॥ 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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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. Agriculture Microbiology	11	B.Sc. Physics
02	B.Sc. Botany	12	B.Sc. Seed Technology
03	B.Sc. Dairy Science	13	B.Sc. Horticulture
04	B.Sc. Electronics	14	B.Sc. Statistics
05	B.Sc. Environmental Science	15	B.Sc. Biochemistry
06	B.Sc. Fishery Science	16	B.Sc. Analytical Chemistry
07	B.Sc. Food Science	17	B.Sc. Agrochemical & Fertilizers
08	B.Sc. Geology	18	B.Sc. Industrial Chemistry
09	B.Sc./B.A. Mathematics	19	B.Sc. Industrial Microbiology
10	B.Sc. Microbiology		

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/२०२५–२६/११६
दिनांक ०५.०६.२०२५

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 मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
५) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, परिपत्रक अभ्यासक्रम संकेतस्थळावर प्रसिध्द करण्यात यावेत.

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

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

UNDERGRADUATE PROGRAMME OF SCIENCE & TECHNOLOGY

B. Sc. Second Year

Major in **PHY (Physics)** and Minor in **DSM**

Under the Faculty of Science & Technology

Effective from the Academic year 2025-26

(As per NEP-2020)

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

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

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

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

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

The curriculum given in this document for BSc SY Physics 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

From Desk of Chairman, Board of Studies of the Subject Physics

Preamble:

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

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

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

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

Dr. K. S. Kanse
Chairman,
Board of Studies of the Physics
Swami Ramanand Teerth
Marathwada University, Nanded

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

Sr. No	*Name of the Member*	*Designation*	*Address*
1.	Dr. K. S. Kanse Mob: 09850924426 kskanse@gmail.com	Chairman	Department of Physics, Lal Bahadur Shastri Mahavidyalaya, Dharmabad, Dist. Nanded
2.	Dr. M. K. Patil Mob: 08308298063 patil@associates.iucaa.in	Professor	School of Physical Sciences, S.R.T.M. University, Nanded
3.	Dr. Ms. M. P. Mahabole Mob: 9421850549 mpmsrtmunsps@gmail.com	Professor	School of Physical Sciences, S.R.T.M. University, Nanded
4.	Dr. S. N. Keshatti, Mob: 9422743448 keshatti.shrinivas@gmail.com	Professor	Department of Physics, Shivaji Mahavidyalaya, Parbhani
5.	Dr. C. T. Londhe Mob: 9850136648 Email: londhect@gmail.com	Associate Professor	Department of Physics, Mahatma Gandhi Mahavidyalaya, Ahmedpur Dist. Latur
6.	Dr. M. A. Giri Mob: 9423440996 Email: drmadangiri@gmail.com	Associate Professor	Department of Physics, Gramin (ACS) Mahavidyalaya, Vasantnagar Kotygal Tq. Mukhed Dist Nanded
7.	Dr. V. D. Mote Mob: 9960639169 vmote.physics@gmail.com	Associate Professor	Department of Physics, Dayanand Science College, Latur
8.	Dr. A. A. Yadav Mob: 9975213852 aay_physics@yahoo.co.in	Associate Professor	Department of Physics, Rajarshi Shahu Mahavidyalaya (Auto), Latur Tq. Dist. Latur
9.	Dr. R. A. Joshi Mob.: 9096655278 urajoshi@gmail.com	Associate Professor	Department of Physics, Toshniwal Arts, Commerce and Science College, Sengaon
10.	Dr. S. S. Jadhav Mob: 9405209939 santosh.jadhav28@yahoo.com	Professor	Department of Physics, D.S.M. Arts, Commerce and Science College, Jintur Dist Parbhani
11.	Dr. M. D. Shirsat Mob: 9422291987 mdshirsat.phy@bamu.ac.in	Professor	Department of Physics Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

12.	Dr. S. P. Yawale Mob: 9423125231 spyawale@rediffmail.com	Professor	Department of Physics, Govt. Vidarbha Institute of Science and Humanities, Amravati
13.	Dr. C. H. Ishwara Chandra Mob: 9403136630 Email: ishwarx@gmail.com	Professor	National Centre for Radio Astrophysics, TIFR, Pune
14.	Dr. Ram Chitalkar Mob: 9325078845 ram_chitalkar@yahoo.com	Industry expert	Morganite crucible (India) Ltd. Morganite crucible (India)
15.	Dr. Pramod Watekar Mob: 9168187110 pramodwatekar@sterlite.com	Chief Manager	Sterlite Technologies Ltd., Pune
Invited Members			
16.	Dr. R. S. Mane Mob: 9850331971 rsmane_2000@yahoo.com	Professor	School of Physical Sciences, S.R.T.M. University, Nanded
17.	Dr. A. V. Sarode Mob: 9921340727 avsarode@gmail.com	Professor	School of Physical Sciences, S.R.T.M. University, Nanded
18.	Dr. K. A. Bogle Mob:7350845827 kashinath.bogle@gmail.com	Associate Professor	School of Physical Sciences, S.R.T.M. University, Nanded
19.	Dr. B. K. Kumthekar Mob: 9421451055 bkumthekar@gmail.com	Assistant Professor	Nutan College, Sailu Dist. Parbhani
20.	Dr. G. R. Mahajan Mob:9881736664 drgrmahajan@rediffmail.com	Assistant Professor	Shri Datta Arts, Commerce and Science College, Hadgaon Dist. Nanded
21.	Dr. S. S. Kadam Mob:9421489925 sskadam2011@gmail.com	Assistant Professor	Naraynarao Waghmare College, Balapur Akhada Dist. Hingoli
22.	Dr. R. S. Shaikh Mob:9970468877 shaikhraju99@gmail.com	Assistant Professor	Shri Guru Buddhi Swami College, Purna Dist. Parbhani
23.	Dr. M. A. Barote Mob:9422658959 barotema@yahoo.com.in	Associate Professor	Azad College, Ausa Dist. Latur
24.	Trupti Nrusinh Kulkarni	UG student	Dayanand Science College, Latur Dist Latur

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

Teaching Scheme

Subject	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	SPHYCT1201	MMP & Application in E&M-I	02	--	**08**	02	--
	SPHYCT1202	Waves and Oscillations	02	--		02	
	SPHYCP1201	Practical –1	-	02			04
	SPHYCP1202	Practical –2	-	02			04
Optional 2	SDSCMT1201	General Properties of Matters	02	--	**04**	02	--
	SDSCMP1202	Parctical	-	02			04
Generic Electives *(from other Faculty)*	SDSCGE1201	Physics in Daily Life-I	02	--	**02**	02	--
Vocational Course (related to Major)	SPHYVSC1201	Domestic Wiring	--	02	**02**	--	04
Ability Enhancement Course	AECENG1201	Compulsory English	02	--	**02**	02	--
Language	ACEMIL1201		02	--	**02**	02	
CCC	NCC/NSS/SPT/CLS/HWS/YGE/FIT)		02	--	**02**	02	--
Total Credits			**14**	**08**	**22**	**14**	**16**

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

Examination Scheme

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

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

Subject (1)	Course Code (2)	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	SPHYCT1201	MMP & Application in E&M-I	10	10	10	40	--	--	50
	SPHYCT1202	Waves and Oscillations	10	10	10	40	--	--	50
	SPHYCP1201	Practical –1					20	30	50
	SPHYCP1202	Practical –2	--	--	--	--	20	30	50
Optional 2	SDSCMT1201	General Properties of Matters	10	10	10	40	--	--	50
	SDSCMP1202	Parctical	--	--	--	--	20	30	50
Generic Electives *(from other Faculty)*	SDSCGE1201	Physics in Daily Life-I	10	10	10	40	--	--	50
Vocational Course (related to Major)	SPHYVSC1201	Domestic Wiring	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1201	Compulsory English	10	10	10	40	--	--	50
Language	ACEMIL1201		10	10	10	40	--	--	50
CCC	(NCC/NSS/SPTCLS/HWS/YEG/FIT)		10	10	10	40	--	--	50

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

Teaching Scheme

Subject	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	SPHYCT1251	MMP & Application in E&M-II	02	--	**08**	02	--
	SPHYCT1252	Optics and LASER	02	--		02	
	SPHYCP1251	Practical –3	-	02			04
	SPHYCP1252	Practical –4	-	02			04
Optional 2	SDSCMT1251	Physics for Chemist and Biologist	02	--	**04**	02	--
	SDSCMP1252	Parctical	-	02			04
Generic Electives *(from other Faculty)*	SDSCGE1251	Physics in Daily Life-II	02	--	**02**	02	--
Vocational Course (related to Major)	SPHYVSC1251	Home Appliances	--	02	**02**	--	04
Ability Enhancement Course	AECENG1251	Compulsory English	02	--	**02**	02	--
Language	ACEMIL1251		02	--	**02**	02	
	EVS		02	--	**02**	02	--
Total Credits			**14**	**08**	**22**	**14**	**16**

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

Examination Scheme

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

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

Subject (1)	Course Code (2)	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	SPHYCT1251	MMP & Application in E&M-II	10	10	10	40	--	--	50
	SPHYCT1252	Optics and LASER	10	10	10	40	--	--	50
	SPHYCP1251	Practical –3					20	30	50
	SPHYCP1252	Practical –4	--	--	--	--	20	30	50
Optional 2	SDSCMT1251	Physics for Chemist and Biologist	10	10	10	40	--	--	50
	SDSCMP1252	Parctical	--	--	--	--	20	30	50
Generic Electives *(from other Faculty)*	SDSCGE1251	Physics in Daily Life-II	10	10	10	40	--	--	50
Vocational Course (related to Major)	SPHYVSC1251	Home Appliances	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1251	Compulsory English	10	10	10	40	--	--	50
Language	ACEMIL1251		10	10	10	40	--	--	50
	EVS		10	10	10	40	--	--	50

SEM III

SPHYCT1201 (Major-1): **Mathematical Methods and Applications in Electricity and Magnetism - I**

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SPHYCT1201	Mathematical Methods and Applications in Electricity and Magnetism - I	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SPHYCT1201	Mathematical Methods and Applications in Electricity and Magnetism - I	10	10	10	40	50

Course pre-requisite:

1. Knowledge of real numbers and algebra.
2. Introductory idea of Scalars, Vectors and their mathematical operations.
3. Alternating current (AC) and its mathematical representation.
4. Basic knowledge of Electrostatics and Magnetostatics.

Course objective:

- To develop ability in identifications of Scalar and Vector quantities.
- To make students compatible for utilizing the mathematical tools in resolving the physical laws and understanding the concepts in Electrostatics and Magnetostatics.
- To gain the knowledge in correlating basic laws in Electrostatics and Magnetostatics and their mathematical terminologies.
- To understand the concepts of AC circuits by means of the voltage, current and power.
- To develop ability for resolving the fundamental aspects relating to AC and DC circuits.

Course outcome:

- ✓ Implementation of impedance and reactance of the ac circuit as a complex quantity.
- ✓ Utilization of concepts of complex algebra to solve the problems related to AC circuits.
- ✓ Implementation of different electric and magnetic entities as scalars and vectors.
- ✓ Utilization of concepts (grad, div. and curl) of vector analysis to resolve the laws of electrostatics and Magnetostatics.
- ✓ Utilization of grad, div and curl to derive the mathematical expressions of the applications of the laws of electrostatics and Magnetostatics.

Curriculum Details: Mathematical Methods and Applications in Electricity and Magnetism - I

Module No.	Unit No.	Topic	Hrs
1.0	**Complex variables**		
	1.1	Introduction, Definition, complex algebra (Addition, Subtraction, Multiplication, Division, conjugate complex number)	
	1.2	Argand diagram, Graphical representation of Sum, Difference, product and Quotient of complex number	**07**
2.0	**Vector Analysis**		
	2.1	Introduction to Scalars, Vectors, Dot products and Cross Product of two vectors	
	2.2	Vector triple product, Scalar triple product, Scalar and vector field	
	2.3	Gradient of a scalar field, Divergence of a vector field and Curl of a vector field and their Physical interpretation	**08**
3.0	**Alternating Current circuits**		
	3.1	Brief introduction to AC through Capacitor and Inductor, Nature of Impedance (Z) and Reactance (X) of Inductance (Z_L and X_L), Capacitance (Z_C and X_C) and Resistance (Z_R and X_R)	
	3.2	Complex number and J-operator, Complex Impedance and reactance, Application of Complex numbers in solving AC Circuit (Not vector diagram), L-C-R (Series resonance and Parallel resonance) circuits	**08**
4.0	**Magnetic Forces and Fields**		
	4.1	Magnetism and Its Historical Discoveries, Concept of Magnetic Field (B) and magnetic flux (Φ)	
	4.2	Motion of a Charged Particle in a Magnetic Field	**07**
	4.3	Magnetic Force on a Current-Carrying Conductor, Force and Torque on a Current Loop	
			30

Text Books:

1. Rajput B. S., "Mathematical Physics", 23rd Edition, Pragati Prakashan, 2011
2. Arora C. L., Hemne P. S., "Physics for Degree Students B.Sc.FY" S. Chand, 2013.
3. Murugesan R., "Electricity and Magnetism", 10th Edition, S. Chand, 2019.
4. Samuel J. Ling, Jeff Sanny, William Moebs, Univeristy Physics Vol. II, OpenStax Rice University, Texas, 2016.

Reference Books:

1. Dass H. K. and Verma Rama, "Mathematical Physics", 1stEdition, S. Chand, 2021.
2. Tayal, D. C., "Electricity and Magnetism", 4th Edition, Himalaya Publishing House, 2016.

SPHYCT1202 (Major-2): **Waves and Oscillations**

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SPHYCT1202	Waves and Oscillations	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SPHYCT1202	Waves and Oscillations	10	10	10	40	50

Course pre-requisite:

1. Knowledge of the waves and their types.
2. Introductory idea of formation of stationary waves.
3. Knowledge of oscillations specifically the simple harmonic motion.
4. Basic knowledge of sound.

Course objective:

- To introduce the concepts of mechanical waves, their properties, like propagation and reflection.
- To provide the knowledge of the transverse wavs along the string and to understand their applications in sound production e.g. musical instruments.
- To gain the in-depth knowledge of stationary waves and their applications resonance tubes.
- To understand the concept of ultrasonics, their production and applications in various fields.
- To introduce the architectural acoustics for understanding it importance in designing the good quality of sound in a building or auditorium.

Course outcome:

- ✓ Understands the transfer of energy by means of progression of mechanical vibrations.
- ✓ Utilization of concepts of transverse waves along the string to understand the working of string instruments.
- ✓ Implementation of the knowledge of reverberation time and absorption coefficient in designing of the acoustically good auditoriums and halls.
- ✓ Utilization of concepts of ultrasonics in different applications such as SONAR.
- ✓ Knows the production ultrasonics with controlled frequency.

Curriculum Details: Waves and Oscillations

Module No.	Unit No.	Topic	Hrs.
1.0	**Waves**		**07**
	1.1	Introduction, Wave velocity and particle velocity	
	1.2	Differential equation of wave motion	
	1.3	Energy of a plane progressive wave	
	1.4	Equation of motion of a vibrating string, Frequency and period of vibration of a string	
2.0	**Stationary waves**		**08**
	2.1	Analytical treatment of stationary waves (closed end & open-end pipe at the other end)	
	2.2	Investigation of pressure and density changes at displacement Nodes and Antinodes	
	2.3	Distribution of Energy in a stationary wave, Energy is not transferred in a stationary wave	
3.0	**Free and Forced Vibrations**		**08**
	3.1	Free Vibrations, Undamped vibrations, Damped Vibrations	
	3.2	Damped SHM in an electrical circuit	
	3.3	Forced Vibrations, Resonance and Sharpness of Resonance, Phase of Resonance	
	3.4	Examples of forced and resonant vibrations	
4.0	**Acoustics and Ultrasonic**		**07**
	4.1	Reverberation, Reverberation time, Derivation of Reverberation Time (Sabine's formula)	
	4.2	Conditions for good acoustical designs of an auditorium	
	4.3	Ultrasonics, Piezoelectric Oscillator, Magnetostriction Oscillator, Application of Ultrasonic Waves	
		Total	**30**

Text Books:

1. Brijlal and Subrahmanyam, "Waves and Oscillations", Vikas Publishing House, 2
2. D. R. Khanna and R. S. Bedi, "Text Book of Sound with Theory of Oscillations and waves", Atma Ram & Sons Delhi
3. N. Subrahmanyam, Brijlal, "A text book of Sound"
4. Sharma and Saxena, "Text Book of Sound", New Age international publishers.
5. Murugesan R., "Electricity and Magnetism", 10th Edition, S. Chand, 2019.

Reference Books:

1. M. Ghosh, "Sound".
2. H.J.Pain, "Physics of Vibrations and Waves".

Course Structure:
SPHYCP1203 (Major-3): Practical-1

Teaching Scheme

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

Assessment Scheme

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

Course pre-requisite:

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

Course objectives:

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

Course outcomes:

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

Curriculum Details: **Practical-1**

1. Solving Simple Operations: Addition, Subtraction, Multiplication and division using SCILAB.
2. Addition and subtractions of simple complex numbers using SCILAB.
3. I-H curve by magnetometer method.
4. Ballistic Galvanometer (Figure of merit).
5. Calibration of ammeter using potentiometer.
6. Study the frequency response of L-C-R series/ parallel circuit.
7. Frequency response of High pass and Low pass filter.
8. Determination of unknown frequency using Helmholtz resonator.
9. Efficiency of Transformer.
10. Efficiency of Solar Cell.

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

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

Course Structure:
SPHYCP1204 (Major-4): Practical-2

Teaching Scheme

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

Assessment Scheme

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

Course pre-requisite:

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

Course objectives:

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

Course outcomes:

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

Curriculum Details: **Practical-2**

1. Frequency of A. C. by Sonometer.
2. Study of function generator and CRO.
3. Study of Lissajous figures using CRO.
4. Maximum velocity of electron using photocell.
5. Capacitance of Capacitor by discharging it through a ballistic galvanometer.
6. Volume Resonator –determination of frequency of a tuning fork.
7. Determination of RI of prism.
8. Determination of MI of Flywheel.
9. Determination of g by Katers pendulum.
10. To determine the Grating element.

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

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

SPHYMT1201 (Minor-1): **General Properties of Matters**

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SPHYMT1201	General Properties of Matters	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SPHYMT1201	General Properties of Matters	10	10	10	40	50

Course pre-requisite:

1. Aspirant should have basic knowledge of concepts of materials properties.
2. Should be able to understand the terminologies of physical sciences and its applications in everyday life.

Course objective:

- To introduce students with concepts of mechanics in brief and properties of matter that exists in different phases i.e., solid, liquid and gas.
- To make students understand laws of motion and its applications to various systems.
- To enable students with physical properties depending on aspects of temperature, pressure etc.

Course outcome:

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

Curriculum Details: General Properties of Matters

Module No.	Unit No.	Topic	Hrs.
1.0	**Acceleration due to Gravity**		**07**
	1.1	Compound Pendulum, Center of Suspension and Center of Oscillation, Interchangeability of Center of Suspension and Center of Oscillation	
	1.2	Bar Pendulum, Experiment with bar pendulum	
	1.3	Katers Reversible Pendulum	
	1.4	Bessel's contribution computed time.	
2.0	**Surface Tension**		**08**
	2.1	Molecular Forces, Surface Tension & its explanation	
	2.2	Pressure difference across a curved surface	
	2.3	Expression for Excess Pressure inside a Spherical Drop and spherical Soap Bubble	
	2.4	Surface Tension by Jaeger's Method, Surface Tension by Ferguson Method	
3.0	**Viscosity**		**08**
	3.1	Introduction, Coefficient of Viscosity, Streamline flow, critical velocity	
	3.2	Reynolds Number & its significance	
	3.3	Bernoullies Theorem, Poiseuille's equation for the flow of liquid through a tube	
	3.4	Experimental determination of coefficient viscosity by Poiseuille's Method	
4.0	**Elasticity**		**07**
	4.1	Introduction, Hooke's Law, Elastic Constants (**Y, K & ή**), Poisson's Ratio	
	4.2	Twisting couple on a cylinder or a (wire), Torsional pendulum	
	4.3	Bending of Beam, Bending Moment, Cantilever (Weight of the beam is ineffective, Weight of the beam is effective)	
	4.4	Depression of a Beam supported at the ends and loaded at the Centre	
		Total	**30**

Books Recommended:

1. Elements of Properties of Matter –D.S.Mathur, Shamlal Charitable trust, New Delhi.
2. General Properties of Matter – J. C. Upadhyaya, Ram Prasad & Sons, Agra.
3. Mechanics- J. C. Upadhyaya, Ram Prasad & Sons, Agra.
4. Thermodynamics and statistical Physics. SI Kakani
5. Heat and Themodynamics - Dis. mathur Sultan Chand & Sons. law Delhi
6. Fundamentals of Physics- Dr P B Patil, Prof V R Landge, Prof R D Mahajan, Prof S N Helambe, Samarth Prakashan Aurangabad

Course Structure:
SPHYMP1201 (Minor-2): Practical

Teaching Scheme

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

Assessment Scheme

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

Course pre-requisite:

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

Course objectives:

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

Course outcomes:

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

Curriculum Details: Practical

1	Bifilar suspension (Determination of M.I. and verification of perpendicular axis theorem)
2	Y- by Spiral spring.
3	η - by Spiral spring.
4	η - by Static torsion.
5	η - by Maxwell's needle
6	Y- by bending loaded at the middle.
7	Study of multimeter
8	Characteristics of LDR.
9	Solar Cell characteristics
10	LED characteristics

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

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

SPHYGE1201: **Physics in Daily Life-I**

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SPHYGE1201	Physics in Daily Life-I	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SPHYGE1201	Physics in Daily Life-I	10	10	10	40	50

Course pre-requisite:

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

Course objectives:

- To develop a thorough understanding of the working principles of various equipment and enhance their proficiency in handling them.
- Students will be able to distinguish between different types of materials and explore various concepts in physics.

Course outcomes:

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

- ✓ To calculate the length of objects in different system of units.
- ✓ To demonstrate the use of friction in daily life.
- ✓ To evaluate temperature in Celsius, kelvin and Fahrenheit scales.
- ✓ To acquire the knowledge of the working of various household equipment.
- ✓ To gain a systematic and coherent understanding of the basic concept of electricity, sound and light system.

Curriculum Details: Physics in Daily Life-I

Module No.	Unit No.	Topic	Hrs
1.0	**Measurements**		
	1.1	Units of Length, Mass and Time in CGS And MKS / SI System of Units.	08
	1.2	Friction: Static, Kinetic/Sliding and Rolling.	
	1.3	Use of Wheels,	
	1.4	Methods of Reducing Friction: Use of Ball-Bearings and Lubricants.	
2.0	**Measurement of Temperature**		
	2.1	Units of Measurement of Temperature	07
	2.2	Various Types of Thermometers	
	2.3	Clinical Thermometer	
	2.4	Modes of Transmission of Heat: Convection, Conduction and Radiation (Examples from Daily Life).	
3.0	**Motorized Equipment**		
	3.1	Vacuum Cleaners,	07
	3.2	Clothes Washing Machine,	
	3.3	Food Processors,	
	3.4	Heating Appliances: Electric Irons, Electric Water Heaters.	
	3.5	Cooling Appliances: Refrigeration And Air Conditioning,	
4.0	**Fundamentals of Electricity**		
	4.1	Generation and Efficient Transmission of Electricity	08
	4.2	Safety Features in Household Electric Wiring – Fuse, MCB, Earthing	
	4.3	Electric Shocks, caution boards, precautions against shock. Necessity of earthling & types.	
	4.4	Types of meters, ammeter, voltmeter, wattmeter.	
		Total	**30**

Text Books:

1. Household Physics (2012), Claude H. Brechner, Hardpress.
2. Applied Photography Optics, 3rd Edition, Sidney E. Ray, Focal Press 2002.
3. Modern Physics, Murugeshan, S. Chand and Co., 2002.

Reference Books:

1. Physics in Daily Life, Jo Hermans, EDP Sciences
2. Engineering Physics: Fundamentals and modern applications, P. Khare and A. Swarup, Jones and Barlett Publishers, 2010.
3. Bhatia, K.B., Elements of Electrical Gadgets, Arya Book Depot, 1993.
4. College Practical Physics by Khanna and Gulati, S. Chand and Co., (1999)

Course Structure:

SPHYVSC1201 (Vocational): Domestic Wiring

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SPHYVSC1201	Domestic Wiring	--	04	--	02	02

Assessment Scheme

Course Code	Course Name	Theory				Practical		Total [CA+ESA]
		CA			ESA			
		Test I	Test II	Avg (T1+T2)/2		CA	ESA	
SPHYVSC1201	Domestic Wiring	--	- -	--	--	20	30	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.

Course objective:

- To provide knowledge about the electrical gadgets and their working principles.
- To introduce about the electrical wiring systems at domestic and household appliances.
- To provide hand on experiments for electrical installations, maintenance and wiring repairs.

Course outcome:

- ✓ After completing this course the students will gain knowledge of various electrical gadget installations at domestic levels.
- ✓ Students will be able to understand wiring systems and electrical connections of different phases at house hold appliances.
- ✓ Hand on experiments will provide them an expertise for electrical installations, maintenance and wiring repairs.
- ✓ Students will be trained to take assignments of domestic electrical wirings and thereby it may generate the employment for them.

Curriculum Details: **Domestic Wiring**

1. Verification of Ohm's Law.
2. Verification of Kirchhoff's current and voltage laws.
3. Verification of equivalent resistances in series and parallel connections.
4. Implementation of various types of earthing.
5. Study of various types of protection devices e.g., fuses, Miniature circuit Breaker (MCB) and Earth leakage circuit Breaker (ELCB).
6. Verification of Faraday's laws and Lenz's laws.
7. To start the dc and ac motors with various types of starters.
8. Verification of turns ratio of transformer and find the efficiency.
9. Starting and reversing various ac and dc motors.
10. Fault diagnosis and removal in general electrical connection/apparatus.

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

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

SEM IV

SPHYCT1251 (Major-05): **Mathematical Methods and Applications in Electricity and Magnetism - II**

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SPHYCT1251	Mathematical Methods and Applications in Electricity and Magnetism -II	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SPHYCT1251	Mathematical Methods and Applications in Electricity and Magnetism - II	10	10	10	40	50

Course pre-requisite:

1. Aspirant should have basic knowledge of concepts of mechanics and materials properties.
2. Should be able to understand the terminologies of physical sciences and its applications in everyday life.
3. The pre-requisite for this course is knowledge of Mathematical methods in physics, and its application in electromagnetism.

Course objective:

- To familiarize students with essential mathematical methods for solving advanced problems in theoretical physics.
- To develop expertise in mathematical methods required in the study of Physics.
- This course will also enable the students to solve the problems related to partial differentiation.
- Fourier analysis unit will enable the students to analyze the periodic functions.

Course outcome:

✓ To use advanced mathematical methods and theories on various mathematical and physics problems.
✓ To develop the skill of problem-solving ability.
✓ To understand electromagnetic theory with Vector Calculus.

Curriculum Details: Mathematical Methods and Applications in Electricity and Magnetism - II

Module No.	Unit No.	Topic	Hrs.
1.0	**Partial Differentiation**		**07**
	1.1	Definition of Partial Differentiation, Order or Successive Differentiation	
	1.2	Total Differentiation and Chain rule.	
	1.3	Change of variables from Cartesian to Polar Co-ordinates, Condition for maxima and minimum (without proof),	
	1.4	Homogeneous Partial differential equations with constant coefficients	
2.0	**Fourier Series**		**08**
	2.1	Fourier Series in the interval ($-\pi$ to π) - Definition – Dirichlet's Conditions (Statement Only)	
	2.2	Determination of Fourier Coefficients - Fourier series, Cosine series, Sine series,	
	2.3	Graphical representations of even and odd functions	
	2.4	Advantages of Fourier series, Applications of Fourier series - Half Wave Rectifier and Square wave.	
3.0	**Magnetization**		**08**
	3.1	Introduction, Magnetic Induction (B), Flux density, Intensity of magnetization (I), Intensity of magnetizing field (H)	
	3.2	Permeability, Susceptibility, Relation between Permeability and Susceptibility, Hysteresis curve,	
	3.3	introduction of ferromagnetic, paramagnetic and diamagnetic phenomenon	
	3.4	I-H curve By magnetometer method, Principle and construction of Moving coil type Ballistic Galvanometer with theory (q).	
4.0	**Electromagnetic Induction**		**07**
	4.1	The Biot-Savart Law	
	4.2	Magnetic Field Due to a Thin Straight Wire, Magnetic Force between Two Parallel Currents	
	4.3	Ampere's circuital law (Integral form), Curl of magnetic field (Ampere's circuital law differential form)	
		Total	**30**

Text Books:

1. Mathematical Physics, H. K. Dass, S. Chand & Co. Ltd. (2010).
2. Mathematical Physics, B. D. Gupta, Vikas Publishing house Pvt. Ltd. (2010).
3. Mathematical Physics, B. S. Rajput, 8th Edition,Pragati Prakashan(1978).
4. Electricity and Magnetism. By D. C. Tayal (Himalaya Publishing House, 1988).
5. Electricity and Magnetism –BrijLal, Subramanyan (Ratan Prakashan Mandir, Twentieath revised and enlarged edition 1997)
6. Electricity and Magnetism-Murugesan (S. Chand & Co.)
7. Samuel J. Ling, Jeff Sanny, William Moebs, Univeristy Physics Vol. II, OpenStax Rice University, Texas, 2016.

SPHYCT1252 (Major-06): **Optics and LASER**

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SPHYCT1252	Optics and LASER	02	--	02	--	02

Teaching Scheme

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SPHYCT1252	Optics and LASER	10	10	10	40	50

Course pre-requisite:

1. Aspirant should have basic knowledge of concepts of mechanics and materials properties.
2. Should be able to understand the terminologies of physical sciences and its applications in everyday life.
3. The pre-requisite for this course is knowledge of Mathematical methods in physics, and its application in electromagnetism.

Course objective:

- This course will provide knowledge of the basic concepts and applications of optics and laser in all walks of life.
- The syllabus has been framed keeping in mind the needs of the students of basic medical sciences in their later training.
- The course contains basic theory and applications of lasers in research and industry

Course outcome:

- ✓ To better understanding of optics and Lasers phenomena in daily life.
- ✓ To develop the skill of problem-solving ability.
- ✓ To study the characteristics and uses of lasers.
- ✓ To study the fundamental physics behind Interference.

Curriculum Details: Optics and Lasers

Module No.	Unit No.	Topic	Hrs.
1.0	**Interference and Diffraction**		**08**
	1.1	Light waves (Definition), Superposition of waves	
	1.2	Concept of Interference (Constructive and destructive)	
	1.3	Theory of Newton's ring, determination of wavelength of sodium light using Newton's ring.	
	1.4	Fresnel and Fraunhofer diffraction, Fraunhofer diffraction due to single slit, plane transmission diffraction gratings.	
2.0	**Polarization**		**07**
	2.1	Introduction, Brewster's law, Malus law	
	2.2	Double refraction.	
	2.3	Nicol prism, Nicol prism as analyzer	
	2.4	Huygens explanation of Double refraction in uniaxial crystal	
3.0	**Fundamental of Lasers**		**08**
	3.1	Introduction, Spontaneous & stimulated emission, absorption	
	3.2	Einstein coefficients (definitions)	
	3.3	Population inversion	
	3.4	Optical & electrical pumping, Lasing action	
4.0	**Applications of Lasers**		**07**
	4.1	Properties of LASER	
	4.2	Types of LASERS, He-Ne laser, Ruby LASER	
	4.3	Applications of LASER in Spectroscopy and Microscopy	
		Total	**30**

Books for Study:

1. A Textbook of Optics: N. Subrahmanyam and B.Lal (S.Chand &Co.,N.Delhi,1987)..
2. B. Sc. Physics Volume –I-- C.L.Arora (S.Chand)
3. Lasers and Nonlinear Optics – B.B.Laud (Willey .Eastern limited)
4. Optics and Atomic Physics – D.P. Khandelwal. (Himalaya Publishing House)
5. Optics (Second edition) – A.K.Ghatak
6. Geometrical & Physical optics by D. S. Mathur.
7. O. Svelto - Principles of lasers.

Course Structure:
SPHYCP1253 (Major-7): Practical-3

Teaching Scheme

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

Assessment Scheme

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

Course pre-requisite:

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

Course objectives:

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

Course outcomes:

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

Curriculum Details: Practical-3

1. CE- Characteristics
2. CB-Characteristics
3. Photo-transistor Characteristics
4. CE-Amplifier (Freq. response, gain, 3db band width)
5. OP-AMP as Inverting Amplifier
6. OP-AMP as Non-Inverting Amplifier
7. Hartley Oscillator
8. Phase Shift Oscillator
9. Determination of wavelength of sodium light using diffraction gratings.
10. Calibration of spectrometer.

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

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

Course Structure:
SPHYCP1254 (Major-8): Practical-4

Teaching Scheme

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

Assessment Scheme

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

Course pre-requisite:

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

Course objectives:

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

Course outcomes:

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

Curriculum Details: Practical-4

1. I-D Curve by using spectrometer.
2. Wavelength by Newton's Ring.
3. Radius of Curvature by using Newton's Ring.
4. R.P of Telescope.
5. R. P of Grating.
6. Angle of specific rotation by polarimeter.
7. Concentration of sugar solution by polarimeter.
8. Dispersive power of prism.
9. Dispersive power of Grating.
10. Determination of wavelength by Diffraction grating using LASER.

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

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

SPHYMT1251 (Minor-3): **Physics for Chemist and Biologist**

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SPHYMT1251	Physics for Chemist and Biologist	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SPHYMT1251	Physics for Chemist and Biologist	10	10	10	40	50

Course pre-requisite:

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

Course objectives:

- To introduce the Laws of Physics and Chemistry.
- To understand the behavior of light rays.
- To prepare students for various competitive examinations.
- To provide students with a basic understanding of Biophysics principles.

Course outcomes:

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

- ✓ Define and explain the laws of physics and chemistry.
- ✓ Apply the principles of optics to the biological instruments.
- ✓ Understand the basics of light propagation and light reflection.
- ✓ Apply the principles of thermodynamics to biological systems.

Curriculum Details: **Physics for Chemist and Biologist**

Module No.	Unit No.	Topic	Hrs.
1.0	**Laws of Physics and Chemistry**		
	1.1	Wave Theory of Light	**07**
	1.2	Planks Quantum Theory	
	1.3	Photoelectric Effect	
	1.4	Bohr's Theory of Atomic Spectra,	
2.0	**Ray Optics**		
	2.1	Reflection at Plane Surface, Spherical Mirrors	08
	2.2	Refraction at Spherical Surfaces and By Lenses	
	2.3	Refraction Through A Prism	
3.0	**Optical Instruments**		
	3.1	Microscope, simple and Compound	**07**
	3.2	R.P. and limit of resolution of microscopes	
	3.3	Optical Microscope-magnifying power	
	3.4	Phase contrast Microscope	
4.0	**Biophysics**		
	4.1	Concept of System in Biophysics and Types	**08**
	4.2	System-Types and Properties, Thermodynamic Equilibrium	
	4.3	Laws of Thermodynamics and Living Organisms	
		Total	**30**

Text Books:

1. G.R. Chatwal, Biophysics- Himalaya Publishing House (2005)
2. Dr N. Subrahmanyam, Brijlal, Dr. M.N.Avadhanulu, A Textbook of Optics S. Chand Publications (2012)
3. Abhilasha Singh Mathuria, Biophysics and Biochemistry- Pragati Prakashan (2013)

Reference Books:

1. Rodney M. J. Cotterill, Biophysics An Introduction, John Wiley & Sons Ltd (2014)
2. Singh and Agarwal, Optics, Pragati Prakashan, Meerut (2010)
3. Roland Glaser, Biophysics, Springer (2004)

Course Structure:
SPHYMP1252 (Minor-4): Practical

Teaching Scheme

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

Assessment Scheme

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

Course pre-requisite:

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

Course objectives:

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

Course outcomes:

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

Curriculum Details: Practical

1. To study nature and size of image formed by a convex lens using a candle and a screen.
2. To study nature and size of image formed by a concave mirror using a candle and screen.
3. To determine the focal length of a convex mirror using a convex lens.
4. To find the focal length of a concave lens using a convex lens.
5. To find the refractive index of a liquid by using a convex lens and a plane mirror.
6. To study effect on intensity of light emerging through different coloured transparent sheets.
7. To observe refraction and lateral displacement of a beam of light incident obliquely on a glass slab.
8. To determine the refractive index of a liquid using travelling Microscope.
9. Resolving Power of a Telescope.
10. Resolving Power of a Microscope.

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

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

SPHYGE1251: **Physics in Daily Life-II**

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SPHYGE1251	Physics in Daily Life-II	02	--	02	--	02

Assessment Scheme

Course Code	Course Name	Theory				Total [CA+ESA]
		CA			ESA	
		Test I	Test II	Avg (T1+T2)/2		
SPHYGE1251	Physics in Daily Life-II	10	10	10	40	50

Course pre-requisite:

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

Course objectives:

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

Course outcomes:

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

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

Curriculum Details: Physics in Daily Life-II

Module No.	Unit No.	Topic	Hrs.
1.0	**Physics in Earth's Atmosphere**		
	1.1	Sun, Earth's Atmosphere as An Ideal Gas;	**08**
	1.2	Pressure, Temperature, and Density,	
	1.3	Coriolis Acceleration and Weather Systems,	
	1.4	Rayleigh Scattering, The Red Sunset,	
	1.5	Reflection, Refraction, and Dispersion of Light,	
	1.6	Total Internal Reflection, Rainbow	
2.0	**Physics in Human Body**		
	2.1	The Eyes as An Optical Instrument	**07**
	2.2	Vision Defects	
	2.3	Sound Waves and Hearing	
	2.4	Sound Intensity, Pleasant and Unpleasant Sound	
	2.5	Decibel Scale	
3.0	**Physics in Sports**		
	3.1	The Sweet Spot,	**07**
	3.2	Dynamics of Rotating Objects,	
	3.3	Running, Jumping and Pole Vaulting,	
	3.4	Motion of A Spinning Ball,	
4.0	**Physics in Technology**		
	4.1	Global Positioning System	**08**
	4.2	CCDs, Lasers Displays	
	4.3	Optical Recording, CD DVD Player, Tape Records, Memory Cards.	
	4.4	Telescope, Microscope, Projector etc.	
		Total	**30**

Text Books:

1. H. C. Verma, Concepts of Physics (Bharati Bhawan publishers and distributers, New Delhi, India) 2011.
2. Sears and Zeemansky, University Physics (Addison Wesley, Boston, USA) 2007.
3. B. Lal and Subramaniam, Electricity and Magnetism (Ratan Prakashan Mandir, Agra, India) 2013.

Reference Books:

1. Physics in Daily Life, Jo Hermans, EDP Sciences
2. E. Hecht, Optics (Addison Wesley, Boston, USA) 2001.
3. M. Nelkon and P. Parker, Advanced Level Physics (Heinemann International, London, U.K.) 2012.
4. Louis A. Bloomfield, How Things Work, The Physics of Everyday Life, Wiley, 2013.
5. D.S. Mathur, Elements of Properties of Matter, S. Chand & Co. (2010).
6. Arthur Beiser, Fundamentals of Physics with Applications
7. Ajay Ghatak, Optics, Tata McGraw-Hill publishing Co. Ltd., New Delhi (1998).

Course Structure:

SPHYVSC1251 (Vocational): Home appliances

Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SPHYVSC1251	Home appliances	--	04	--	02	02

Assessment Scheme

Course Code	Course Name	Theory				Practical		Total [CA+ESA]
		CA			ESA			
		Test I	Test II	Avg (T1+T2)/2		CA	ESA	
SPHYVSC1251	Home appliances	--	- -	--	--	20	30	50

Course pre-requisite:

1. Knowledge of basic electrical working of home appliances.
2. Aware about the safety measures and handling of tools.

Course objective:

- To provide knowledge about the electrical home appliances and their working principles.
- To provide hand on experiments for electrical installations, maintenance and wiring repairs in home appliances.

Course outcome:

- ✓ After completing this course the students will gain knowledge of various electrical gadget installations at domestic levels.
- ✓ Students will be able to understand wiring systems and electrical connections of different house hold appliances.
- ✓ Hand on experiments will provide them an expertise for electrical installations, maintenance and wiring repairs.

Curriculum Details: Home appliances

1. To draw forward and reverse characteristics of a semiconductor diode.
2. Join the supplied wires by soldering.
3. Identification of different electrical symbols.
4. Drawing schematic diagram of electrical wiring of a house with 6 points.
5. Identification of common hand tools, make simple twist joint married joint in stranded conductors.
6. Testing of (i) Table Lamp (ii) Night Lamp and (ii) Tube Light (iv) LED table lamp.
7. Testing of Electric Iron (i) Ordinary type (ii) Automatic/Thermostat control type.
8. Polarity test of wiring installation.
9. Controlling a lamp from two and three places.
10. Study of series and parallel connection of cells.

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

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

Guidelines for the Course Assessment:

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

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

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

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

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

Question Paper Pattern of the ESA:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Note:

Number of lectures required to cover syllabus of a course depends on the number of credits assigned to a particular course. One credit of theory corresponds to 15 Hours lecturing and for practical course one credit corresponds to 30 Hours. For example, for a course of two credits 30 lectures of one hour duration are assigned, while that for a three credit course 45 lectures.

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Question Paper Pattern

Semester End Assessment

B**. Sc. First/Second Year Physics**

Time: 02 Hrs **(NEP – 2020 Pattern)** **Total Marks: 40**

Note: i) All questions are carry equal marks.
ii) Question 1. is compulsory.
iii) Solve ANY THREE of the remaining Five Questions (Q.2 to Q.6).
iv) Figures to the right indicates full marks.

Question 1 – Solve the following questions (Each questions 2.5 mark) 10 marks

a) *This question will be based on Module I*

b) *This question will be based on Module II*

c) *This question will be based on Module III*

d) *This question will be based on Module IV*

Question 2 – *This question will be based on* ***Module I*** **(Each sub questions 5 mark) 10 marks**

a)

b)

Question 3 – *This question will be based on* ***Module II*** **(Each sub questions 5 mark) 10 marks**

a)

b)

Question 4 – *This question will be based on* ***Module III*** **(Each sub questions 5 mark) 10 marks**

a)

b)

Question 5 – *This question will be based on* ***Module IV*** **(Each sub questions 5 mark) 10 marks**

a)

b)

Question 6 – Write short note on any two (2 x 5 mark) 10 marks

a) *This question will be based on Module I*

b) This question will be based on Module II

c) *This question will be based on Module III*

d) This question will be based on Module IV

(***Dr. K. S. Kanse***)
Chairman, BOS in Physics