॥ 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

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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Academic-1 (BOS) Section

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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 Zoology
02	B.Sc. II year Chemistry (General)
03	B.Sc. II year Biotechnology (Vocational)
04	B.Sc. II year Dyes & Drugs
05	B.Sc. II year Biotechnology
06	B.Sc. II year Bioinformatics

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/२०२५–२६/134
दिनांक १६.०६.२०२५

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

STRUCTURE AND SYLLABUS OF FOUR YEAR MULTIDISCIPLINARY

DEGREE PROGRAM WITH MULTIPLE ENTRY AND EXIT OPTIONS

UNDER

NATIONAL EDUCATION POLICY (NEP 2020)

In

SUBJECT: BIOTECHNOLOGY (Single Major)

FACULTY OF SCIENCE AND TECHNOLOGY

B. Sc. Second Year
(Affiliated Colleges)

With Effect from June 2025

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 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 the New Education Policy 2020 provided such an opportunity. 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, teamwork 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

From the Desk of the Chairman, BOS in Biotechnology and Bioinformatics:

The National Education Policy 2020 (NEP 2020) is formulated to revamp education system and lay down road map for new India. This policy is framed based on the fundamental pillars of access, equity, quality, affordability, and accountability and seeks to transform India into a thriving knowledge society and a global knowledge superpower.

Some of the important features of National Education Policy are increasing gross enrolment ratio in higher education,holistic and multidisciplinary education with multiple entry/exit options,establishment of academic bank of credit,setting up of multidisciplinary education and research Universities and National Research Foundation,expansion of open and distance learning to increase gross enrolment ratio,internationalization of education, motivated, energized and capable faculty, online and digital education and effective governance and leadership.

As per the National Education Policy, the Government of Maharashtra has proposed a model curriculum framework and an implementation plan for the State of Maharashtra. It is to suggest and facilitate the implementation of schemes and programs, which improve not only the level of academic excellence but also improve the academic and research environment in the state. The proposed curriculum framework endeavors to empower the students and help them in their pursuit for achieving overall excellence.

In view of NEP priority and in keeping with its vision and mission, process of updating the curriculum is initiated and implemented in SRTM University at UG and PG level from the academic year 2023-2024.

Biotechnology is often considered as the technology of hope for meeting future challenges like feeding our increasing population, cleaning dangerously polluted environments and potentiating healthcare sector etc. Establishment of new IISERs, Central Universities and IITs indicate that we are already on the track of developing infrastructure and human resource. Our dream of becoming future ‘superpower’ will not be possible without Biotechnology and inclusive efforts. Therefore, it is necessary to attract young and bright students and train them in the field of Biotechnology.

Keeping in mind, BOS in Biotechnology and Bioinformaticshas prepared the curriculum to ensure up-to-date level of understanding of Biotechnology. Studying Biotechnology prepares the students for their career working either in educational institutions or industries in which they can directly be involved in the teaching, research and development.Also, to ensure uniform curriculum and its quality at UG/PG level, curriculum of different Indian Universities, syllabus of NET, SET, MPSC, UPSC and the UGC model curriculum are referred to serve as a base in updating the same.

The comments or suggestions from all teachers, students and other stakeholdersare welcome for upbringing this curriculum.

Salient Features:

The syllabus of B.Sc. Biotechnology has been framed to meet the requirement of Choice Based Credit System under NEP 2020. The courses offered here in will train and orient the students in the specific fields of Biotechnology.

The Core Courses deals with Bio-instrumentation, Genetics II, Scientific Writing, Immunology and Virology, Basic Molecular Biology and IPR.

Apart from the core courses, the Generic Elective Courses deal with Medical Biotechnology and Biosafety and Bioethics.

The Skill Enhancement Courses like Algal Biotechnology and Diagnostic Biology offered during this program are designed with the aim of imparting specific skills to the students, which will lead to the self-employability and development of their own enterprises.

This would help students to lay a strong foundation in the field of Biotechnology.

Overall, after completion of this course, students will also acquire fundamental knowledge and applications of Biotechnology.

Program Educational Objectives:

The Objectives of this program are:

PEO1: To offer undergraduate programin Biotechnology based on the needs of industries, academic and research institutions worldwide.

PEO2: To promote and popularize Biotechnology at grass root level and attract young and budding talents.

PEO3: To expose the students to the different emerging fields of Biotechnology.

PEO4: To update curriculum by introducing recent advances in the subject that enable the students to face NET, SET, MPSC, UPSC and other competitive examinations successfully.

PEO5: To train and orient the students so as to develop human resource for the educational institutes and other organizations.

PEO6: To inculcate analytical and application-oriented abilities to create active and frontline researchers and human resource for the industries.

PEO7: To develop specific skills amongst students for self-employabilityand for the development of their own enterprises.

Program Outcomes:

The Outcomes of this program are:

PO1: This Biotechnology program shall promote and popularize biotechnology at grass root level and shall also attract young and budding talents.

PO2: This program will expose the students to the different emerging fields of Biotechnology.

PO3: This will provide updated curriculum with recent advances in the subject that enable the students to face NET, SET, MPSC, UPSC and other competitive examinations successfully.

PO4: This program shall train and orient the students so as to develop human resource for the educational institutes and other organizations.

PO5: This program shall train and orient the students so as to develop active and frontline researchers and human resource for the industries.

PO6: This will also develop specific skills amongst students for self-employabilityand for the development of their own enterprises.

Prerequisite:

Basic knowledge of science at 12^{th} (HSC) level. The optional courses of this program are offered to the students registered for under-graduate programs. Such students should have the basic knowledge of Biotechnology and are willing to gain additional knowledge in the field of Biotechnology.

Admissions to this program are given as per the University rules.

Dr. Sunita Dhudiraj Lohare
Chairman, BOS in Biotechnology and Bioinformatics
Swami Ramanand Teerth Marathwada University, Nanded.

Details of the Board of Studies Members in the subject Biotechnology and Bioinformatics under the Faculty of Science & Technology, S.R.T.M. University, Nanded.

Sr No	Name of the Member	Designation	Sr No	Address	Designation
1	Dr. Sunita Dhundiraj Lohare Shri Havgiswami Mahavidyalaya, Udgir, Dist. -Latur Mob. No. 9284161504	Chairman	2	Dr. Babasaheb S.Surwase School of Life Sciences SRTM University, Nanded Mob. No.9075829767	Member
3	Dr. Pratap V. Deshmukh Nagnath Arts, Commerce and Science College, Aundha Nagnath, Dist. Hingoli Mob. No. 9637202024	Member	4	Dr. Komal S. Gomare Dept of Biotechnology Dayanand Science College, Latur Mob. No. 9284238413	Member
5	Dr. Vaibhav D. Deshpande General Manager, Quality Corporate Office, Wockhardt, Mumbai Mob. No. 9100988260	Member	-	--	
	Invitee Members				
6	Dr. Laxmikant Kamble School of Life Sciences, SRTM University, Nanded 431606. Mob. No.8669695555	Member	7	Dr M M V Baig Dept of Biotechnology, Yeshwant Mahavidyalaya, Nanded. Mob. No. 9422170641	Member
8	Dr. A.B. Gulwe School of Technology, SRTM University Sub Campus, Latur. Mob. No. 7387120874	Member	9	Dr. Prashant Thakare Department of Biotechnology, SGB Amravati University, Amravati. Mob. No. 982222822	Member
10	Dr Makarand N. Cherekar Dept. of Biotechnology & Bioinformatics, MGM's College of CS and IT, Nanded. Mob: 9421454254	Member	11	Dr Sunil Hajare Department of Biotechnology, New Model Degree College, Hingoli . Mob 8378878817	Member

Swami Ramanand Teerth Marathwada University, Nanded

(Three Optional in the First Year)

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

Year & Level	Semester	Optional1 *(From the same Faculty)*	Optional2 *(From the same Faculty)*	Optional3 *(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) (Basket5) *(Common across all faculties)*	Field Work / Project/Internship/ OJT/Apprenticeship/ Case Study Or Co-curricular Courses (CCC) (Basket6 for CCC) *(Common across all faculties)*	Credits	Total Credits
1	2	3	4	5	6	7	8	9	10	11
1 (4.5)	I	Opt 11 (T 2Cr) Opt 12(P 2Cr) 4Credits	Opt 21 (T 2Cr) Opt 22(P2Cr) 4Credits	Opt 31(T 2Cr) Opt 32(P 2Cr) 4Credits	GE1 2Credits	SEC 1 2Credits	AECENG 1 (2Cr) ACEMIL1 (2Cr) IKS(2Cr) 6Credits	-	22	44
	II	Opt 13(T 2Cr) Opt 14(T 2Cr) 4Credits	Opt 23 (T 2Cr) Opt 24(P 2Cr) 4Credits	Opt 33(T 2Cr) Opt 34(P 2Cr) 4Credits	GE2 2Credits	SEC 2 2Credits	AECENG 2 (2Cr) ACEMIL2 (2Cr) CI(2Cr) 6Credits	--	22	
	Cum. Cr.	08	08	08	04	04	12	00	44	

Exit option: UG Certificate in Opt1, Opt2 and Opt3 on completion of 44 credits and additional 4 credits from NSQF/Internship

2 (5.0)	III	Major 1(T-2cr) Major 2 (T-2cr) Major 3 (P-2cr) Major 4 (P-2cr) 8 Credits	Minor 1 (T-2cr) Minor 2 (P-2cr) 4 Credits		GE 3 2Credits	VSC 1 2Credits	ACEENG3 (2Cr) ACEMIL3 (2Cr) 4Credits	CCC(2Cr) *(NCC/NSS/SPT/ CLS/ HWS/YGE/FIT)* 2Credits	22	88
	IV	Major 5 (T-2cr) Major 6 (T-2cr) Major 7 (P-2cr) Major 8 (P-2cr) 8 Credits	Minor 1 (T-2cr) Minor 2 (P-2cr) 4 Credits	—	GE 4 2Credits	VSC 2 2Credits	ACEENG4 (2Cr) ACEMIL4 (2Cr) EVS (2Cr) 6Credits	---	22	
	Cr	24	16	08	08	08	22	02	88	
Exit option: UG Diploma in Major and Minor on completion of 88 credits and an additional 4 credits NSQF/ Internship in Major Subject										

3 (5.5)	V	**Major19**(T 3Cr) **Major20**(T3Cr) **Major21**(T2Cr) **Major 22** (P 2Cr) **Major 23** (P 2Cr) **12 Credits**	**Major E1** 4 Credits	-		--	**VSC3** **2 Credits**	--	**FP** **4 Credits**	22	
	VI	**Major24**(T3Cr) **Major25**(T 3Cr) **Major26**(T2Cr) **Major27**(P 2Cr) **Major28**(P2Cr) **12Credits**	**Major E2** **4 Credits**	--		--	**VSC4** **2Credits**	-	**OJT** **4 Credits**	22	13 2
	Cr.	**56**		**16**	**08**	**08**	**4+ 8 =12**	**22**	***04+08***		13 2
***Exit option*: B.Sc. (Bachelor in Science) With a Major in DSC and a Minor in DSM**											

4 (6.0)	VII	Major29(T4Cr) Major30(T4Cr) Major31(T 2Cr) Major32(P4Cr)	Major E1 Major E2 4Cr	RM 4Cr		–	–	–	–	22	44
	VIII	Major33(T4Cr) Major34(T4Cr) Major35(T 2Cr) Major36(P4Cr)	MajorE3 Major E4 4Cr	–		–	–	–	OJT 4Credits	22	
	Cum Cr	Honours:92		16+4	08	08	VSC-8, SEC-4	AEC-8,MIL-8 VEC-4,IKS-2	16		176
Exit option: B.Sc. (Hons) with Major in DSC and Minor in DSM											
4 (6.0)	VII	Major29(T3Cr) Major30(T3Cr) Major31(T4Cr) 10Credits	MajorE1 Major E2 4Cr	RM 4 Cr		–	–	–	Research Project RP1 4Credits	22	44
	VIII	Major29(T3Cr) Major30(T3Cr) Major31(T4Cr) 10 Credits	MajorE3 Major E4 4Cr	–		–	–	–	Research Project RP2 8Credits	22	
Exit option: B.Sc. (Hons with Research) in DSC and Minor in DSM											
Total Credits		Major-92/84	Minor1–16, RM-04	Minor-2 08		GE-08	VSC-8, SEC-6 14	AEC-8,MIL-8, VEC-4, IKS-2 22	CC-2,FP/CS-4, OJT-4, RP-12 30	176	

B. Sc. Second Year Semester III (Level 5.0)

Teaching Scheme

Subject	Course Code	Course Name	Credits Assigned			Teaching Scheme	
			Theory	Practical	Total	Theory (Hrs/ Week)	Practical (Hrs/ Week/ Batch)
Major Core 1	SBTTCT-1201	Bioinstrumentation	02	--	02	02	--
	SBTTCP-1201	Lab Course in Bioinstrumentation	--	02	02	--	04
Major Core 2	SBTTCT-1202	Genetics II	02	--	02	02	--
	SBTTCP-1202	Lab Course Genetics II	--	02	02	--	04
Major Core 3	SBTTCT-1203	Scientific Writing	02	--	02	02	--
	SBTTCP-1203	Lab Course in Scientific Writing	--	02	02	--	04
Generic Elective (GE) (From Other Faculty)	SBTTGE-1201	Medical Biotechnology	02	--	02	02	--
Vocational &Skill Enhancement Course (Related to Major)	SBTTVC-1201	Algal Biotechnology	--	02	02	--	04
Ability Enhancement Course (ENG)	AECENG-1201	L1 – Compulsory English	02	--	02	02	--
Ability Enhancement Course (MIL)	AECXXX-1201	L2–Second Language Marathi (MAR), Hindi (HIN), Urdu (URD), Kannada (KAN), Pali (PAL)	02	--	02	02	--
Cocurricular Courses (CCC)	CCCXXX-1201	Any one of NCC/ NSS /Sports (SPT)/ Culture Studies (CLS) /Health Wellness (HWS) / Yoga Education (YGE) /Fitness (FIT)	--	02	02	--	04
		Total Credits	**12**	**10**	**22**	**12**	**20**

B.Sc. Second Year Semester III (Level 5.0)

Examination Scheme

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

Subject	CourseCode	CourseName	Theory				Practical		Total
			Continuous Assessment (CA) Avg. of			ESA			
			Test I	Test II(5)	(T1+T2)/2	Total	CA	ESA	
Major Core 1	SBTTCT-1201	Bioinstrumentation	10	10	10	40	--	--	50
	SBTTCP-1201	Lab Course in Bioinstrumentation	--	--	--	--	20	30	50
Major Core 2	SBTTCT-1202	Genetics II	10	10	10	40	--	--	50
	SBTTCP-1202	Lab Course in Genetics II	--	--	--	--	20	30	50
Major Core 3	SBTTCT-1203	Scientific Writing	10	10	10	40	--	--	50
	SBTTCP-1203	Lab Course in Scientific Writing	--	--	--	--	20	30	50
Generic Elective (GE) (From Other Faculty)	SBTTGE-1201	Medical Biotechnology	10	10	10	40	--	--	50
Vocational & Skill Enhancement Course (Related to Major)	SBTTVC-1201	Algal Biotechnology	--	--	--	--	20	30	50
Ability Enhancement Course (ENG)	AECENG-1201	L1 – Compulsory English	10	10	10	40	--	--	50
Ability Enhancement Course (MIL)	AECXXX-1201	L2–Second Language Marathi (MAR), Hindi (HIN), Urdu (URD), Kannada (KAN), Pali (PAL)	10	10	10	40	--	--	50
Cocurricular Courses (CCC)	CCCXXX-1201	Any one of NCC/ NSS /Sports (SPT)/ Culture Studies (CLS) /Health Wellness (HWS) / Yoga Education (YGE) /Fitness (FIT)	--	--	--	--	20	30	50

B. Sc. Second Year Semester IV (Level 5.0)

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme	
			Theory	Practical	Total	Theory (Hrs/ Week)	Practical (Hrs/ Week/ Batch)
Major Core 1	SBTTCT-1251	Immunology and Virology	02	--	02	02	--
	SBTTCP-1251	Lab Course in Immunology and Virology	--	02	02	--	04
Major Core 2	SBTTCT-1252	Basic Molecular Biology	02	--	02	02	--
	SBTTCP-1252	Lab Course in Basic Molecular Biology	--	02	02	--	04
Major Core 3	SBTTCT-1253	IPR	02	--	02	02	--
	SBTTCP-1253	Lab Course in IPR	--	02	02	--	04
Generic Elective (GE)	SBTTGE-1251	Biosafety and Bioethics	02	--	02	02	--
Vocational & Skill Enhancement Course	SBTTVC-1251	Diagnostic Biology	--	02	02	--	04
Ability Enhancement Course (ENG)	AECENG-1251	L1 – Compulsory English	02	--	02	02	--
Ability Enhancement Course (MIL)	AECXXX-1251	L2–Second Language Marathi (MAR), Hindi (HIN), Urdu (URD), Kannada (KAN), Pali (PAL)	02	--	02	02	--
Value Education Course (VEC)	VECEVS-1251	Environmental Studies	02	--	02	02	--
		Total Credits	**14**	**08**	**22**	**14**	**16**

B.Sc. Second Year Semester IV (Level 5.0)

Examination Scheme

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

Subject	Course Code	CourseName	Theory				Practical		Total
			Continuous Assessment (CA) Avg. of			ESA			
			Test I	Test II(5)	(T1+T2)/2	Total	CA	ESA	
Major Core 1	SBTTCT-1251	Immunology and Virology	10	10	10	40	--	--	50
	SBTTCP-1251	Lab Course in Immunology and Virology	--	--	--	--	20	30	50
Major Core 2	SBTTCT-1252	Basic Molecular Biology	10	10	10	40	--	--	50
	SBTTCP-1252	Lab Course in Basic Molecular Biology	--	--	--	--	20	30	50
Major Core 3	SBTTCT-1253	IPR	10	10	10	40	--	--	50
	SBTTCP-1253	Lab Course in IPR	--	--	--	--	20	30	50
Generic Elective (GE)	SBTTGE-1251	Biosafety and Bioethics	10	10	10	40	--	--	50
Vocational &Skill EnhancementCourse	SBTTVC-1251	Diagnostic Biology	--	--	--	--	20	30	50
Ability EnhancementCourse (ENG)	AECENG-1251	L1 – Compulsory English	10	10	10	40	--	--	50
Ability Enhancement Course (MIL)	AECXXX-1251	L2–Second Language Marathi (MAR), Hindi (HIN), Urdu (URD), Kannada (KAN), Pali (PAL)	10	10	10	40	--	--	50
Value Education Course (VEC)	VECEVS-1251	Environmental Studies	10	10	10	40	--	--	50

SBTTCT-1201: Bioinstrumentation

Marks: 50 **B.Sc. Biotechnology** **Hours: 30**

Course pre-requisite: Basic knowledge about Science/Mathematics

Course objectives:

- To provide knowledge of analytical techniques.
- To understand the basic components and working of Microscopy & Spectroscopy
- To understand the basic components and working of Chromatography & Centrifugation
- To understand the basic components and working of Electrophoretic Techniques

Course Outcomes: Students shall be able to

- Apply basic principles of different analytical techniques in analytical work.
- Use microscopy, centrifugation and Electrophoretic techniques
- Demonstrate principle and working of various instruments
- Use various techniques for solving industrial and research problems.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs
1.0	**1.0**	**Microscopy & Spectroscopy**	08
	1.1	History of Microscope, Simple & Compound Microscope, Principle, Theory, ray diagram, Image formation and applications.	
	1.2	Electron Microscope (TEM/SEM) Principle, Theory, ray diagram, Image formation and applications.	
	1.3	Spectroscopy: General principle, Electromagnetic Spectrum, Types of Spectra & their biochemical usefulness.	
	1.4	Basic law of absorption, Visible & Ultraviolet Spectroscopy, Application in biology.	
2.0	**2.0**	**Chromatography**	08
	2.1	Definition, types : Adsorption chromatography, Partition Chromatography.	
	2.2	Paper Chromatography and TLC, Principle and working.	
	2.3	Column Chromatography, Principle and working.	
	2.4	Ion exchange chromatography.	
3.0	**3.0**	**Centrifugation**	06
	3.1	Centripetal Force, Centrifugal force, basic principle of Centrifugation.	
	3.2	Centrifuge type, types of rotor.	
	3.3	Density gradient centrifugation & its applications.	
	3.4	Differentials centrifugation & its applications.	
4.0	**4.0**	**Electrophoretic Techniques**	08
	4.1	General Principles, Types of electrophoresis.	
	4.2	Agarose, PAGE & SDS PAGE.	
	4.3	Factors affecting on Electrophoretic Mobility.	
	4.4	Isoelectric focusing (IEF).	
		Total	30

SBTTCP-1201: Lab Course in Bioinstrumentation

B.Sc. Biotechnology Marks: 50

Sr. No.	List of Experiments: Bioinstrumentation
1	Microscopy – Study and Care of Microscope, Observation of Microscopic samples.
2	Study of Colorimeter
3	Determination of Lambda Max
4	Study of UV Spectrophotometer.
5	Study of Visible Spectrophotometer
6	Study of Paper Chromatography/ TLC.
7	Separation of Pigments by paper Chromatography.
8	Separation of pigments by column chromatography.
9	Principals and working of different centrifuges.
10	UV Spectroscopic Analysis of DNA, RNA & Proteins.
12	Study of Paper Electrophoresis.
13	Demonstration of GC/ HPLC/ HPTLC.
14	Study of SDS-PAGE Agarose Gel Electrophoresis
15	Study of Agarose Gel Electrophoresis
16	Separation of Biomolecules by Chromatography.

Reference Books

1. Biophysical Chemistry- Upadhyay, Upadhyay and Nath-Himalaya. 2023.
2. Practical Biochemistry- Wilson & Walker –Cambridge. 2002.
3. Practical Biochemistry- David Plummer- Tata McGraw Hill. 2017.
4. Principles of Biochemistry- Lehninger –Kalyani Publications. 2013.
5. Light Microscopy in Biology-A.J. Laccy. 1999.
6. Instrumental Methods of Chemical Analysis- Chatwal Anand- Himalaya. 2024.
7. Instrumental Methods of Chemical Analysis –B.K. Sharma-Goel. 2011.
8. Physical Biochemistry-D. Friefilder. 1976.

SBTTCT-1202: Genetics II

Marks: 50 **B.Sc. Biotechnology** **Hours: 30**

Course pre-requisite:

- The candidate should have basic knowledge in Genetics

Course Objectives:

- To understand the sex determination methods
- To understand human genetics.

Course Outcomes:

- Students will be able to describe the metabolism errors
- Students will be able to describe disorders of human genes.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs.
1.0	**01**	**Unit-I Sex linked Inheritance**	08
	1.1	Inheritance of X-linked genes : characteristics of sex-linked Inheritance.	
	1.2	Examples of inheritance of X linked recessive genes.	
	1.3	Inheritance of Y-linked genes.	
	1.4	Inheritance of X-Y linked genes.	
2.0	**2.0**	**Unit-II Determination of Sex**	08
	2.1	Types of sex chromosomal mechanism of sex determination.	
	2.2	Sex determination in man.	
	2.3	Male haploidy or haplodiploidy Mechanism.	
	2.4	Environmentally controlled sex-determining mechanism.	
3.0	**3.0**	**Unit-III Extra-Nuclear Inheritance**	08
	3.1	Extra-nuclear inheritance in eukaryotes: maternal inheritance.	
	3.2	Extra-nuclear inheritance by cellular organelles.	
	3.3	Chloroplast Inheritance.	
	3.4	Extra-nuclear inheritance by endosymbionts.	
4.0	**4.0**	**Unit-IV Human Genetics**	06
	4.1	Pedigree analysis; amniocentesis.	
	4.2	twins : identical or monozygotic Twins, fraternal or dizygotic Twins.	
	4.3	Disorders due to mutant genes : PTC tasters, brachydactyly, Huntington's chorea, tongue rolling.	
	4.4	Inborn errors of metabolism — phenylketonuria (PKU), alkaptonuria, albinism, sickle-cell anaemia.	
		Total	30

Reference Books:

1. Verma & Agarwal , Cell biology, Genetics, Molecular biology, Evolution & Ecology , S Chand publication 2022

2. David Friefelder, Microbial Genetics, Narosa Publications, 2008

3. Gardner, Genetics, 1999

4. P.K. Gupta, Genetics, Rastogi Publication., 2018

5. C. Sarin "Genetics", 1988

6. Larry Snyder Wendy Champness, "Molecular Genetics of Bacteria", 2007

7. Arora, Genetics, Himalaya Publications, 2017

8. B.D. Singh, Genetics, Himalaya Publication, 2009

SBTTCP-1202: Lab Course in Genetics II

Marks: 50 **B.Sc. Biotechnology** **Hours: 30**

Sr. No.	List of Experiments: Genetics II
1	Study of Karyotype and preparation of ideogram .
	Study and preparation of ideogram .
2	Problems based on Sex linked inheritance in drosophila.
3	Problems based on Sex linked diseases in man colorblindness.
4	Problems based on Sex linked diseases in man haemophilia.
5	Problems based on Sex linked diseases in man hypertrichosis.
6	Study of pedigree analysis
7	Problems based on pedigree analysis.
8	Biochemical Basis of the PKU test: bacterial inhibition assay.
9	Biochemical tests for Alkaptonuria:Ferric chloride test and Benedicts test.

SBTTCT-1203: Scientific Writing

Marks: 50 **B.Sc. Biotechnology** **Hours: 30**

Course pre-requisite:

- The students should have basic knowledge about Science

Course Objectives: To understand basic concepts in Scientific Writing.

- To understand the techniques and methods of scientific writing

Course Outcomes:

- Students will understand the methods and skills of scientific writing.

Module No.	Unit No.	Topic	Hrs.
1.0		**Unit I: Introduction to Research**	08
	1.1	Introduction and definition of research.	
	1.2	General characteristic and functions of research.	
	1.3	Objectives and types of research.	
	1.4	Scientific and reflective thinking.	
2.0		**Unit II: Research process**	08
	2.1	Steps in research, Identification of research problem.	
	2.2	Literature review: objectives & sources.	
	2.3	Research Design, Hypothesis: meaning, function and formulation.	
	2.4	Sampling, steps in sampling.	
3.0		**Unit III: Scientific writing**	08
	3.1	Various forms of scientific writings - theses, technical papers, reviews.	
	3.2	Abstract, Introduction, Materials and Methods, Results and Discussion, Summary and Conclusion, (IMRAD).	
	3.3	References How to write and arrange references.	
	3.4	Citation, Rules of Citation.	
4.0		**Unit IV: Preparation of Manuscript**	06
	4.1	How to write a research paper, Author instructions, reference Styles.	
	4.2	Process of submission of a paper, Criteria for publication.	
	4.3	Modes of paper communication.	
	4.4	Presentation of a scientific Paper.	
		Total	30

SBTTCP-1203: Lab Course in Scientific writing

B.Sc. Biotechnology Marks: 50

Sr. No.	List of Experiments: Scientific writing
1	Various forms of scientific writings – technical papers/ reviews.
2	Study on author instructions, reference styles.
3	Study and preparation of review of literature.
4	Study and preparation of Abstract.
5	Study and preparation of Introduction/ Materials and Methods
6	Study and preparation of Results
7	Study and preparation of Discussion
8	Study and preparation of Summary and Conclusion
9	Study on communication of paper.
10	Presentation of a scientific Paper,.
11	Study rules of Citation
12	Study of Modes of paper communication
13	Study of preparations of PPTs
14	Study of hypothesis

Reference Books:

Text Books:

1. C. R. Kothari, *Research Methodology – Methods and Techniques, (Second Revised Edition),* New Age International Publications. 2004.
2. Research Methodology and Statistical Techniques by Santosh Gupta. 2002.

Reference Books:

1. Michael Alley, *The Craft of Scientific Writing (3rd Edition)*, Springer, New York, 1996
2. Philip Reubens (General editor), *Science and Technical Writing – A Manual of Style (2nd Edition)*, Routledge, New York, 2001

Generic Elective

SBTTGE-1201: Medical Biotechnology

Marks: 50 **B.Sc. Biotechnology SY** **Hours: 30**

Course pre-requisite:

- Technical understanding of Microbiology, immunology and basics of cancer biology

Course Objectives:

- To improve the knowledge on medical techniques used to identify the diseases.
- To enables the students to understand the role of antigen antibody reactions and Role of carcinogenic agents

Course Outcomes:

- It will prepare students to understand the role of different immunization techniques of diseases
- It will also help students to learn the application of stem cell technology.
- It will help students for the preparation of Vaccines.

Curriculum Details

Module No.	Unit No.	Topic	Hrs.
1. 0		**Unit-I : Vaccine Technology**	08
	1.1	Immunization, live, killed, attenuated, Sub unit vaccines; Recombinant DNA and protein.	
	1.2	based vaccines, plant-based vaccines and reverse vaccinology; Peptide Vaccines.	
	1.3	conjugate vaccines; Passive Immunization; Antibody, Transfusion of Immuno-competent.	
	1.4	Cells, Stem cell therapy; Cell based vaccines.	
2.0		**Unit-II : Diagnostic methods**	08
	2.1	Antibody based diagnosis; Monoclonal antibodies as diagnostic Reagents.	
	2.2	Production and screening of monoclonal antibodies.	
	2.3	Monoclonal antibodies for Diagnosis of bacterial and viral diseases.	
	2.4	Detection of parasitic diseases by using; ELISA and Western blot.	
3.0		**Unit-III: Stem cell technology**	06
	3.1	Cellular therapy; Stem cells: definition, properties and potency of stem Cells.	
	3.2	Embryonic and adult stem cells with applications Role of scaffolds; Role of Growth factors.	

	3.3	Concept of tissue engineering.	
	3.4	Clinical applications and Ethical issues.	
4.0		**Unit-IV : Cancer Biology**	08
	4.1	Oncogenes, tumor suppressor genes, cancer and the cell cycle.	
	4.2	Virus-induced cancer, metastasis.	
	4.3	Interaction of cancer cells with normal cells, apoptosis.	
	4.4	Therapeutic interventions of uncontrolled cell growth.	
			30

Reference Books & Text

1. Kuby Immunology- Goldsby, Kindt, Osborne.-W,H Freeman. 2207.
2. Cellular & Molecular Immunology- Abbas, Lichtman, Pillai.-Elsevier publications. 2021.
3. Roitt‟s Essential Immunology- Deives, Martin, Burton, Roitt-Blackwell publications. 2016.
4. Cellular interactions &Immunobiology- Butterwort & Heinemann. 2024.
5. Review of Medical Microbiology & Immunology- Warren Levinson.-McGraw Hill. 1989.
6. David Sadava; Cell and Molecular biology- Jones & Bartlett Publishers 2020.
7. Cell & molecular biology - Gerald karp :John Wills. 2021.
8. Developmental biology- SF Gilbert Sinauer associates. 2010.
9. T.A. Brown – Genomes – Garland Science. 2006.

Sr. No.	**List of Experiments: Medical Biotechnology**
1	SDS PAGE.
2	2D Gel electrophoresis capillary.
3	ELISA
4	Immunoblotting.
5	Study of Ag-Ab reactions Widal.
6	Study of Ag-Ab reactions VDRL.
7	Study of Immuno electrophoresis
8	Study of Rocket immuno electrophoresis.
9	Latex agglutination.
10	ELISA.
11	Western Blotting.
12	Study of stem cell therapy

Vocational Skill Course

SBTTVC-1201: Algal Biotechnology

Marks: 50 **B.Sc. Biotechnology** **Hours: 30**

Pre requisite: Basic knowledge of microorganisms and algae

Course Objectives: The objective of this course is to enable Students to develop basic skills such as culturing of algae.

Course Outcomes:

Students will be able to acquire the knowledge about the Algal culturing techniques in the laboratory, Lab. organization & nutritional importance of algae

Curriculum Details:

Module No.	Unit No.	Topic	Hrs.
1.0	**1.0**	**Unit I**	08
	1.1	Introduction to the Algae (Habitat, cell structure and Reproduction).	
	1.2	Roles of Algae in Biogeochemistry.	
	1.3	Role of Algae in Food Webs.	
	1.4	Role of algae in other biotic Associations.	
2.0	**2.0**	**Unit II**	08
	2.1	Algal culturing techniques in the laboratory.	
	2.2	Introduction of Photo bioreactor.	
	2.3	Raceway ponds	
	2.4	Indoor and mass culture methods of economically important Algae.	
3.0	**3.0**	**Unit III**	08
	3.1	Products of Algae: SCP.	
	3.2	Vitamins.	
	3.3	Essential fatty acids.	
	3.4	Algae as a bio fertilizer.	
4.0	**4.0**	**Unit IV**	06
	4.1	Recent developments and future of algal biotechnology: Algal Biofuels – algal biodiesel.	
	4.2	Bioethanol.	
	4.3	Biological hydrogen production.	
	4.4	Role of Algae in global warming.	
		Total	30

Sr. No.	List of Experiments
1	Collection and microscopic observation of algae.
2	Study of cultivation of algae
3	Quantification of cultured algae.
4	Isolation, identification of economically important algae.
5	Inoculum development of any one economically important algae.
6	Pilot scale production of any one economically important algae
7	Quantitative estimation proteins from algae.
8	Chromatographic separation of essential biomolecules from algal extract.
9	Study of SCP
10	Preparation of algal biofertilizer
11	Production of Bioethanol
12	Visit to nearby industry actively engaged in algal technology.
13	Project on algal biotechnology.

Reference Books:

1. Algal Culturing Techniques (1st Edition) Elsevier Publication. 2005.
2. Handbook of Microalgal Culture: Applied Phycology and Biotechnology, (2nd Edition) Authors: Amos Richmond, Qiang Hu (Wiley Publication). 2013.
3. K.R.Aneja, Experiments in Microbiology, Plant Pathology and Biotechnology, 4th edition, Newage International Publishers, 2010.
4. R.C.Dubey, Experiments in Microbiology, S. Chand Publ., 2013.
5. Dr. V.Singh, A Text Book of botany diversity of microbes and cryptogams, 5th edition, Rastogi Publication, 2020.
6. Sabina Fijan, Probiotics and antimicrobial effect, Mdpi AG, 2023.
7. Anju Dhir, Applied Microbiology, 2nd edition, CBCS publisher and distributors Pvt. Ltd., 2022.
8. Lorrence Green, Emanuel Goldmann, Practical Handbook of Microbiology, 4th edition, CRC Press, 2020.

SEMESTER IV

SBTTCT-1251: Immunology and Virology

Marks: 50 **B.Sc. Biotechnology** **Hours: 30**

Course pre-requisite:

- The candidate should have basic knowledge in Biology

Course Objectives:

- The objective of this course is to provide the detail understanding of different cells of the immune system and their role in immune protection as well as application of immunological techniques.
- The course will provide knowledge about the basics of virology To understand the structure, behavior and importance of biomolecules.

Course Outcomes:

- Students will be able to describe the basis of different cells of the immune system and their role in immune protection.
- Students will be able to describe application of immunological techniques.

- **Curriculum Details:**

Module No.	Unit No.	Topic	Hrs.
1.0	**01**	**Unit I: Basics of Immunology**	08
	1.1	General concept of Immunity, Innate and Acquired Immunity.	
	1.2	Humoral and cellular Immunity.	
	1.3	Haematopoiesis, Primary and Secondary lymphoid organs.	
	1.4	Types and role of Cells of Immune System.	
2.0	**2.0**	**Unit II:** Antigen and Antibody	08
	2.1	Antigen and Antibody: Immunogenicity and factors that influence Immunogenicity.	
	2.2	Antigenicity, Adjuvants, Epitopes, Haptens.	
	2.3	Structure and functions of Immunoglobulins.	
	2.4	Antigen- Antibody interactions: Precipitation and Agglutination Reactions, Complement fixation.	
3.0	**3.0**	**Unit III: Basics of Virology**	08
	3.1	Brief introduction / outline on discovery of viruses.	
	3.2	Nomenclature & classification of Viruses (ICTV, LHT, Baltimore).	
	3.3	Ultra-structure, viral nucleic acid.	
	3.4	Nucleo-capsid structure and envelope, viroid, prions, cultivation.	
4.0	**4.0**	**Unit IV:**	06
	4.1	Life cycle and replication of RNA and DNA Viruses. Bacteriophages-Lambda, T, M13.	
	4.2	Animal Viruses- Adenovirus, Retrovirus.	
	4.3	Plant Viruses- TMV, CaMV.	
	4.4	Brief outline of Vaccines, antivirals, Interferon. Detailed account on	

		Corona and Ebola Viruses. Detailed account on COVID- 2019.	
		Total	30

Reference Books

1. Immunology – Kuby- W.H. Freeman. 2018.
2. Essentials of Immunology- Roitt I. M.- Blackwell. 2011.
3. Immunology- Nandini Shetty- New Age International. 2021.
4. Textbook of Microbiology – Anantnarayan and Panikar-Orient Longman.2017.
5. Immunology- A.K. Abbas- Elsevier. 2021.
6. An Introduction to Viruses- Amita Biswas- Vikas Publication. 2006.
7. Bacterial and Bacteriophage Genetics– Edward Birge- Springer. 2020.
8. Microbial Genetics-David Freifelder- Narosa. 2013.
9. Virology Principles and Applications- John Carter, Venetia A. Saunders-Wiley. 2013.
10. Introduction to Modern Virology IV l edition- Dimmock, Primrose. 2001.
11. Plant Virus- M.V. Nayudu- Tata McGraw Hill. 2008.

SBTTCP-1251: Lab Course in Immunology and Virology

Marks: 50 **B.Sc. Biotechnology** **Hours: 30**

Sr. No.	List of Experiments: Immunology and Virology
1	Immunodiagnostics & demonstration by Widal kit.
2	Immunodiagnostics & demonstration by VDRL Kit.
3	Immunodiagnostics & demonstration by Blood Grouping kit.
4	Study of Immuno-electrophoresis
5	Western Blotting.
6	Study of Differential Leukocyte Count
7	Lymphoid organ, Cell and their microscopic observation.
8	Immunization, collection of Serum.
9	Purification of Ig G from Serum.
10	Isolation of bacteriophage from sewage
11	Study of one-step growth curve of bacteriophage.
12	Enumeration of Bacteriophage by PFU method.
13	Cultivation of Virus in Embryonated egg.
14	ELISA study and demonstration.
15	Isolation and study of plant virus.

SBTTCT-1252: Basic Molecular Biology

Marks: 50 **B.Sc. Biotechnology FY** **Hours: 30**

Course pre-requisite

- The candidate should have been basic knowledge Molecular Biology

Course objectives:

- To understand gene regulation in prokaryotes & eukaryotes
- To understand DNA repair mechanism

Course Outcomes:

- Students will acquire the laboratory skills for the isolation if genetic material.
- Students will learn the mutation & repair mechanism.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs.
1.0		**Unit: I – DNA Replication**	08
	1.1	DNA replication: experimental evidence for semiconservative DNA Replication in *E.coli*, Meselson and Stahl's experiment.	
	1.2	Replication in prokaryotic.	
	1.3	Replication in Eukaryotic Cells. Mechanism of Replications and Enzymes involved in it.	
	1.4	DNA Repair- Direct repair – Photo Reactivation, Excision, Mismatch, SOS, Base excision, Nucleotide excision.	
2.0		**Unit:II - Transcription of Prokaryotes and Eukaryotes**	08
	2.1	Transcription of Prokaryotes: Initiation, Elongation & Termination. Structure of RNA polymerase, Role of sigma factor.	
	2.2	Transcription in Eukaryotes: Initiation, Elongation & Termination.	
	2.3	Upstream & downstream Promoters.	
	2.4	Post transcriptional modification.	
3.0		**Unit: III –**Translation in Prokaryotes and Eukaryotes	08
	3.1	Introduction to translation	
	3.2	Translation Prokaryotes: Initiation, elongation, termination.	
	3.3	Translation Eukaryotes: Initiation, elongation, termination.	
	3.4	Post translational modifications.	
4.0		**Unit- IV: Gene regulation and operon concept:**	06
	4.1	Regulation of gene expression	
	4.2	Regulation of transcription in Prokaryotes.	
	4.3	Operon concept: Trp-operon & Lac- operon.	
	4.4	Operon concept: Arabinose & Histidine operon.	
		Total	30

Reference Books:

1. Kakoli and Upadhya- Molecular Biology- Himalaya. 2023.
2. Watson – Molecular biology of gene- Pearson. 2004.
3. David Freifelder - Microbial Genetics – Narosa. 1997.
4. David Freifelder – Molecular Biology – Jones and Bartlett /Narosa. 1983.
5. Gardner – Principals of Genetics – Wiley international pub. 2006.
6. Simmonds &Snustad – Principles of Genetics IV ed- Wiley international. 2005.
7. T.A. Brown – Genomes – Garland Science. 2006.
8. Albert Bruce- Molecular biology of the cell- Garland Science. 2017.
9. Loddish - Molecular cell biology – W-H. Freeman. 2016.
10. B. Lewin – Genes- IX- Oxford. 2019.

SBTTCP-1252: Lab Course in Basic Molecular Biology

Marks: 50 **B.Sc. Biotechnology** **Hours: 30**

Sr. No.	List of Experiments:
1	Isolation of genomic DNA from bacteria.
2	Isolation of genomic DNA, animal cells.
3	Isolation of genomic DNA from plant cells.
4	Isolation of RNA.
5	Isolation of plasmid DNA.
6	Spectroscopic analysis of DNA/ RNA.
7	Study of Agarose gel electrophoresis.
8	Study of Photoreactivation.
9	Effect of UV on growth of bacteria.
10	Isolation of Lac mutants by using Replica plate method.
11	Study of Ames test.
12	Study of fluctuation test.

SBTTCT-1253: Intellectual Property Right (IPR)

Marks: 50 **B.Sc. Biotechnology SY** **Hours: 30**

Coursepre-requisite

- The candidate should have been basic knowledge about science

Course objectives:

- To provide the students with the essential knowledge/ awareness of Intellectual Property Right and its importance

Course Outcomes: Students will be able to:

- Understand the knowledge of Intellectual Property its Rights
- Understand types of IPs
- Plant Protection rights and Farmer's right.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs.
1.0		**Unit I:**	08
	1.1	Concept of property, Intellectual Property (IP) and Intellectual Property Rights (IPR).	
	1.2	Importance of IP,	
	1.3	Types of IP.	
	1.4	Value creation through IP, Advantages of IP protection.	
2.0		**Unit II:**	08
	2.1	World organizations, Role of WIPO.	
	2.2	Concept, Basics of Patent.	
	2.3	Criteria of patentability novelty, Non- obviousness, and utility.	
	2.4	Non-patentable inventions in India.	
3.0		**Unit III:**	08
	3.1	Trademarks and their types, How to protect Trademarks?	
	3.2	Copyrights and its importance in education, business, entertainment and fine arts.	
	3.3	Registration of Copyrights, infringement of Copyright.	
	3.4	What are Trade Secrets? Examples of Trade Secrets.	
4.0		**Unit IV:**	06
	4.1	Geographical Indications.	
	4.2	What does GI means and how is it used?	
	4.3	Concept of UPOV.	
	4.4	Introduction to Protection of Plant Varieties & Farmers' right.	
		Total	30

SBTTCP-1253: Lab Course in IPR

Marks: 50 **B.Sc. Biotechnology** **Hours: 30**

Sr. No.	List of Experiments: IPR
1	Demonstration of procedure of filling application of patent in India.
2	Demonstration of procedure of copyright.
3	Demonstration of procedure of filling application of trademark.
4	Demonstration of procedure of filling application of patent.
5	Demonstration of procedure of filling application of geographical indications.
6	Demonstration of procedure of filling application of trade secrets.
7	Study of PBR
8	Study of GI with examples
9	Study and demonstration of patenting of genes

Reference Books:

1. Rajashree Chandra, "Knowlegde As Property" Oxford India Press (2012).

2. Gragham Dutfeild "Intellectual Property, Biogenetic Resources and Traditional Knowledge", Earth Scan (2004).

3. Tapan Kumar Rout (Ed),"WTO, TRIPS & Geographical Indications", New Century Publications (2021).

4. Simran R. Gurnani, "Intellectual Property Rights" C. Jamnadas & Co. (2021).

Generic Elective (GE)
SBTTGE-1251 : Biosafety and Bioethics
B.Sc S.Y Biotechnology

Marks: 50 **Hours: 30**

Course pre-requisite:

- The study of the course "Biosafety and Bioethics "is subject to Knowledge of natural and socio-humanitarian disciplines of the first year, both compulsory and elective: "Basic of Cell Biology", "Genetics", etc.

Course objectives:

- To form in students a holistic view of the Biosafety and Bioethics of human life and the Biosphere in general.
- To lay the foundations of a healthy lifestyle and prevention of dangerous situations in the Professional activities of future Biotechnologist.

Course outcome: As a result of studying this course, students shall know:

- Basic principles of safety in ensuring human life
- Requirements of legislative and normative acts on life safety, labor protection of Biotechnology workers;
- Requirements for occupational safety of biotechnological personnel in modern Conditions.
- Historical stages of development of medical ethics, bioethics, nanoethics
- Basic principles of biomedical ethics
- International declarations on biosafety, medical ethics, bioethics.
- Basics of state biosafety
- Bioethical problems of public health in various fields of medicine and Biotechnology

Curriculum Details;

Module No.	Unit No.	Topic	Hrs.
1.0		**Unit I: BIOETHICS & LEGAL ISSUES**	08
	1.1	BIOETHICS & LEGAL ISSUES: Principles of bioethics: Legality.	
	1.2	Morality and ethics, human rights.	
	1.3	Beneficence, privacy, justice, Equity.	
	1.4	etc., bioethics vs. business ethics, ethical dimensions of IPR.	
2.0		**Unit II:**	08
	2.1	Maintenance of ecological biodiversity hot spots in India.	
	2.2	Legal Instruments relevant to biological diversity in India.	
	2.3	Endangered species Act, Federal role in wild life preservation.	
	2.4	Convention on Biological diversity; FAO and NBA Cartagena.	
3.0		**Unit III:**	08
	3.1	Risk management of GMOs.	

	3.2	Biosafety guidelines in India; EPA-1986.	
	3.3	Rules and Regulations of DBT, MOEF, IBC, RCGM.	
	3.4	Rules and Regulations of GEAC.	
4.0		**Unit IV:**	06
	4.1	Regulatory framework for GMOs in India.	
	4.2	GEAC, SBCC, DLC.	
	4.3	RDAC, IBSC, RCGM.	
	4.4	Biosafety regulations and national and international guidelines	
		Total	30

Reference Books:

1. Singh, R., Bioethics. New Age International. 2012.
2. Gruen, L., & Grabel, L. The Ethics of Animal Research: Exploring the Controversy. MIT Press. 2019.
3. Rasmussen, L. M., Ethics of Human Genome Editing: From Bathrooms to Boardrooms. Routledge. 2018.
4. Dyson, A. Bioethics in Biotechnology: Ethics of Genetic Engineering and Transgenic Animals. Routledge, 2013.
5. Resnik, D. B. Playing God: Biological and Spiritual Perspectives on Biotechnology and Human Enhancement. Oxford University Press, 2015.
6. Tzamalis, G. Bioethics and Biotechnology. Routledge, 2018.
7. Ravitsky, V., Fiester, A., The Penn Centre Guide to Bioethics. Springer. 2019
8. World Health Organization (WHO). Laboratory Biosafety Manual (3rd ed.). World Health Organization. 2007.
9. World Health Organization (WHO). Biorisk Management: Laboratory Biosecurity Guidance. World Health Organization, 2009.
10. Peccoud, J., & Gallegos, J. E. Safety and Security in Synthetic Biology: A Comprehensive Approach. Academic Press, 2019.
11. US National Research Council. . Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards (Updated Version). National Academies Press, 2007.

Websites

1. http://patentoffice.nic.in
2. www.wipo.org
3. www.dbtindia.nic.in
4. www.dbtbiosafety.nic.in

Vocational Skill Course

SBTTVC-1251: Diagnostic Biology

Marks: 50 **SY B.Sc. Biotechnology** **Hours: 30**

Coursepre-requisite:

- No as such pre requisite required

Course Objectives:

- To understand the basic diagnostic techniques and their applications in disease diagnosis. Also to understand the composition of whole blood.

Course Outcomes:

- Students will be able to acquire the knowledge about the diagnostics techniques and become able to work in pathology laboratory

Curriculum Details:

Module No.	Unit No.	Topic	Hrs.
1.0		**Unit I:**	08
	1.1	Introduction to Immunology. Cells of the immune systems.	
	1.2	Blood, compositions.	
	1.3	Blood cells, plasma, serum etc.	
	1.4	Anticoagulants.	
2.0		**Unit II:**	08
	2.1	Antigen, antibody.	
	2.2	Structure and function.	
	2.3	Antigen – Antibody interaction.	
	2.4	Precipitation and agglutination reactions.	
3.0		**Unit III:**	08
	3.1	Different Biochemical Tests.	
	3.2	Liver tests, Kidney function test.	
	3.3	Endocrine function tests.	
	3.4	Lipid profile, Blood Glucose test, etc.	
4.0		**Unit IV:**	06
	4.1	Introduction to Medical Diagnostics.	
	4.2	Methods in Medical diagnostics.	
	4.3	Instrumentation in Medical diagnostics.	
	4.4	Use of Molecular diagnostics in disease identification.	
		Total	30

References:

1. Kuby, RA Goldsby, Thomas J. Kindt, Barbara, A. Osborne Immunology, 6th Edition, Freeman, 2002.

2. Gerald Collee J, Andrew G Fraser, Barrie P Marmion, Mackie and McCartney's Practical Medical Microbiology, Elsevier. 2006.

3. Culliford, B.E. The Examination and Typing of Blood Stains US Deptt. of Justice, Washingron, 1971.

4. DNA Profiling and DNA fingerprinting; Edited by Jorg T. Epplen and Thomas Lubjuhn; BirkhauserVerlag, Switzerland, 1999.

Sr No	List of Experiments in Diagnostic Biology
1.	Separation of plasma and serum from blood.
2.	Differential leukocyte count.
3.	Staining of blood cells.
4.	WIDAL Test.
5.	ELISA Test.
6.	Liver tests/ Kidney function test/ Endocrine function tests.
7.	Lipid profile
8.	Blood Glucose test.
9.	PCR.
10.	PAGE
11.	Immunoelectrophoresis.
12.	Colorimetry
13.	Spectrophotometry.

**********13.06.2025**********