science and Technology*)	Vocational & Skill Enhancement Course	Ability Enhancement Course (AEC) (Basket 4) Value Education Courses (VEC) / Indian Knowledge System (IKS) (Basket 5) *(Common across all faculties)*	Field Work / Project/Internship/ OJT/ Apprenticeship / Case Study Or Co-curricular Courses (CCC) (Basket 6 for CCC) *(Common across all faculties)*	Credits	Total Credits
1	2	3	4	5	6	7	8	9	10	11
1 (4.5)	I	SBPHCT1101 (T 2Cr) SBPHCP1101 (P 2Cr) 4 Credits	SCHECT1101 (T 2Cr) SCHECP1101 (P 2Cr) 4 Credits	SELECT1101 (T 2Cr) SELECP1101 (P 2Cr) 4 Credits	SBPHGE1101 2 Credits	SBPHSC1101 2 Credits	AECENG1101 (2Cr) ACEMIL1101 (2Cr) IKSXXX1101 (2Cr) 6 Credits		22	44
	II	SBPHCT1151 (T 2Cr) SBPHCP1151 (P 2Cr) 4 Credits	SCHECT1151 (T 2Cr) SCHECP1151 (P 2Cr) 4 Credits	SELECT1151 (T 2Cr) SELECP1151 (P 2Cr) 4 Credits	SBPHGE1151 2 Credits	SBPHSC1151 2 Credits	AECENG1151 (2Cr) ACEMIL1151 (2Cr) VECCOI1151 (2Cr) *Constitution of India* 6 Credits		22	
	Cum. Cr.	08	08	08	04	04	12		44	

***Exit option*: UG Certificate in Opt 1, Opt 2 and Opt 3 on completion of 44 credits** and additional **4 credits from NSQF / Internship**										
2 (5.0)	**III**	**SBPHCT1201 (2cr) SBPHCT1202 (2cr) SBPHCP1203 (2cr) SBPHCP1204 (2cr) 8 Credits**	**SCHEMT1201 SCHEMP1201 (1T+1P) 2 Credits**		**SBPHGE1201 (2cr) SBPHGE1202 (2cr) 4 Credits**	**SBPHSC1201 2 Credits**	**ACEXXX1201 (MAR/HIN/URD /KAN/PAL) (2Cr) 2 Credits**	**SBPHFP1201 (2Cr) CCCXXX1201 (2Cr) 4Credits**	**22**	**88**
	IV	**SBPHCT1251 (2cr) SBPHCT1252 (2cr) SBPHCP1253 (2cr) SBPHCP1254 (2cr) 8 Credits**	**SCHEMT1251 SCHEMP1251 (1T+1P) 2 Credits**		**SBPHGE1251 2 Credits**	**SBPHVC1251 2 Credits**	**ACEXXX1251 (MAR/HIN/URD /KAN/PAL) (2Cr) VECEVS1251 (2Cr) 4 Credits**	**SBPHFP1351 (2Cr) CCCXXX1151(2Cr) 4 Credits**	**22**	
	Cum. Cr.	**24**	**12**	**08**	**10**	**06**	**14**	**12**	**88**	
***Exit option*: UG Diploma in Major DSC and Minor DSM on completion of 88 credits and** additional **4 credits NSQF / internship in DSC**										
3 (5.5)	**V**	**SBPHCT1301** (T 3Cr) **SBPHCT1302** (T 3Cr) **SBPHIK1303** (T 2Cr) **SBPHCP1304** (P 2Cr) **SBPHCP1305** (P 2Cr) **12 Credits**	**SBPHET1301** (T 3Cr) **SBPHEP1301** (P 1Cr) **4 Cr**	--		--	**SBPHVC1301 4 Credits**	--	**SBPHFP1301 (2 Cr) 2 Credits**	**22**
	VI	**SBPHCT1351** (T 3Cr) **SBPHCT1352** (T 3Cr) **SBPHCT1353** (T 2Cr) **SBPHCP1354** (P 2Cr) **SBPHCP1355** (P 2Cr) **12 Credits**	**SBPHET1351** (T 3Cr) **SBPHEP1351** (P 1Cr) **4 Cr**	--		--	**SBPHVC1351 2 Credits**	--	**SBPHOJ1351 4 Credits**	**22**
	Cum. Cr.	**56**		**12**	**08**	**10**	**6 + 8 =14**	**14**	**18**	**132**

***Exit option*: B. Sc. (Bachelor in Science) with Major in DSCand Minor in DSM**											
4 (6.0)	**VII**	**SBPHCT1401** (T 4Cr) **SBPHCT1402** (T 4Cr) **SBPHCT1403** (T 2Cr) **SBPHCP1404** (P 4Cr) **14 Credits**	**SBPHET1401** (T 3Cr) **SBPHEP1401** (P 1Cr) **4 Cr**	*Research Methodology* **SBPHRM1401** **4 Credits**		--	--	--	--	**22**	
	VIII	**SBPHCT1451** (T 4Cr) **SBPHCT1452** (T 4Cr) **SBPHCT1453** (T 2Cr) **SBPHCP1454** (P 4Cr) **14 Credits**	**SBPHET1401** (T 3Cr) **SBPHEP1401** (P 1Cr) **4 Cr**	--		--	--	--	**SBPHOJ1451** **4 Credits**	**22**	
	Cum Cr	**Honours: 92**		**18+4**	**08**	**10**	**V-08 + S-06**	**AEC-4+MIL-4 +VEC-4 +IKS-2**	**22**		**176**
***Exit option*: B. Sc. (Hons) with Major in DSCand Minor inDSM**											
4 (6.0)	**VII**	**SBPHCH1401** (T 3Cr) **SBPHCH1402** (T 3Cr) **SBPHCH1403** (T 4Cr) **(H- Honours)** **10 Credits**	**SBPHET1401** (T 3Cr) **SBPHEP1401** (P 1Cr) **4 Cr**	*Research Methodology* **SBPHRM1401** **4 Credits**		--	--	--	Research Project **SBPHRP1401** **4 Credits**	**22**	**44**
	VIII	**SBPHCH1451** (T 3Cr) **SBPHCH1452** (T 3Cr) **SBPHCH1453** (T 4Cr) **(H- Honours)** **10 Credits**	**SBPHET1451** (T 3Cr) **SBPHEP1451** (P 1Cr) **4 Cr**	--		--	--	--	Research Project **SBPHRP1451** **8 Credits**	**22**	
***Exit option*: B. Sc. (Hons with Research) in DSCand Minor in DSM**											
Total Credits		**Major – 92 / 84**		**Minor 1 -18 + RM - 04**	**Minor 2 08**	**GE/OE - 10**	**(V-08 + S-06) 14**	**(AEC-8 + VEC-4 + IKS-2)14**	**(CC-08+FP/CS-06+OJT-04+RP-12) 30**	**176**	

Abbreviations:

1. **DSC:** Department/Discipline Specific Core (Major)
2. **DSE:** Department/Discipline Specific Elective (Major)
3. **DSM:** Discipline Specific Minor
4. **GE/OE:** Generic/Open Elective
5. **VSEC:** Vocational Skill and Skill Enhancement Course
6. **VSC:** Vocational Skill Courses
7. **SEC:** Skill Enhancement Courses
8. **AEC:** Ability Enhancement courses
9. **MIL:** Modern Indian languages
10. **IKS:** Indian Knowledge System
11. **VEC:** Value Education Courses
12. **OJT:** On Job Training: (Internship/Apprenticeship)
13. **FP:** Field Projects
14. **CEP:** Community Engagement and Service
15. **CC:** Co-Curricular Courses
16. **RM:** Research Methodology
17. **RP:** Research Project/Dissertation

Swami Ramanand Teerth Marathwada University, Nanded

Assigning TEN DIGIT Codes to the Courses ALPHANUMERIC Coding AAAAAA XXXX

1) First (A) Letter indicate Faculty: H – Humanities; **S** - Science; **C** – Commerce, & Management, **I** - Interdisciplinary Studies and **D** –Distance / External mode .

2) Next Three Letters(XXX) indicates Subject (e.g. **ECO** – Economics, **BPH** – Biophysics, **COM** – Commerce, **CSC** – Computer Sci.) etc.

3) Fourth and Fifth Letters indicate nature of the course : (e.g. **CT** – Core Theory, **CP** – Core Practical, **MT** – Minor Theory, **ET** – Elective Theory, **EP** – Elective Practical, **FP**– Field Project, **FW** – Field Work, **OJ** – On Job training, **GE** - Generic /open Elective, **IN** – Internship, **CS** – Case Study, **VC** - Vocational Skill Courses, **SC** - Skill Enhancement Courses, **AEC** - Ability Enhancement courses, **ML** - Modern Indian languages, **CCC** - Co-Curricular Courses/ Community Engagement and Service, **RM** - Research Methodology, **IKC** - Indian Knowledge System,**VEC** - Value Education Courses, etc.)

4) Sixth Character or First Number: indicate the Centre (**1**- for Affiliated colleges, **2** -Main Campus, **3**- Model Degree College, **4**- Sub-Centre Latur, **5**-Sub-Centre Parbhani, **6** –Sub-Centre Kinwat)

5) Seventh Character or second number indicate -Year of Study.e.g.**1** - First year,**2**- second year.etc.

6) Last Two Numbers indicate Course Number

e.g. **SBPHCT1101** – Faculty of **Science & Technology (S) BPHSICS** (BPH) subject **Core Theory** (**CT**) Course offered in the First Semester in affiliated colleges

Sr. No	UG/PG	Semester	Affiliated Colleges	Main Campus	Model Degree College	Sub-center Latur	Sub-center Parbhani	Sub-Centre Kinwat
1	First Year	Semester I	1101 to 1150	2101 to 2150	3101 to 3150	4101 to 4150	5101 to 5150	6101 to 6150
2		Semester II	1151 to 1199	2151 to 2199	3151 to 3199	4151 to 4199	5151 to 5199	6151 to 6199
3	Second Year	Semester III	1201 to 1250	2201 to 2250	3201 to 3250	4201 to 4250	5201 to 5250	6201 to 6250
4		Semester IV	1251 to 1299	251 to 2299	3251 to 3299	4251 to 4299	5251 to 5299	6251 to 6299
5	Third Year	Semester V	1301 to 1350	2301 to 2350	3301 to 3350	4301 to 4350	5301 to 5350	6301 to 6350
6		Semester VI	1351 to 1399	2351 to 2399	3351 to 3399	4351 to 4399	5351 to 5399	6351 to 6399
7	Fourth Year	Semester VII	1401 to 1450	2401 to 2450	3401 to 3450	4401 to 4450	5401 to 5450	6401 to 6450
8		Semester VIII	1451 to 1499	2451 to 2499	3451 to 3499	4451 to 4499	5451 to 5499	6451 to 6499
9	Fifth Year	Semester IX	1501 to 1550	2501 to 2550	3501 to 3550	4501 to 4550	5501 to 5550	6501 to 6550
10		Semester X	1551 to 1599	2551 to 2599	3551 to 3599	4551 to 4599	5551 to 5599	6551 to 6599

B. Sc. First Year Semester I *(Level 4.5)*

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	SBPHCT1101	Molecular Biophysics- I	02	--	**04**	02	--
	SBPHCP1101	Practical –I	-	02			04
Optional 2	SDSCMT1101	--	02	--	**04**	02	--
	SDSCMP1101	Title of paper 2 (practical)	-	02			04
Optional 3	SDSCMT1101	--	02	--	**04**	02	--
	SDSCMP1101	Title of paper 2 (practical)	-	02			04
Generic Electives *(from other Faculty)*	SDSCGE1101	Renewable Energy **(Basket 3 of respective Faculty)**	02	--	**02**	02	--
Skill Based Course (related to Major)	SBPHSC1101	Science Communication skill	--	02	**02**	--	04
Ability Enhancement Course	AECENG1101	L1 – Compulsory English	02	--	**02**	02	--
Indian Knowledge System (IKS)	IKSXXX1101	Select from **Basket 5**	02	--	**02**	02	--
Language	ACEMIL1101		02	--	**02**	02	
Total Credits			**14**	**08**	**22**	**14**	**16**

B. Sc. First Year Semester I *(Level 4.5)*

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	SBPHCT1101	Molecular Biophysics-I	10	10	10	40	--	--	50
	SBPHCP1101	Practical I	--	--	--	--	20	30	50
Optional 2	SDSCMT1101	--	10	10	10	40	--	--	50
	SDSCMP1101	Title of paper 2 Practical	--	--	--	--	20	30	50
Optional 3	SDSCMT1101	--	10	10	10	40	--	--	50
	SDSCMP1101	Title of paper 2 practical	--	--	--	--	20	30	50
Generic Elective	SDSCGE1101	Introduction to **B**iophysics **(Basket 3)**	10	10	10	40	--	--	50
Skill Based Course	SBPHSC1101	Science communication Skill	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1101	**L1 – Compulsory English**	10	10	10	40	--	--	50
Indian Knowledge System	IKSXXX1101	Title **(Basket 5)**	10	10	10	40	--	--	50
Language	ACEMIL1101		10	10	10	40	--	--	50

B. Sc. First Year Semester II *(Level 4.5)*

Teaching Scheme

	Course Code	CourseName	CreditsAssigned			TeachingScheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	SBPHCT1151	Cellular Biophysics- II	02	--	**04**	02	--
	SBPHCP1151	Practical –II	-	02			04
Optional 2	SDSCMT1151	--	02	--	**04**	02	--
	SDSCMP1151	Title of paper 2 (practical)	-	02			04
Optional 3	SDSCMT1151	--	02	--	**04**	02	--
	SDSCMP1151	Title of paper 2 (practical)	-	02			04
Generic Electives *(from other Faculty)*	SDSCGE1151	Foundation of Biophysics **(Basket 3 of respective Faculty)**	02	--	**02**	02	--
Skill Based Course (related to Major)	SDSCSC1151	Medical Diagnostic technique	--	02	**02**	--	04
Ability Enhancement Course	AECENG1151	L1 – Compulsory English	02	--	**02**	02	--
Indian Knowledge System (IKS)	IKSXXX1151	Select from **Basket 5**	02	--	**02**	02	--
Constitution of India	VECCOI1151		02	--	**02**	02	
Total Credits			**14**	**08**	**22**	**14**	**16**

B. Sc. First Year Semester II *(Level 4.5)*

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)	Course Name (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	SBPHCT1151	Cellular Biophysics II	10	10	10	40	--	--	50
	SBPHCP1151	Practical II	--	--	--	--	20	30	50
Optional 2	SDSCMT1151	--	10	10	10	40	--	--	50
	SDSCMP1151	Title of paper 2 Practical	--	--	--	--	20	30	50
Optional 3	SDSCMT1151	--	10	10	10	40	--	--	50
	SDSCMP1151	Title of paper 2 practical	--	--	--	--	20	30	50
Generic Elective	SDSCGE1151	Foundation of Biophysics **(Basket 3)**	10	10	10	40	--	--	50
Skill Based Course	SBPHSC1151	Medical Diagnostic technique	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1151	**L1 – Compulsory English**	10	10	10	40	--	--	50
Indian Knowledge System	IKSXXX1151	Title **(Basket 5)**	10	10	10	40	--	--	50
Constitution of India	VECCOI1151		10	10	10	40	--	--	50

SBPHCT1101 Molecular Biophysics -I

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHCT1101	Molecular Biophysics -I	02	--	02	--	02

Major 1 -Assessment Scheme

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7) or Col (8+9)] (10)
		CA			ESA (7)			
		Test I (4)	Test II (5)	Avg. of T1 & T2 (6)		CA (8)	ESA (9)	
SBPHCT1101	Molecular Biophysics -I	10	10	10	40	--	--	50

SBPHC101 (Major): Molecular Biophysics-I

Course pre-requisite:

1. Students should have basic knowledge of concepts Biophysics.
2. Should be able to understand the basics of physical sciences and itsapplications in life sciences.
3. The pre-requisite for this course is knowledge of chemistry, biochemistry and fundamentals of Biophysics.

Course objective:

- To impart basic knowledge of biochemistry.
- To make familiar with physico-chemical foundation of biophysics.
- To know the structure and properties of macromolecules that interacts to maintain and perpetuate the living systems.

Course outcome: Students will able

- ✓ To understand the basics of Biophysics.
- ✓ To understand the relationship between biology and concepts of physics.
- ✓ To interpret the biochemistry fundamentals and mechanisms in terms of building blocks of life

Curriculum Details:

SBPHC101 (Major): **Molecular Biophysics**

Module No.	Unit No.	Topic	Hrs. Required to cover contents
1.0		**Atomic & Molecular structure**	
	1.1	Structure of atom-Models & theories, Periodic table	**07**
	1.2	Concept of bonding; valence of carbon; hybridizations	
	1.3	Polar & non polar molecules; inductive effect.	
	1.4	Secondary bonding: weak interactions, hydrogen bonding;	
	1.5	Bonds within molecules-Ionic, covalent, Hydrogen, Electrostatic, Van-der Waals forces, Bond lengths & Bond energies, Bond angles,	
2.0		**Physico-chemical Foundations**	
	2.1	**Biophysics of Water**: Physicochemical properties of water	**08**
	2.2	Molecular structure, Nature of hydrophobic interactions, Water Structure.	
	2.3	**Acid & Bases:** Acid-Base theories, Mole concept, Molarity, Molality & Normality, Ampholyte,	
	2.4	Concept of pH, measurements of pH , Henderson–Hasselbatch equation , Titration curve & pK values, numerical problems.	
3.0		**Physical Foundations of Biophysics**	
	3.1	**Thermodynamics of Biological system**: First and second laws of thermodynamics, activation energy. Biological systems as open,	**08**
	3.2	Concept of free energy, entropy, Enthalpy, Negative entropy as Significant to biological systems.	
	3.3	**Bioenergetics:** Concept of energy coupling in biological processors, structure and role of mitochondria,	
	3.4	structure and role of mitochondria, Electron-transport chain,	
4.0		**Biomolecules as alphabets of life**	
	4.1	**Nucleic acids**: nucleosides, nucleotides, basic differences in structure and function of RNA and DNA	**07**
	4.2	**Amino acids & Proteins:** Amino acid **general structure &** types, peptide bond, Structure of Proteins	
	4.3	**Carbohydrates:** Structure and function carbohydrate,	

	4.4	**Lipids** : **Vitamins & hormones:** Structure, classification & function.	
		Total	**30**

Books Recommended:

1. Bloomfield V.A. and Harrington R.E. (1975), Biophysical chemistry, W.A.Freeman
2. Cantor C.R. and Schimmel P.R. (1980), Biophysical chemistry, W.A.Fremman and Co.
3. Lehninger A. (1981), Biochemistry, Butter Worth Publication.

Curriculum Details:

SBPHCP1101: *Practical- I (based on Molecular Biophysics I)*

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHCP 1101	Practical I	--	04 (60 Hr)	--	02	02

Assessment Scheme

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7)/ Col (8+9)] (10)
		CA			ESA (7)			
		Test I (4)	Test II (5)	Avg (T1+T2)/2 (6)		CA (8)	ESA (9)	
SBPHCP1101	Practical	--	--	--	--	20	30	50

Course pre-requisite:

1. Knowledge of Principles of work
2. Basic information about biophysical techniques etc.
3. Knowledge of precautionary measures.

Course objectives:

- The main objective of practical course is to engage the student in the subject and help them get a better understudying of the topic studies in molecular biophysics.
- To allow hand on experiments to learn and understand fundamental principle of biochemistry.
- To develop the scientific attitude amongst student.

Course outcomes:

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

Practical- I (based on Molecular Biophysics I)

Sr. No.	Name of Experiment
1.	Preparation of buffers (acetate, phosphate, citrate, borate buffers).Preparation of
2.	Normal, molar and standard solutions,serial dilutions
3.	To study the principle of spectrophotometer. To verify the Lambert Beer's law.
4.	To determine the beer's limit and measurement of molar and percent extinction
5.	coefficient.
6.	To plot absorption spectrum of DNA and protein (BSA/Egg Albumin)
7.	Estimation of Glycine or any other by formal titration method.
8.	Estimation of reducing sugars by Benedict's Method
9.	To estimate proteins by Biuret assay, Folin's-Lowry method
10.	Spot test for carbohydrates.
11.	Qualitative tests for Glucose, Fructose, Ribose, Maltose
12.	Spot tests for Amino Acids.
13.	Isolation of Starch from potato
14.	Acid – Base titration using pH meter and Determine the pK values: - Strong acid Vs Strong
15.	To determine the pH titration curve of amino acids & calculate the pKa values.
16.	To measure the pH of given solution
17.	pH and pKa calculation
18.	Use of pH tablet for maintaining pH using pH meter

Note: Students should perform at least twelve experiments from above list.

SBPHSC1101 (Skill): Science Communication Skills

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHSC 1101	Science Communication skill	--	04	--	02	02

Assessment Scheme

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7)/ Col (8+9)] (10)
		CA			ESA (7)			
		Test I (4)	Test II (5)	Avg (T1+T2)/2 (6)		CA (8)	ESA (9)	
SBPHSC 1101	Science Communication skill	--	--	--	--	20	30	50

Course pre-requisite:

Prerequisite for this course is the knowledge of basic sciences.

Course objectives:

- To impart skills related to Reading tactics and strategies, Reading purpose and meaning, Reading outcomes, structure of meaning.
- To introduce the students to benefits of listening and writing skills in science communication.

Course outcomes:

- ✓ This course being pre requisite for many advance courses hence students will be able to learn how to perform experiments and interpretation.
- ✓ Students will be made aware with science communication and its applicability.

SBPHSC1101 (Skill): Science Communication skill

Module No.	Unit No.	Topic	Hrs. Required
1.0		Reading Skill	**10**
	1.1	Reading tactics and strategies,	
	1.2	Reading purpose and meaning,	
	1.3	Reading outcomes, structure of meaning	
2.0		**Scientific** Listening Skill	**15**
	2.1	Barriers to listening,	
	2.2	Effective listening skills,	
	2.3	Attending telephone calls, Note-taking;	
	2.4	Speaking and discussion Skill:	
	2.5	Component of effective talk / presentation,	
3.0		Writing skills	**15**
	3.1	Writing skills and techniques of writing	
	3.2	Guidelines for effective writing,	
	3.3	Writing styles for application with personal resume	
	3.4	Technical report writing,	
	3.5	Development of paragraph, Development of story.	
4.0		scientific documents	**20**
	4.1	Definition and kinds of– research paper	
	4.2	Publication – role of author, guide, co-authors.	
	4.3	Components of a research paper- title, authors and addresses, abstract, acknowledgements, references,	
	4.4	Report writing	
	4.5	Preparation of thesis,	
	4.6	Oral presentation, Oral and poster presentation of research papers in conferences/symposia	
		Total	**60**

Reference Books:

(i) Adair, John. Effective Communication. London: Pan Macmillan Ltd., 2003.

(ii) Ajmani, J. C. Good English: Getting it Right. New Delhi: Rupa Pubications, 2012.

(iii) Amos, Julie-Ann. Handling Tough Job Interviews. Mumbai: Jaico Publishing, 2004.

(iv) θ Bonet, Diana. The Business of Listening: Third Edition. New Delhi: Viva Books, 2004.

Course Structure:

SBPHG101: *(Generic Elective 1) Introduction to Biophysics*

Assessment Scheme

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		Test I (4)	Test II (5)	Avg (T1+T2)/2 (6)		CA (8)	ESA (9)	
SBPHG101	Introduction to Biophysics	10	10	10	40	--	--	50

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHG101	Introduction to Biophysics	02	--	02	--	02

SBPHG101: *(Generic Elective 1) Introduction to Biophysics*

Course pre-requisite:

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

Course objectives:

- To inculcate a scientific awareness about the multidisciplinary subject
- To introduce the learners to the exciting world of Biophysics
- To understand the foundation of Life sciences through biophysical Approach

Course outcomes:

- **Foundations:** Examine biophysical scenarios using both a conceptual understanding of the core concepts of biology, chemistry, and physics, and calculations using the appropriate methods of mathematical, theoretical, and computational physics.
- **Scientific Communication:** Effectively communicate biophysics content through both written reports and oral presentation.
- **Experimental Methods:** Devise, implement, and refine an experiment to assess biophysics questions using appropriate statistical and computational methods to interpret the data and draw valid scientific conclusions.
- **Applications:** Apply their physics and biophysics experience and knowledge to analyze new biophysical situations and to develop and refine experimental methods for new biophysical applications.

Curriculum Details:

SBPHG101: ***(Generic Elective 1) Introduction to Biophysics***

Module No.	Unit No.	Topic	No. of hours required to cover the contents
1. 0	**Alphabets of Biophysics**		
	1.1	Introduction to Biophysics	
	1.2	Biophysics as Interdisciplinary science	
	1.3	Branches of Biophysics	**08 Hours**
	1.4	Concepts in biophysics	
2.0	**Biophysical Techniques**		
	2.1	Electrophoresis	
	2.2	ECG, EEG, Patch clamp technique	
	2.3	Microscopy and spectroscopy, X-ray crystallography	**07 Hours**
	2.4	Centrifugation and chromatography	
3.0	**Biomechanics and Neurobiophysics**		
	3.1	**Biomechanics Basics, Muscle Contraction, Regulation of Heart**	
	3.2	Biopotential, nature of nerve impulse, Action potential, mechanism of Action potential.	**08 Hours**
	3.3	Neurotransmitters, neuromuscular junction, photoreception, sound reception	
	3.4	Cell signaling: Signal transduction	
4.0	**Origin and evolution of life**		
	4.1	Pre-biotic earth atmosphere	
	4.2	Significance of Water and formation of Biomolecules	
	4.3	Thermal vent, frozen ocean	**07 Hours**
	4.4	Miller experiment and formation of polymers	
		Total	**30 Hours**

Books Recommended:

- Lehninger A. (1981), Biochemistry, Butter Worth Publication.
- Pesce A.J., Rosen C.G and Pasty T.L., Fluorescence Spectroscopy: An introduction for Biology and Medicine, Marcel Dekkar.
- Pullman B. (1978), Molecular Association in Biology, Academic Press.
- Spragg S.E. (1980), Physical Behavior of macromolecules with biological functions, John willey and sons.

- Stanford J.R. (1975), Foundation of Biophysics Academic press.
- Szekely M. (1984), From DNA to protein, Macmillan.
- Volkenstein M.V. (1977), Molecular Biophysics, Mir Publication.
- Basar E. (1976), Biophysical and physiological system Analysis, Addition-Wesley.
- Guyton A.C. (1981), Textbook of Medical Physiology, Sounders co.
- Geoffrey L. Zubay, William W. Parson, Dennis E. Vance. (1995), Principles of Biochemistry, Wm.c.Brown Publishers.

SBPHCT1151: *Cellular Biophysics II*

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHCT1151	Cellular Biophysics-I I	02	--	02	--	02

Major 1 -Assessment Scheme

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7) or Col (8+9)] (10)
		CA			ESA (7)			
		Test I (4)	Test II (5)	Avg of T1 & T2 (6)		CA (8)	ESA (9)	
SBPHCT1151	Cellular Biophysics -II	10	10	10	40	--	--	50

SBPHCT1151: *Cellular Biophysics II*

Course pre-requisite:

1. Aspirant should have basic knowledge of cell and its organization.
2. Should be able to understand the terminologies of cellular sciences and its applications in everyday life.
3. The pre-requisite for this course is knowledge of organization of cell to lifeforms.

Course Objectives:

- To understand the knowledge of cell biology of changes or losses in cell function..
- Students will understand how cellular components are used to generate and utilize energy in cells.
- Students will understand the structures and purposes of basic components of
- prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.

Students will understand the cellular components underlying mitotic cell division.

Course Outcomes:

- Students will be able to understand the fundamental nature of cellular Biophysics.
- Students will be enabled to handle different types of problems and other advanced courses in Biophysics.

SBPHCT1151: Cellular Biophysics *II*

Module No.	Unit No.	Topic	Hrs. Required to cover contents
1.0	**Unit I: Cell Organization**		**07**
	1.1	Cell as the basic structural unit	
	1.2	Origin of cell	
	1.3	Fine structure of Prokaryotic & Eukaryotic cell organization	
	1.4	Internal architecture of cells and Cell organells	
2.0	**Unit II: Cell cycle and growth**		**08**
	2.1	The Cell Cycle, Interphase-G1,S,G2,M-phase	
	2.2	molecular events at different cell cycle phases	
	2.3	Mitosis & Cell division	
	2.4	Molecular mechanism, Events in mitosis, significance of mitosis,	
	2.5	Meiosis	
	2.6	Molecular mechanism of meiosis, significance of meiosis.	
3.0	**Unit III: Cell differentiation & Cell-Cell Interactions**		**08**
	3.1	General characteristics of cell differentiation	
	3.2	Localization of cytoplasmic determinants	
	3.3	Molecular mechanism of cell differentiation	
	3.4	Connection between the cell and its environment	
	3.5	Cell Junctions	
	3.6	Desmosomes, Gap junction	
	3.7	connexins, Tight Junctions	
	3.8	Plasmodesmata.	
4.0	**Unit IV: Basics of Cell Signalling**		**07**
	4.1	General principle of cell signaling,	
	4.2	Paracrine, Autocrine, Endocrine &synaptic signaling	
	4.3	G-Protein structure and role in signaling,	
	4.4	Intracellular Cyclic AMP, Ca^{++} in cell signaling, CAM Kinases	
	4.5	Bacterial chemotaxis.	
		Total	**30**

SBPHCP1151: *Practical-II (Cellular Biophysics II)*

Teaching scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHCP 1151	Practical II	--	04 (60 Hr)	--	02	02

Assessment Scheme

Course Code (1)	Course Name (2)	Theory				Practical		Total [Col (5+6)/ Col (7+8)] (9)
		CA			ESA (6)			
		Test I (3)	Test II (4)	Avg (T1+T2)/2 (5)		CA (7)	ESA (8)	
SBPHCP1151	Practical II	--	--	--	--	20	30	50

Course pre-requisite:

1. Knowledge of Principles of work
2. Basic information about cell as basic unit.
3. Knowledge of precautionary measures.

Course objectives:

- The main objective of practical course is to engage the student in the subject and help them get a better understudying of the topic studies in cellular Biophysics.
- To allow hand on experiments to learn and understand fundamental principle of Cellular Biophysics.
- To develop the scientific attitude amongst student.

Course outcomes:

✓ Students will be able to understand different concepts and principles of cellular biophysics instrumentations.

✓ Student will learn about validity of concepts by doing the experiment.

SBPHCP1151: *Practical- II (based on Cellular Biophysics II)*

1. To learn a) use of microscope b) principles of fixation and staining;
2. To familarize with bright field,
3. phase contrast,
4. fluorescence & polarizing microscopes.
5. Microscopic observation of bacteria, microalgae, fungi, lichen and protists;
6. Cell staining – Staining of Plant cell (onion epidermal cell),
7. Cell staining Animal cell (Squamous epithelial cell),
8. Cell staining Blood cell,
9. Cell staining -Microbial cells (Bacteria & Yeast).
10. To study cell structure from onion leaf peels ; Shape and size of the cell–simple & differential staining
11. Cell division- Examination of various stages of mitosis and meiosis - mitosis (Onion root tip)& Meiosis (Tradescantia flower buds / grasshopper testes)
12. Polytene chromosome (chironomous larvae)
13. Separation of flower pigments by paper chromatography
14. Separation of chloroplast by paper chromatography
15. Microbiological Techniques:Preparation of Media(Media preparation : Nutrient agar and Nutrient broth),
16. Preparation of Cotton Plugging and Sterilization,
17. Gram staining, other staining methods
18. Bacterial growth curve- To raise the culture of E. coli and estimate the culture density by turbidity method.
19. Draw a growth curve from the available data. determination of generation time
20. Study of different types of eggs; Study of egg of hen and vital staining of embryo;Culture of chick embryo fibroblast – Demonstration,Study of frog development, observation of frog embryo different developmental stages; Study of different types of sperms by smear preparation.

STUDENT SHOULD PERFORM AT LEAST 12 (TWELVE) EXPERIMENTS FROM THE ABOVE LIST

Recommended list of Books:

1. Geoffrey L. Zubay, William W. Parson, Dennis E. Vance. (1995), Principles of Biochemistry, Wm.c.Brown Publishers.
2. Sambrook and Russell (2001), Molecular cloning (A laboratory Manual) cold spring Harbor Laboratory Press.
3. Henry B. Bull (1971), An Introduction to physical biochemistry, F.A.Devis Co.
4. Gerald Karp (1996), Cell and Molecular biology concepts and experiments, John willey and sons, Inc.

SBPHSC1151 (Skill): **Medical Diagnostic techniques**

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHSC1151	**Medical Diagnostic techniques**	02	--	02	--	02

Assessment Scheme

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7)/ Col (8+9)] (10)
		CA			ESA (7)	CA (8)	ESA (9)	
		Test I (4)	Test II (5)	Avg (T1+T2)/2 (6)				
SBPHSC1151	**Medical Diagnostic techniques**	10	10	10	40	--	--	50

Course pre-requisite:

1. Knowledge of basic electrical working principles and symbols.
2. Wiring principles and connections including phases.
3. Aware about the safety measures and handling of tools.

Learning objectives:

- To understand accurately, efficiently, and comprehensively collect key clinical findings needed to inform diagnostics
- To explain and justify the diagnosis by comparing and contrasting the patient's findings and test results
- To learn the importance of medical reports, infectious diseases, non-infectious diseases, tumors in diagnosis,.

Learning outcome:

- Students will understand the key clinical findings needed to inform diagnostics
- Students will able to analyse essential epidemiological and clinical information
- Students will understand and present different types of academics' report and thesis writings

SBPHSC1151 (Skill): **Medical Diagnostic techniques**

Module No.	Unit No.	Topic	Hrs. Required to cover contents
1.0	**Introduction:**		**15**
	1.1	Introduction for the Need of Medical Diagnostics	
	1.2	Medical Diagnostics and its Importance	
	1.3	ethics in medical diagnosis,	
	1.4	safety measures during diagnostic.	
2.0	**Diagnostics Methods**		**15**
	2.1	Blood composition,	
	2.2	Preparation of blood smear	
	2.3	CBC using analyzer machine,Routine Urine Analysis.	
3.0	**Non-infectious Diseases**		**15**
	3.1	Causes, types, symptoms, complications,	
	3.2	diagnosis and prevention of Diabetes	
	3.3	Hypertension (Primary and secondary),	
4.0	**Infectious Diseases and Tumors**		**15**
	4.1	Causes, types, symptoms, diagnosis and prevention of Tuberculosis	
	4.2	Hepatitis, Types of Tumours (Benign/Malignant),	
	4.3	Detection and metastasis; Medical imaging: X-Ray of Bone fracture, CT Scan (using photographs).	
		Total	**60**

Reference Books:

1. Park, K. (2007), Preventive and Social Medicine, B.B. Publishers ·

2. Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology, II Edition, Bhalani Publishing House ·

3. Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis for Training Courses ·

4. Guyton A.C. and Hall J.E. Textbook of Medical Physiology, Saunders ·

5. Robbins and Cortan, Pathologic Basis of Disease, VIIIEdition, Saunders ·

6. Prakash, G. (2012), Lab Manual on Blood Analysis and Med Diagnostics, S. Chand

Course Structure:

SBPHGE1151 (Elective): Foundation of Biophysics

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SBPHGE 1151	Foundation of Biophysics	02	--	02	--	02

Assessment Scheme

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7)/ Col (8+9)] (10)
		CA			ESA (7)			
		Test I (4)	Test II (5)	Avg (T1+T2)/2 (6)		CA (8)	ESA (9)	
SBPHGE 1151	Foundation of Biophysics	10	10	10	40	--	--	50

SBPHGE1151 (Elective): Foundation of Biophysics

Course pre-requisite:

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

Course objective:

- To provide knowledge and awareness amongst students about need of biophysical foundation.
- To introduce and create awareness among the students about biophysics in everyday life.

Course outcome:

- ✓ Appreciate the origins, width and depth of Biology.
- ✓ Realize the fact that there is no one definition by which a living organism can be recognized.
- ✓ Identify the different aspects of Biology which leads to Biophysics.
- ✓ Evaluate the validity of ideas and techniques to give rise to correct knowledge.
- ✓ Analyze any area of Biology and distinguish tangible phenomena which can be measured by physic-chemical techniques.

SBPHGE1151 (Elective): **Foundation of Biophysics**

Module No.	Unit No.	Topic	Hrs. Required
1.0		**Basics of Life**	
	1.1	Biology is the science of life	**07**
	1.2	**Three phases of Biology** Physical,	
	1.3	Chemical	
	1.4	and Biological phase with origin of life	
2.0		**Molecules of life**	
	2.1	Atomic structure	**08**
	2.2	Biomolecules	
	2.3	Chemical Bondingand thermodynamics of Biomolecules	
	2.4	-ve entropy	
3.0		**The unit of Life ; Cellular organization**	
	3.1	Structural organization of cell	**08**
	3.2	Coordination in cellular system	
	3.3	Regulation of life	
	3.4	Biological -ve entropy	
4.0		**Computational Fundamentals**	
	4.1	Biological databases	**07**
	4.2	Insilco Visualation of Biomolecules	
	4.3	Molecular Basis of Phylogeny and Structure evolution	
	4.4	Applications of Computational biophysics	
		Total	**30**

Text Books:

(i) C.Edward Gasque (1992), A manual of lab. Experience in Cell biology, Universal stall.
(ii) F. Heinmets (1970), Quantitative Cellular Biology, Marcal Dekker, Inc.
(iii) Daniel L. Hartl (1995), Essential genetics, Jones and Barlett Publishers.
(iv) Bernard R. Glick and Jack J. Pastermak: (1994), Molecular Biotechnology Principles and
(v) Applications of Recombinant DNA.

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):

a. 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.

b. 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.

c. 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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