DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

CIRCULAR NO.SU/Revised B.Sc./NEP/72/2024

It is hereby inform to all concerned that, the Revised syllabi prepared by the Board of Studies/Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, **Academic Council at its meeting held on 08 April 2024 has accepted** the following **Revised syllabi of Bachelor of Science** under the Faculty of Science & Technology **as per Norms of National Education Policy-2020 and as per Government Letter dated 13 March 2024** run at the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc.Botany	Ist and IInd semester
2.	B.Sc.Biotechnology	Ist and IInd semester
3.	B.Sc.Zoology	Ist and IInd semester
4.	B.Sc.Agrochemical and Fertilizer	Ist and IInd semester
5.	B.Sc.Geology	Ist and IInd semester
6.	B.Sc.Environmental Science	Ist and IInd semester
7.	B.Sc.Home Science	Ist and IInd semester
8.	B.Sc.Diary Science and Technology	Ist and IInd semester
9.	B.Sc.Automobile Technology	Ist and IInd semester
10.	B.Sc.Physics	Ist and IInd semester
11.	B.Sc.Chemistry	Ist and IInd semester
12.	B.Sc.Analytical Chemistry	Ist and IInd semester
13.	B.Sc.Polymer Chemistry	Ist and IInd semester
14.	B.Sc.Electronics	Ist and IInd semester
15.	B.Sc.Forensic Science & Cyber Security	Ist and IInd semester
16.	B.Sc.Microbiology	Ist and IInd semester
17.	B.Sc.Fisheries Science	Ist and IInd semester
18.	B.Sc.Mathematics	Ist and IInd semester
19.	B.Sc.Forensic Science	Ist and IInd semester
20.	B.Sc.Information Technology	Ist and IInd semester
21.	B.Sc.Horticulture	Ist and IInd semester
22.	B.Sc.Networking & Multimedia	Ist and IInd semester
23.	B.Sc.Biochemistry	Ist and IInd semester
24.	B.Sc.Industrial Chemistry	Ist and IInd semester
25.	B.Sc.Bioinformatics	Ist and IInd semester

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26.	**B.Sc.Instrumentation Practice**	**Ist and IInd semester**
27.	**B.Sc.Non-Conventional and Conventional Energy**	**Ist and IInd semester**
28.	**B.Sc.Statistics**	**Ist and IInd semester**
29.	**Bachelor of Computer Application**	
30.	**B.Sc.Computer Science (Degree)**	**Ist and IInd semester**
31.	**B.Sc.Computer Science (Optional)**	**Ist and IInd semester**

This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.SU/2024/25588-96
Date:- 29.04.2024.

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Deputy Registrar,
Academic Section

Copy forwarded with compliments to :-

1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,
2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

1] **The Director, Board of Examinations & Evaluation,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR- 431004 (M. S.), INDIA

FACULTY OF SCIENCE AND TECHNOLOGY

B. Sc. Degree Programme

[3 Years/4 Years (Honors)/4 Years (Honors with Research)]

As Per

National Education Policy-2020

Revised

Course Structure and Curriculum

(As per NEP-2020)

Subject (Major): Physics

30/3/2024

For

B. Sc. First Year
(Semester-I and II)

Effective from Academic Year: 2024-25

PREFACE

As we stand on the threshold of a new era in education, the dawn of the National Education Policy 2020 illuminates our path toward a holistic, inclusive, and progressive educational landscape. The Bachelor of Science (B. Sc.) curriculum outlined herein reflects the ethos and aspirations of this transformative policy, aiming to equip learners with the knowledge, skills, and values necessary to thrive in the dynamic world of the 21st century.

At its core, the National Education Policy 2020 envisions an educational framework that is learner-centric, multidisciplinary, and geared towards fostering creativity, critical thinking, and innovation. It emphasizes the integration of knowledge across disciplines, breaking down traditional silos to encourage holistic understanding and application of concepts. The Bachelor of Science (B. Sc.) curriculum embodies these principles by offering a diverse array of courses spanning various scientific domains, while also incorporating interdisciplinary studies to nurture well-rounded graduates capable of addressing complex challenges with agility and insight.

Furthermore, the curriculum is designed to promote experiential learning, research, and hands-on exploration, recognizing the importance of practical engagement in deepening understanding and cultivating real-world skills. Through laboratory work, field experiences, internships, and project-based learning opportunities, students will have the chance to apply theoretical knowledge in practical settings, develop problem-solving abilities, and cultivate a spirit of inquiry and discovery.

Integral to the National Education Policy 2020 is the commitment to inclusivity, equity, and access to quality education for all. The Bachelor of Science (B. Sc.) curriculum reflects this commitment by embracing diversity in perspectives, backgrounds, and experiences, and by fostering an inclusive learning environment where every student feels valued, supported, and empowered to succeed.

Moreover, the curriculum emphasizes the cultivation of ethical values, social responsibility, and global citizenship, instilling in students a sense of accountability towards society and the environment. By integrating courses on ethics, sustainability, and social sciences, the Bachelor of Science (B. Sc.) program aims to produce graduates who are not only proficient in their respective fields but also compassionate, ethical leaders committed to making a positive impact on the world.

As we embark on this journey of educational transformation guided by the National Education Policy 2020, the Bachelor of Science (B. Sc.) curriculum stands as a testament to our collective vision of a more equitable, inclusive, and enlightened society. It is our hope that through rigorous academics, innovative pedagogy, and unwavering dedication to excellence, we can inspire the next generation of scientists, scholars, and change-makers to realize their full potential and contribute meaningfully to the advancement of knowledge and the betterment of humanity.

INTRODUCTION TO UNDERGRADUATE DEGREE COURSE IN PHYSICS

As per the recommendations of the NEP-2020, the undergraduate degree course in Physics is a six/ eight semester course spread over three/ four academic years. The teaching – Learning process is student-centric, and it involves both theory and practical components. It offers a flexibility of programme structure while ensuring that the student gets a strong foundation in the subject and gains in-depth knowledge. Besides the Discipline Specific Core (DSC) courses, a student can opt courses from the syllabus comprising of Discipline Specific Electives (DSEs), Generic Electives (GEs), Skill Enhancement Courses (SECs), Ability Enhancement courses (AECs) and Value Addition Courses (VACs). Thereby, bringing out the multidisciplinary approach and adherence to innovative ways within the curriculum framework. Moreover, it allows a student maximum flexibility in pursuing his/her studies at the undergraduate level to the extent of having the liberty to eventually design the degree with multiple exit options depending upon the needs and aspirations of the student in terms of his/her goals of life, without compromising on the teaching learning, both in qualitative and quantitative terms. This will suit the present day needs of students in terms of securing their paths towards higher studies or employment.

Courses of Study:

Courses of the study indicate pursuance of study in a particular discipline. Every discipline shall offer four categories of courses of study, viz. Discipline Specific Core (DSC) courses, Discipline Specific Electives (DSEs), Skill Enhancement Courses (SECs) and Generic Electives (GEs). Besides these four courses, a student will select Ability Enhancement Courses (AECs) and Value-Added Courses (VACs) from the respective pool of courses offered by the University.

a) **Discipline Specific Core (DSC):** Discipline Specific Core is a course of study, which should be pursued by a student as a mandatory requirement of his/ her programme of study. In Bachelor of Science (Hons.) Physics programme, DSCs are the core credit courses of Physics which will be appropriately graded and arranged across the semesters of study, being undertaken by the student, with multiple exit options as per NEP 2020.

b) **Discipline Specific Elective (DSE):** The Discipline Specific Electives (DSEs) are a pool of credit courses of Physics from which a student will choose to study based on his/ her interest.

c) **Generic Elective (GE):** Generic Electives is a pool of courses offered by various disciplines of study (excluding the GEs offered by the parent discipline) which is meant to provide multidisciplinary or interdisciplinary education to students. In case a student opts for DSEs beyond his/ her discipline specific course(s) of study, such DSEs shall be treated as GEs for that student.

d) **Ability Enhancement course (AEC), Skill Enhancement Course (SEC) and Value Addition Course (VAC):** These three courses are a pool of courses offered by all the Departments in groups of odd and even semesters from which a student can choose.

   i) **AEC:** AEC courses are the courses based upon the content that leads to knowledge enhancement through various areas of study. They are based on Language and Literature, and Environmental Science which are mandatory for all disciplines.

   ii) **SEC:** SECs are skill-based courses in all disciplines and are aimed at providing hands-on training, competencies, proficiency and skills to students. SEC courses may be chosen from a pool of courses designed to provide skill-based instruction.

   iii) **VAC:** VACs are common pool of courses offered by different disciplines and aimed towards personality building, embedding ethical, cultural and constitutional values; promote critical thinking, Indian knowledge systems, scientific temperament, communication skills, creative writing, presentation skills, sports and physical education and teamwork which will help in all round development of students.

Structure of B. Sc. (Three/Four Years Honours/Honours with Research Degree) Programme with Multiple Entry and Exit Options

B. Sc. First Year: 1st Semester **Subject (Major): Physics**

Course Type	Course Code	Course Name	Teaching Scheme (Hrs/Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory: **Physics**	DSC-1	Mechanics and Properties of Matter	2	---	2	---	2+2=4
	DSC-2	Practicals Based on DSC-1	---	4	---	2	
Major (Core) M2 Mandatory:	DSC-1	----	2	---	2	---	2+2=4
	DSC-2	Practicals Based on DSC-1	---	4	---	2	
Major (Core) M3 Mandatory:	DSC-1	----	2	---	2	---	2+2=4
	DSC-2	Practicals Based on DSC-1	---	4	---	2	
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) It should be chosen from the faculty other than that of Major	GE/OE – 1	To be chosen from other faculty	2	---	2	---	2
SEC (Skill Enhancement Course) (Choose any one from SEC- 1 and accordingly Choose relevant practical paper from SEC - 2)	SEC-1	1) Basic Instrumentation Skill 2) Medical Physics	1	---	1	---	2
	SEC-2	1) Practicals Based on SEC – 1 (Basic Instrumentation Skill) 2) Practicals Based on SEC – 1 (Medical Physics)	---	2	---	1	
AEC, VEC, IKS	AEC-1	English (Common for all faculty)	2	---	2	---	2+2=4
	IKS-1	Choose any one from pool of Courses	2	---	2	---	
OJT/ FP/CEP/CC/RP	CC-1	Health and Wellness (Common for all faculty)	---	4	---	2	2
			13	**18**	**13**	**09**	**22**

GE/OE-1: Everyday Physics (This course will be available for the students from other faculty)

Structure of B. Sc. (Three/Four Years Honours/Honours with Research Degree) Programme with Multiple Entry and Exit Options

B. Sc. First Year: 2nd Semester **Subject (Major): Physics**

Course Type	Course Code	Course Name	Teaching Scheme (Hrs/Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory: Physics	DSC- 3	Optics	2	---	2	---	2+2=4
	DSC- 4	Practicals Based on DSC-3	---	4	---	2	
Major (Core) M2 Mandatory:	DSC- 3	---	2	---	2	---	2+2=4
	DSC- 4	Practicals Based on DSC-3	---	4	---	2	
Major (Core) M3 Mandatory:	DSC- 3	---	2	---	2	---	2+2=4
	DSC- 4	Practicals Based on DSC-3	---	4	---	2	
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) It should be chosen from the faculty other than that of Major	GE/OE - 2	To be Chosen from other Faculty	2	---	2	---	2
VSC (Vocational Skill Courses) (Choose any one from VSC - 1 and accordingly choose relevant practical paper from VSC - 2)	VSC- 1	1) Electrical Measurements 2) Electronic Communications	1	---	1	---	2
	VSC- 2	1) Practicals Based on VSC – 1 (Electrical Measurements) 2) Practicals Based on VSC – 1 (Electronic Communications)	---	2	---	1	
AEC, VEC, IKS	AEC- 2	English (Common for all faculty)	2	---	2	---	2+2=4
	VEC- 1	Constitution of India (Common for all the faculty)	2	---	2	---	
OJT/ FP/CEP/CC/RP	CC- 2	Yoga Education / Sports and Fitness (Common for all the faculty)	---	4	---	2	2
			13	**18**	**13**	**09**	**22**

Exit Option: Award of UG Certificate in 3 Majors with 44 credits and an additional 4 credits of core NSQF course/ Internship OR continue with Major and Minor

GE/OE-2: Physics in Sports (This course will be available for the students from other faculty)

Students will have to choose any three subjects as **Major 1, Major 2, Major 3,** from Basket 1 under the **Faculty of Science and Technology**.

Students will be having three subject options of equal credits (instead of Major and / or minor verticals) in the first year. Students will have to select / declare choice of one subject **as a major subject** in the beginning of second year **out of three major options M1, M2 and M3 (which were opted in the first year).**

Detailed Illustration of Courses included in 1st and 2nd semester:

1) **Major** (Core) subject are mandatory.

   DSC-1: This is a 2 credit theory course corresponding to Major (core) subject
   DSC-2: This is a 2 credit practical course based on DSC-1
   DSC-3: This is a 2 credit theory course corresponding to Major (core) subject
   DSC-4: This is a 2 credit practical course based on DSC-3

2) **Generic / Open Elective (GE/OE)**: (Needs to be chosen (any two) from pool of courses available at respective college). **These courses should be chosen compulsorily from faculty other than that of Major.**

   GE/OE -1: This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.
   GE/OE -2: This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.

3) **SEC** (Skill Enhancement Courses): Choose any one from pool of courses. These courses needs to be designed to enhance the technical skills of the students in specific area.

   SEC-1: This is a 1 credit theory course to enhance the technical skills of the students in specific area.
   SEC-2: This is a 1 credit practical course based on SEC-1.

4) **VSC** (Vocational Skill Courses) : Choose any one from pool of courses. These courses should be based on Hands on Training corresponding to Major (core) subject.

   VSC-1: This is a 1 credit theory course based Hands on Training corresponding to Major (core) subject.
   VSC-2: This is a 1 credit practical course based on VSC-1.

5) **AEC** (Ability Enhancement courses): The focus of these courses should be based on linguistic and communication skills. In first semester it will be English and will be common for all the faculty.

AEC-1: English
This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.
AEC-2: English
This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

6) **IKS** (Indian Knowledge System) : The courses related to traditional and ancient culture of India will be included in this section. The respective college will have to choose one of the courses from the pool of courses designed by the University.

IKS-1: To be chosen from the pool of courses designed by the University
This is a 2 credit theory course based on Indian Knowledge System. It will be common for all the faculty.

7) **VEC** (Value Education Courses): The courses such as understanding India, Environmental Science / Education, Digital and Technological solutions etc will be part of Value Education Courses.

VEC-1: Constitution of India
This is a 2 credit theory course based on value education. It will be common for all the faculty.

8) **CC** (Curricular Courses): The courses such as Health and wellness, Yoga education, Sports and Fitness, Cultural activities, NSS/NCC, Preforming Arts.

CC-1: Health and Wellness
This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty.

CC-2: Yoga education / Sports and Fitness
This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty.

General Guidelines for Course Selection

1) The Major subject is the discipline or course of main focus, bachelor's degree shall be awarded in that discipline / subject.
2) Students will have to choose any three subjects as a Major 1, Major 2, Major 3, from **Basket 1** under the Faculty of Science and Technology.
3) Students will be having three subject options of equal credits (instead of Major and / or minor verticals) in the first year.
4) In the beginning of second year, students will have to select / declare choice of **one major subject** and **one minor subject** from three major options **M1, M2 and M3 (which were opted in the first year).**
5) Once the students finalize their **Major Subject** and **Minor Subject** in the beginning of the second year of the programme, they shall pursue their further education in that particular subject as their **Major and Minor** subjects. Therefore, from second year onwards curriculum of the Major and Minor subjects shall be different.
6) Students are required to select **Minor subject** from **other discipline of the same faculty**.
7) Students are required to select **Generic /Open Elective** (vertical 3 in the credit framework) **compulsorily from the faculty different than that of their Major / Minor subjects.**
8) Vocational Skill Courses and Skill Enhancement Courses (VSC and SEC) shall be related to the Major subject.
9) Curriculum of Ability Enhancement Courses (AEC), Value Education Courses (VEC), Indian Knowledge System (IKS), and Co-curricular Courses (CC) will be provided by the University separately.

Programme Educational Objectives (PEOs):

Programme Educational Objectives (PEOs) for the Bachelor of Science Curriculum under the National Education Policy 2020:

1. **Mastery of Discipline-Specific Knowledge**: Graduates of the Bachelor of Science program will demonstrate a deep understanding of fundamental principles, theories, and methodologies in their chosen scientific discipline, enabling them to analyze complex problems, propose innovative solutions, and contribute to advancements in their field.

2. **Interdisciplinary Proficiency**: Graduates will possess the ability to integrate knowledge and skills from multiple scientific disciplines, fostering a holistic approach to problem-solving and innovation. They will be equipped to address multifaceted challenges by drawing upon diverse perspectives and methodologies.

3. **Critical Thinking and Analytical Skills:** Graduates will develop strong critical thinking abilities, enabling them to evaluate information rigorously, analyze data effectively, and make informed decisions based on evidence. They will demonstrate proficiency in applying logical reasoning and scientific methods to solve problems and generate new knowledge.

4. **Leadership and Innovation:** Graduates will demonstrate leadership qualities and entrepreneurial mindset, capable of initiating and driving positive change in their organizations and communities. They will exhibit creativity, resilience, and adaptability, harnessing innovation to address complex challenges and seize opportunities for growth and advancement.

5. **Global Citizenship and Cultural Sensitivity**: Graduates will possess a global perspective and cultural sensitivity, recognizing the interconnectedness of diverse communities and the importance of collaboration across borders. They will engage in cross-cultural dialogue, embrace diversity, and contribute to the advancement of knowledge and understanding on a global scale.

These Programme Educational Objectives serve as guiding principles for the Bachelor of Science curriculum, reflecting our commitment to nurturing well-rounded graduates who are prepared to excel in their careers, contribute to society, and lead meaningful lives in a rapidly changing world.

Programme Outcomes (POs) :

The National Education Policy (NEP) 2020 for India emphasizes several key aspects for Bachelor of Science (B.Sc.) programs, aiming to produce graduates who are not only well-versed in their respective disciplines but also equipped with skills necessary for holistic development and employability. While specific program outcomes may vary between institutions and disciplines within B.Sc. programs, here are some common outcomes aligned with NEP 2020:

- **PO1. The citizenship and society:** Apply broad understanding of ethical and professional skill in science subjects in the context of global, economic, environmental and societal realities while encompassing relevant contemporary issues.

- **PO2. Environment and sustainability**: Apply broad understanding of impact of science subjects in a global, economic, environmental and societal context and demonstrate the knowledge of, and need for sustainable development.

- **PO3. Ethics:** Apply ability to develop sustainable practical solutions for science subject related problems within positive professional and ethical boundaries.

- **PO4. Individual and teamwork:** Function effectively as a leader and as well as team member in diverse/ multidisciplinary environments.

- **PO5. Communication:** Communicate effectively on complex science subject related activities with the scientific community in particular and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

- **PO6. Project management and finance**: Demonstrate knowledge and understanding of the first principles of science and apply these to one's own work as a member and leader in a team, to complete project in any environment.

- **PO7. Life-long learning**: Recognize the need for lifelong learning and have the ability to engage in independent and life-long learning in the broadest context of technological change.

These program outcomes align with the broader goals of NEP 2020 to transform higher education in India and prepare students for the challenges and opportunities of the 21st century. Board of Studies designing B.Sc. curricula are encouraged to incorporate these outcomes into their program objectives and learning outcomes.

Programme Specific Outcomes (PSOs):

On completion of the 03/ 04 years Degree in **B.Sc. (Physics) students will be able to:**

PSO1: Domain knowledge: Graduates will have an in-depth comprehension of fundamental theories and principles across various domains of physics, encompassing classical mechanics, electromagnetism, thermodynamics, quantum mechanics, nuclear and high-energy physics, solid-state physics, materials science, electronics, and modern physics.

PSO2: Problem Analysis: Graduates will demonstrate adeptness in analysing complex physical problems, formulating hypotheses, and employing appropriate mathematical and computational techniques for solutions. They will understand the significance of equations, formulas, graphs, and mathematical tools. Furthermore, they will effectively utilize technology for experimental design and implementation, data analysis, numerical methods, and computational techniques in problem-solving.

PSO3: Design Development of solutions: Graduates will possess the capability to create and execute experimental setups, simulations, and theoretical models, effectively addressing scientific inquiries and resolving practical physics-related issues. They will have both fundamental and advanced-level expertise in physics, enabling them to proficiently utilize computational tools and scientific software.

PSO4: Conduct Investigation of complex problems: Graduates will exhibit proficiency in conducting investigations of intricate physics problems, which involves effectively utilizing established knowledge and methodologies to design experiments, meticulously analyzing resulting data to extract pertinent information, and accurately interpreting data to draw valid conclusions, thereby contributing to a deeper comprehension of the problem under scrutiny.

PSO5: Modern Tools: Graduates will demonstrate proficiency in employing modern experimental, computational, and data analysis tools and techniques prevalent in physics research and industrial settings. They will adeptly apply and cultivate skills in physics and engineering for industrial applications, production, and technology development and transfer. Furthermore, they will hone advanced analytical skills tailored for job requirements in industries, consultancies, educational institutions, research organizations, or public administration.

PSO6: Communication Skills: Graduates will effectively communicate scientific ideas, methodologies, and results through written reports, oral presentations, and scientific publications, facilitating collaboration and dissemination of knowledge within the scientific community.

SEMESTER – I

DSC-1: Mechanics and Properties of Matter

Total Contact Hours: 30 **Credits: 02** **Max. Marks: 50**

Learning Objectives of the Course:

i Understand Newton's laws and apply them in calculations of the motion of simple systems.
ii Use the free body diagrams to analyze the forces on the object.
iii Understand the concepts of friction and the concepts of elasticity, fluid mechanics and be able to perform calculations using them.
iv Demonstrate quantitative problem-solving skills in all the topics covered

Course Outcomes (COs): After completion of the course, students will be able to -

i Understand **Newton's laws of motion.**
ii Recognize different forces existing in nature and their physical significance.
iii Acquire deep knowledge of physical quantities such as **elasticity**, **viscosity**, and **surface tension.**
iv Develop the capacity to investigate and analyze daily problems related to mechanical Movement

Module No.	Topics/Actual contents of the syllabus	Contact Hours
I	**Mechanics:** Newton's law of Gravitation (Statement only), Gravitational Field Gravitational Potential, Gravitational Potential of mass, Gravitational potential and field due to spherical shell and solid sphere (at a point, outside, inside and on the surface). Compound Pendulum- expression of time period, Interchangeability of center of suspension and oscillation, Kater's Pendulum, Problems.	10
II	**Elasticity:** Introduction, Stress and Strain, Hook's law and Coefficient of elasticity, Young's modulus, Bulk modulus, Modulus of rigidity, Twisting couple on a cylinder, Bending of Beam- Bending moment, cantilever loaded at free end- (a) When weight of beam is ineffective, (b) When weight of beam is effective, Depression of Beam supported at center, Problems.	10
III	**Viscosity:** Introduction, Concept of viscous force and viscosity, Coefficient of viscosity, Steady and Turbulent flow, Reynolds number, Equation of continuity, Bernoulli's Theorem **Surface Tension:** Angle of contact, Factors affecting surface tension, Difference of pressure across a curved surface, Determination of S.T. by Jaeger's method, Problems.	10

Learning Resources:

1) Elements of Properties of Matter - D. S. Mathur (S. Chand, 11 th edition, 1992)
2) Physics for Degree students-C. L. Arora and P.S. Heme (S. Chand, I st edition 2010)
3) Mechanics and Electrodynamics - Brijlal, N. Subrahmanyam, Jivan Seshan (S. Chand, 7th Ed.)
4) Concepts of Physics: H. C. Verma, Bharati Bhavan Publisher.
5) University Physics: Sears and Zeemansky, XIth/XIIth Edition, Pearson Education.

DSC-2: Practicals Based on DSC-1
(Mechanics and Properties of Matter)

Total Contact Hours: 60 **Credits: 02** **Max. Marks: 50**

Learning Objectives of the Course:

i To familiarize students with fundamental experimental techniques related to principles of elasticity, surface tension, viscosity and thermal conductivity.

ii To enable students to gain practical insights into the concepts of elasticity, surface tension, viscosity and heat transfer.

iii To prepare students for advanced laboratory work and research in the related areas of study.

Course Outcomes (COs): After completion of the course, students will be able to –

i Understand gravitational acceleration through pendulum analysis and learn material stiffness and viscosity determination techniques using various setups.

ii Explore rotational dynamics through flywheel experiments for moment of inertia and torsional property analysis.

iii Develop instrument precision skills via least count analysis, crucial for physics and related field pursuits.

Expt. No.	Name of Experiments
01	Determination of acceleration due to gravity by using Kater's Pendulum
02	Y by bending loaded at center
03	Y by cantilever (Oscillation method)
04	Moment of inertial by using fly wheel
05	η by Maxwell's needle
06	Determination of 'Y' and 'η' by flat spiral spring
07	Surface tension of a liquid by using Jaeger's method
08	Viscosity of a liquid by using Poiseuille's method
09	Bar pendulum
10	Bifiler's pendulum
11	Tortional Pendulum
12	Moment of inertial of disc by annular ring
13	Surface tension by liquid drop method
14	Viscosity by Stikes method
15	Least count of various measuring instruments

Learning Resources:

1. B. Sc. Practical Physics – C. L. Arora (S. Chand Publications)
2. College Practical Physics – Khanna and Gulati (S. Chand Publication)
3. Practical Physics – Gupta and Kumar (Pragati Prakashan, Meerut)
4. A text book of Practical physics – Shrinivasan and Balsubramanyam.

SEC-1: Basic Instrumentation Skill

Total Contact Hours: 15 **Credit: 01** **Max. Marks: 50**

Learning Objectives of the Course:

i Get exposure with various aspects of instruments and their usage through hands-on mode.

ii Describe primary blocks of an Instrumentation System and Qualities of Measurement.

iii Classify physical measurement backgrounds.

Course Outcomes (COs): After completion of the course, students will be able to –

i Gain understanding of measurement fundamentals including instrument accuracy, precision, and errors, as well as principles of voltage, current, and resistance measurement using voltmeters, ammeters, and multimeters.

ii Master the use of CRO for voltage (DC and AC), frequency, and time period measurements, and understand signal and pulse generator specifications, alongside distortion factor meter usage and wave analysis.

iii Learn analog versus digital instrument distinctions, comprehend digital multimeter block diagrams and operations, and understand time interval, frequency, and period measurements using universal counters, emphasizing time-base stability, accuracy, and resolution.

Module No.	Topics/Actual contents of the syllabus	Contact Hours
I	**Basic of Measurement:** Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. **Voltmeter, Ammeter and Multimeter:** Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.	05
II	**Use of Oscilloscope:** Use of CRO for the measurement of voltage (dc and ac), frequency and time period. Special features of dual trace, Introduction to digital oscilloscope, probes. Digital storage Oscilloscope. **Signal and pulse Generators:** Block diagram, explanation and specifications of low frequency signal generator and pulse generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.	05

III	**Digital Multimeter:** Comparison of analog & digital instruments. Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution.	**05**

Learning Resources:

1. Basic instrumentation skill by H.S. Kalsi
2. Electronic Instrument Handbook by Clyde F. Coombs
3. Introduction to measurements and instrumentation by Arun K. Ghosh.

SEC-1: Medical Physics

Total Contact Hours: 15 **Credit: 01** **Max. Marks: 50**

Learning Objectives of the Course:

i To learn the construction of X-ray generator.
ii Explain different types of radiation, their sources/properties.
iii The basic principles and working of CT, MRI and Ultrasound Imaging.
iv Able to provide adequate knowledge about medical testing equipment.
v Able to transfer knowledge and skills to students as well as younger professionals.

Course Outcomes (COs): After completion of the course, students will be able to -

i Understand the principles, applications, and usage of various medical equipment including thermometers, glucometers, ECG machines, and X-ray machines for diagnostic purposes in healthcare settings.
ii Comprehending the principles and components of Computed Tomography (CT) systems, including image reconstruction, acquisition techniques, and factors influencing image quality.
iii Develop a comprehensive understanding and proficiency in various image acquisition techniques, advanced imaging methods, safety protocols, and their applications in planning radiotherapy treatments.

Module No.	Topics/Actual contents of the syllabus	Contact Hours
I	**Medical Equipments:** Thermometer, Optical thermometer, Thermal gun, LASER gun, Infrared thermometer, Reflex hammer, radiography, Weighing machine, Glucometer, Oximeter, ECG machine, Stethoscope, X-Ray machine	05
II	**Computed Tomography (CT):** Principle, CT imaging system, image reconstruction and processing, acquisition and image quality.	05
III	**Magnetic Resonance Imaging (MRI):** Introduction to MRI, techniques involved MR image acquisition and reconstruction, safety and applications of MRI in radiotherapy for treatment planning. **Ultrasound imaging (US):** Construction and working of a transducer, B-mode signal processing, modern imaging methods, Ultrasound imaging in radiotherapy for treatment.	05

Learning Resources:

1. F. M. Khan, The Physics of Radiation therapy, 3rd Edition, Lippincott Williams &Wikins, Philadelphia, 2003
2. Radiation Physics in Radiology, Oliver R., Blackwell Science Ltd; 1st Edition (1966).
3. Radiation Physics for Medical Physicists, E. B. Podgarsak, Springer Verlag, 1st Edition (1996).
4. The essential physics of medical imaging, Bushberg, S.T., Seibert, J.A, Leidholt, E.M. & Boone, J.M., Baltimore: Williams & Wilkins 1st Edition (1990).

SEC-2: Practicals Based on SEC-1
(Basic Instrumentation Skill)

Total Contact Hours: 30 **Credit: 01** **Max. Marks: 50**

Learning Objectives of the Course:

i Achieve proficiency in utilizing digital multi-meters for precise measurement of DC and AC voltages, currents, and resistance.

ii Develop advanced skills in circuit tracing and troubleshooting electronic equipment, complemented by comprehensive knowledge of signal and pulse generator operation.

iii Practice effective frequency measurement techniques using oscilloscopes and demonstrate the ability to compare two frequencies through accurate oscilloscope analysis for troubleshooting and optimization purposes.

Course Outcomes (COs): After completion of the course, students will be able to –

i Employ digital multimeters for measuring DC voltages, currents, resistance, and AC voltages.

ii Acquire advanced knowledge in circuit tracing and troubleshooting techniques for electronic equipment, including understanding the operation of signal and pulse generators.

iii Conduct frequency measurements using oscilloscopes and analyze and compare two frequencies using oscilloscope analysis.

Expt. No.	Name of Experiments
01	Use of Digital multimeter for measuring dc voltages and current
02	Use of Digital multimeter for measuring Resistance, ac voltages and current
03	Circuit tracing of Laboratory electronic equipment
04	Trouble shooting a circuit
05	Study of Signal and pulse Generators
06	Frequency measurement using Oscilloscope
07	AC and DC Voltage measurement using Oscilloscope
08	Comparison of two frequencies using oscilloscope
09	Circuit tracing of Laboratory electronic equipment

SEC-2: Practicals Based on SEC-1
(Medical Physics)

Total Contact Hours: 30 **Credit: 01** **Max. Marks: 50**

Learning Objectives of the Course:

i Student develop the skill reading the medical instruments.
ii Minimization of errors and get exposure to know the idea of measurements.
iii To do handling and repairing the electrical instruments.
iv To develop the skills to touch the social awareness.

Course Outcomes (COs): After completion of the course, students will be able to –

i Acquire practical skills in healthcare monitoring, including using glucometers for blood sugar levels, stethoscopes for pulse rates, and measuring blood pressure, body temperature, weight, and oxygen levels.
ii Develop proficiency in analyzing diagnostic imaging results from X-rays, CT scans, and MRIs to draw conclusions about potential health conditions.
iii Enhance understanding of healthcare assessment techniques and diagnostic interpretation, facilitating comprehensive healthcare evaluation.

Expt. No.	Name of Experiments
01	Measure sugar level in blood using glucometer of five students in our class
02	Measure the blood pressure
03	To compare the body temperature of the students in our class using thermal gun and thermometer
04	Measure the weight of the students in our class and calculate the underweight and overweight students
05	Check the pulse rate using stethoscope of minimum five students in our class
06	Observe the film/ photograph of X-ray, CT scan, MRI and write your Conclusions
07	Measure the oxygen level with the help of oximeter and ten male and female and draw the conclusions

GE/OE-1: Everyday Physics

Total Contact Hours: 30 **Credits: 02** **Max. Marks: 50**

Learning Objectives of the Course:

i This course serves as a phenomenological introduction to physics. It aims to introduce students to physical concepts that are relevant to everyday life

ii Perform basic calculation/estimations to solve simple physics related problems.

iii Make correct judgment /decisions on physics related issues in their daily life based on basic physics principles.

Course Outcomes (COs): After completion of the course, students will be able to –

i The course imparts essential physics principles to real-world contexts, covering transportation fundamentals, sports analysis, and sustainable weather solutions.

ii Students will understand concepts such as linear and circular motion, friction, and energy/momentum, applying them to transportation and sports.

iii Additionally, they'll explore sustainable weather management and green energy technologies, gaining practical knowledge about home electricity systems.

Module No.	Topics/Actual contents of the syllabus	Contact Hours
I	**Vital life:** **Transportation:** Linear motion, Speed, velocity, acceleration, Force, Newton's laws, circular motion, friction, collision, energy and momentum *Sports:* Force, projectile motion, rotation, moment of inertia, angular Momentum	10
II	**Sustainable weather solutions** **Weather and Climate:** Energy, heat and temperature, the first law thermodynamics, energy heat transfer, black body radiation **Green Energy:** Electricity as energy, Electromagnetic Induction, thermal power generation, heat engine, nuclear power, solar power, wind power, biofuels	10
III	**Home Electricity** Electrostatics, electric potential, current, resistance, Ohm's law Kirchhoff's voltage and current laws, electric power, AC/DC voltage rectifier, motors, refrigeration, electric safety.	10

Learning Resources:

1) Conceptual Physics By Paul G. Hewitt, Pearson Education (2017)
2) Physics Beyond the Comfort Zone By Peter Watson, (2014)
3) Fundamentals of Physics with Applications By Arthur Beiser, McGraw Hill Education (2017)

SEMESTER – II

DSC-3: Optics

Total Contact Hours: 30 **Credits: 02** **Max. Marks: 50**

Learning Objectives of the Course:

i Understand light behavior in optical systems.
ii Learn light wave interference conditions.
iii Study light wave diffraction phenomena.
iv Develop problem solving skills for analyzing patterns.

Course Outcomes (COs): On completion of the course, students will be able to,

i Acquire the basic concept of optics and its applications.
ii Explain how image formation takes place in lenses
iii Understand the operations of many modern optical devices
iv Understand the optical phenomenon such as interference and diffraction

Module No.	Topics/Actual contents of the syllabus	Contact Hours
I	**Optics and Optical Instruments:** ***Optics:*** Introduction to lenses, Location of the image, sign conversions, Thin Lens, Lens Equations, Lens Makers formula, Cardinal points of optical system (Six Points) and corresponding planes, Deviation by Lens, Coaxial Lens System (equivalent focal length and cardinal points),	10
II	***Optical Instruments:*** Introduction, The Simple Magnifier, Field of View, stop and pupils, Objective and eyepiece, Need of multiple lens eye piece, Huygen's Eyepiece, Ramsden's Eye-piece, Comparison of Ramsden's eyepiece with Huygen's Eyepiece, Gauss Eye-piece, Problems	10
III	**Interference:** Introduction, Interference in thin film due to reflected and transmitted light, wedge shaped thin film, Newton's rings by reflected light, determination of wavelength, Michelson's Interferometer, type of fringes, determination of wavelength and difference in wavelength, Problems. **Diffraction:** Introduction, Types of Diffraction, Plane diffraction grating, Rayleigh's Criterion for resolution, Resolving power of prism and grating, Problems	10

Learning Resources:

1. Optics - A.R. Ganesan, 4th edition, Pearson Education.
2. A Textbook of Optics - N. Subhramanyam, Brijlal, M.N. Avadhanulu, S. Chand Publication.
3. Physical Optics - A.K. Ghatak, McMillan, New Delhi
4. Fundamental of Optics - F.A. Jenkins, H.E.White, Mc Graw-Hilll International edition
5. Principles of Optics - D.S. Mathur, Gopal Press, Kanpur.

DSC-4: Practicals Based on DSC-3
(Optics)

Total Contact Hours: 60 **Credits: 02** **Max. Marks: 50**

Learning Objectives of the Course:

i Gain hands on experience in measuring focal lengths of lenses.
ii Investigate interference, diffraction and polarization phenomena through experiments.
iii Develop skills in assembling and calibrating optical instruments.
iv Explore practical applications of optical instruments in various fields.

Course Outcomes (COs): On completion of the course, students will be able to,

i Understanding of interference and diffraction phenomena through hands-on experimentation.
ii Appreciation of practical applications of optical instruments across various scientific disciplines.
iii Proficiency in conducting precise measurements and observations using optical instruments.
iv Analyze experimental results critically and compare them with theoretical expectations.

Expt. No.	Name of Experiments
01	Study of Telescope, Microscope and Spectrometer
02	Adjustment of a spectrometer for obtaining angle of minimum deviation.
03	Measurement of a focal length of convex or concave Lenses
04	Resolving power of a telescope
05	Dispersive power of a prism
06	Dispersive power of a grating
07	To determine the focal length of two lenses by Nodal Slide and locate the position of cardinal point.
08	To determine the specific rotation of sugar solution by using Polarimeter
09	To determine the wavelength of spectral lines by using plane transmission grating.
10	Determination of wavelength of light by Newton's rings.
11	To determine refractive index of the material of prism.
12	To determine angle of prism using spectrometer.

Learning Resources:

1. B. Sc. Practical Physics – C. L. Arora (S. Chand Publications)
2. College Practical Physics – Khanna and Gulati (S. Chand Publication)
3. Practical Physics – Gupta and Kumar (Pragati Prakashan, Meerut)
4. A text book of Practical Physics – Shrinivasan and Balsubramanyam.

VSC-1: Electrical Measurements

Total Contact Hours: 15 **Credit: 01** **Max. Marks: 50**

Learning Objectives of the Course:

i Understanding fundamental concepts of electrical measurements.
ii Lear principles of operation, construction and calibration of instruments.
iii Gain proficiency in using measurement instruments to perform basic electrical measurements accurately.
iv Study the characteristics and operation of electrical devices commonly used in measurement applications.

Course Outcomes (COs): On completion of the course, students will be able to,

i Understand and apply fundamental electrical measurement concepts.
ii Gain the skill in selecting appropriate measurement methods and minimizing errors.
iii Understanding of electrical device characteristics and their role in measurement circuits.
iv Calibrate instruments and verify their accuracy against standards.

Module No.	Topics/Actual contents of the syllabus	Contact Hours
I	**Basics of Measurements and Instruments:** Accuracy, Sensitivity, Precision, resolution, reliability, repeatability, validity, errors in the measurements and their analysis, units and standards of measurement. Galvanometer, Voltmeter, Ammeter, Ohmmeter, Wattmeter, Multimeter, Oscilloscope, potentiometer, meter bridge.	05
II	**Measurement Techniques:** Measurements of voltage and current, measurements of power and energy, measurements of frequency and phase, measurement of resistance, capacitance and impedance.	05
III	**Electrical Devices:** Resistor, capacitors, PN junction diode, Zener diode, photo diode, LED, Solar cell, rectifier, amplifiers.	05

Learning Resources:

1. Electronics Instruments and Instrumentation Technology- Anand, PHI
2. Doebelin, E.O., Measurement systems, McGraw Hill, Fourth edition, Singapore, 1990.
3. A Course in Electronic and Electrical Measurements and Instrumentation, S.K. Kataria & Sons, Delhi, 2003.S

VSC-1: Electronic Communications

Total Contact Hours: 15 **Credit: 01** **Max. Marks: 50**

Learning Objectives of the Course:

i. Understanding the principles of modulation and their advantages in communication system.
ii. Learn about advantages and limitations of different modulation schemes.
iii. Learn about error detection and correction techniques used in digital communication system.
iv. Gain practical experience in designing and implementing digital communication system for transmitting binary data reliably over communication channels.

Course Outcomes (COs): On completion of the course, students will be able to,

i. Analyze the power and transmission bandwidth of Amplitude and Frequency Modulated signals.
ii. Familiarize the process of reproduction of base band signal.
iii. Analyze various pulse analog and pulse digital Modulation Techniques.
iv. Understand the transmission of binary data in communication systems.

Module No.	Topics/Actual contents of the syllabus	Contact Hours
I	**Amplitude Modulation:** Introduction to Modulation, Need for Modulation, Ordinary Amplitude Modulation – Modulation index, Side bands, AM Power, Double Side Band Suppressed Carrier Modulation, AM demodulation, Applications of AM.	05
II	**Frequency and Pulse Modulation:** Modulation index and sidebands, Principles of Phase Modulation, Frequency Modulation verses Amplitude Modulation, FM demodulation, Applications of FM. Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation, Pulse Code Modulation, Delta Modulation.	05
III	**Transmission of Binary Data in Communication Systems**: Digital Codes, Principles of Digital Transmission, Transmission Efficiency, Modem Concepts and Methods – FSK, BPSK, Error Detection and Correction.	05

Learning Resources:

1. Louis E. Frenzel, Principles of Electronic Communication Systems, 3rd Edition. Tata Mcgraw Hill.
2. Wayne Tomasi, Electronic Communications Systems, 5th Edition, Pearson Education.
3. Kennedy's Electronic Communication Systems by George Kennedy, Brendan Davis , Srm Prasanna
4. Principles of Digital Communication – Robert G. Gallager
5. Modern Digital and Analog Communication Systems – B.P Lathi & Zhi Ding
6. Electronic Communications by Dennis Roddy and John Coolen

VSC-2: Practicals Based on VSC-1
(Electrical Measurements)

Total Contact Hours: 30 **Credit: 01** **Max. Marks: 50**

Learning Objectives of the Course:

i. Develop practical skills in electrical measurements, including current, resistance, and voltage assessment in conducting wires.
ii. Enhance understanding of electronic components by collecting resistors, calculating their values, and testing circuit continuity using a digital multimeter.
iii. Gain proficiency in battery assessment techniques, including measuring voltage of various cells and determining internal resistance using a meter bridge.

Course Outcomes (COs): On completion of the course, students will be able to,

i. Student develop the skill reading the electrical instruments.
ii. Minimization of errors and get exposure to know the idea of measurements.
iii. To do handling and repair the electrical instruments.

Expt. No.	Name of Experiments
01	Measure current, resistance and voltage of any conducting wire.
02	Collect various resistors and calculates its values
03	Study the parts of digital multimeter and test the continuity of any circuit.
04	Prepare the chart/model showing resistor, capacitors, PN junction diode, Zener diode, photo diode, LED, Solar cell, rectifier, amplifiers etc.
05	Measure the voltage of Dry cell, Daniel cell, lead-acid cell.
06	Measure the internal resistance of the cell by using meter bridge

VSC-2: Practicals Based on VSC-1
(Electronic Communications)

Total Contact Hours: 30 **Credit: 01** **Max. Marks: 50**

Learning Objectives of the Course:

i. Understand the principles of modulation techniques, including Amplitude Modulation (AM) and Frequency Modulation (FM).
ii. Explore demodulation methods such as Amplitude Demodulation and Frequency Demodulation.
iii. Study various pulse modulation techniques like Pulse Width Modulation (PWM), Pulse Amplitude Modulation (PAM), Pulse Position Modulation (PPM), and Pulse Code Modulation (PCM).
iv. Investigate digital modulation techniques including Delta Modulation (DM), Frequency Shift Keying (FSK), and Binary Phase Shift Keying (BPSK).

Course Outcomes (COs): On completion of the course, students will be able to,

i. Gain a thorough understanding of modulation principles and techniques, including Amplitude Modulation (AM) and Frequency Modulation (FM), facilitating proficiency in signal modulation.
ii. Develop skills in demodulation methods such as Amplitude Demodulation and Frequency Demodulation, enabling the extraction of modulating signals from carrier waves.
iii. Acquire knowledge and practical experience in various pulse modulation techniques like Pulse Width Modulation (PWM), Pulse Amplitude Modulation (PAM), Pulse Position Modulation (PPM), and Pulse Code Modulation (PCM), enhancing abilities in signal encoding and transmission.
iv. Understand digital modulation techniques including Delta Modulation (DM), Frequency Shift Keying (FSK), and Binary Phase Shift Keying (BPSK), enabling proficiency in digital communication systems and applications.

Expt. No.	Name of Experiments
01	Study of Amplitude Modulation
02	Study of Frequency Modulation
03	Study of Amplitude Demodulation
04	Study of Frequency Demodulation
05	Study of Pulse Width Modulation (PWM)
06	Study of Pulse Amplitude Modulation (PAM)
07	Study of Pulse Position Modulation (PPM)
08	Study of Pulse Code Modulation (PCM)
09	Study of Delta Modulation (DM)
10	Study of Frequency Shift Keying (FSK)
11	Study of Binary Phase Shift Keying (BPSK)

GE/OE-2: Physics in Sports

Total Contact Hours: 30 **Credits: 02** **Max. Marks: 50**

Learning Objectives of the Course:

i Analyze Classical mechanics in sports.
ii Explore forces and torque in sports dynamics.
iii Understand the physics behind sports gear performance.
iv. Explore how environmental conditions affect performance.

Course Outcomes (COs): On completion of the course, students will be able to,

i Explain how Newton's laws relate to athletic performance.
ii Evaluate sports equipment design and performance.
iii Assess the effects of environmental conditions of athletic performance.
iv Apply strategies for optimizing performance in various conditions.

Module No.	Topics/Actual contents of the syllabus	Contact Hours
I	**Fundamentals of Physics in Sports:** Sport training principle, basic biomechanics, length, mass and time: the basic units, average speed, velocity and acceleration (bicycle racing, marathon, sprint), gravity and falling bodies without air resistance (jumping, diving, sky diving), air and water resistance (running, jumping, water diving, sky diving, scuba diving, swimming, buoyancy, eddy resistance, frontal resistance) vectors and projectile motion: two dimensional problems without air resistance (baseball, football, basketball, throwing)	10
II	**Concepts of Physics in Sports:** Force: Newton's law of motion, (used in all games and sports), Archimedes law of lever, (used in all games and sports), Friction: (Skiing, skating, ball games, skin friction in swimming) momentum conservation, collision and impact (football, motor racing, accident, tennis, baseball bating, soccer, wrestling) torque and rotation (football, throwing, blocking and tackling), rotational motion, centripetal force, centrifugal force, (bicycle racing, skating, hammer throw, motor racing)	10
III	**Applications of Physics in Sports:** Angular momentum conservation (football throwing, figure skating, diving, gymnastics) work, energy, power, (baseball pitching, diving), temperature and heat: heat loss by conduction and radiation (uniforms, Heat exhaustion), elasticity (Bungee Jumping), fluids and pressure, Bernoulli;s effect in sports (Scuba diving, Hang Gliding, sailing, swimming, snowboarding), Air and fluid resistance, drag force, terminal speed, (sky diving, auto racing), Magnus force (Baseball pitching, curve ball, slider, knuckle ball, cut fast ball, football throwing and kicking, volleyball hitting, spins in tennis table tennis and soccer) projectile motion (Baseball pitching, curve ball, ball, football throwing and kicking, volleyball hitting, spins and soccer)	10

Learning Resources:

1. Dick Franck W. et. al. (2014) Sports training principles: An introduction to sports science, Bloomsbury Publishing Plc 50 Bedford Square, London WC1B 3DP
2. Dick Frank W. (2015), Sports Training Principles: An Introduction to Sports Science, Six Edition, Bloomsbury Publishing Plc 50 Bedford Square, London WCIII 3DP
3. G. Suryakant, (2020). Sports Mathematics, Chinmay Publication, Aurangabad
4. Payton Carl & Bartlett Roger, (2007), Biomechanical Evaluation of Movement in Sports and Exercise: The British Association of Sports and Exercise Sciences Guide (BASES Sports Exercise Science), Routledge Taylor & Francis Group New York 270 Madison Ave, New York,
5. McGinnins Peter M. (2013) Bio-Mechanics of sports and exercise, Third Edition, Human Kinetic Publication, 1607, N Market Street, P. O. Box 5076 Champaign, IL61825-5076. United States.
6. Vassilos McLnnes Spathopoulos, (2013), An introduction to Physics of Sports.
7. Michale Lisa, (2015), Gold Medal Physics, The Science of Sports, John Hopkins.

Basket 1: List of Major subjects in Science (DSC)

Students willing to pursue their bachelors in the **Faculty of Science and Technology** shall choose any three subjects (from the following options) as Major 1, Major 2 and Major 3 (Based on the available options in the respective college)

Semester	Sr No	BOS / Ad hoc Board proposing thecourse	Title of the Corse
1st and 2nd Semester (Students shall choose any three subjects (from these options) as Major 1, Major 2 and Major 3 (Based on the available options in the respective college)	1	BOS in Botany	Botany
	2	BOS in Chemistry	Chemistry
			Analytical Chemistry
			Polymer Chemistry
	3	BOS in Mathematics	Mathematics
	4	BOS in Physics	Physics
			Non-Conventional and Conventional Energy
			Instrumentation Practice
	5	BOS in Zoology	Zoology
	6	BOS in Electronics	Electronics
	7	BOS in Fishery Science	Fishery Science
	8	BOS in Microbiology	Microbiology
	9	Ad Hoc Board in Statistics	Statistics
	10	Ad hoc Board in Industrial Chemistry	Industrial Chemistry
	11	Ad hoc Board in Dairy Science & Technology	Dairy Science & Technology
	12	Ad hoc Board in Biotechnology and Bioinformatics	Biotechnology
			Bioinformatics
	13	Ad hoc Board in Biochemistry	Biochemistry
	14	Ad hoc Board in Home Science	Home Science
	15	Ad Hoc Board in Agrochemical Fertilizers, Horticulture, Dry land Agriculture	Agrochemical Fertilizers
			Horticulture
	16	Ad hoc Board in Forensic Science	Forensic Science
			Forensic Science & Cyber Security
	17	Ad Hoc Board in Computer Science	Computer Science
			Computer Application
			Information Technology
			Data Science
	18	Ad Hoc Board in Networking and Multimedia	Networking and Multimedia
	19	Ad Hoc Board in Environmental Science	Environmental Science
	20	BOS in Fishery Science	Fishery Science

	21	Ad hoc Board in Automobile Technology / Workshop Technology / Refrigeratorand Air Conditioning	Automobile Technology
			Workshop Technology
			Refrigerator and Air Conditioning
	22	Ad hoc Board in Geology	Geology