AC – 20/05/2025
Item No. – 6.11 (R) (a)

As Per NEP 2020

I

University of Mumbai

Syllabus for Basket of Open Electives	
Faculty of Science	
Board of Studies in Physics	
UG First Year Programme:	
Semester	**I**
Title of Paper	**Credits**
1) Wonders of Physics – I **OR** **2) Wonders of Physics – II**	**2**
From the Academic Year	**2025-26**

SEM. - I

Syllabus of Scheme II
F. Y. B. Sc. Physics – Open Electives
(Semester- I)

Name of the Course: Physics – Open Elective Course 1
OE I: Wonders of Physics - I (2 Credits)

Sr. No.	Heading	Particulars
1.	**Description the course: (Including but not limited to**)	Introduction, relevance, Usefulness, Application, interest, connection with other courses, demand in the industry, job prospects etc.
2.	**Vertical:**	Major / Minor / **Open Electives** / Skill Enhancement / Ability Enhancement / Indian Knowledge System
3.	**Type:**	Theory
4.	**Credit**:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5.	**Hours Allotted:**	**30 Hours**
6.	**Marks Allotted**:	**50 Marks**
7.	**Course Objectives**: The students are expected to:	
	CO 1	understand the historical development of science, fundamental physics concepts.
	CO 2	recognize the significance of physics in understanding reality. Familiarize with cosmological models and tools. Grasp the big bang model and fine-tuned universe.
	CO 3	recognize cause-and-effect principles in cosmology.
8.	**Course Outcomes**: On successful completion of this course students will be able to:	
	OC 1	understand Aristotle's Criticism of Plato and Early Ontology, Aristotle's Philosophy of Nature (Physics)
	OC 2	understand Metaphysics as "First Philosophy", Ancient Texts and Terminology, major Milestones in the History of Cosmology
	OC 3	explain the Big Bang Theory and Its Significance, Fine-Tuning of Physical Constants for Life, Recent Discoveries Related to the Solar System and Cosmological Distances. Understand the Life Cycle of Massive Stars, Including Supernovae and Black Holes
9.	**Modules / Units**: - There will be One module / Unit Per Credit	
	Module / Unit - I: Science **(15 Lectures)**	
	Introduction, Aristotelian science, Science - tracing back its origin, what is physics, why physics, the three fundamental entities of reality –Space, time and matter.	
	Module / Unit-II: Space **15 Lectures)**	
	1. **Universe by design:** From backyard to the big bang – A brief history of cosmology; world-views in science and cosmological models, twentieth century cosmology, more recent developments in cosmology, tools for explaining the universe, the big bang model, fine-tuned universe, the law of cause and effect, A pale blue dot but a privileged planet.	

<table>
<tr><td></td><td colspan="3">2. Frontiers of Astronomy: From dawn to dusk, exploring the night sky, recent discoveries in the solar system, other worlds, cosmological distance and measurements, death of massive stars – supernova and black holes</td></tr>
<tr><td>10.</td><td colspan="3">Reference Books:
1. Aslamazov, L. G., Varlamov, A. (2001). The Wonders of Physics. Singapore: World Scientific Publishing Company.
2. Hoyle, F. (1955). Frontiers of Astronomy. United Kingdom: Harper.
3. Concepts of Matter in Science Education. (2013). Netherlands: Springer Netherlands.</td></tr>
<tr><td>11.</td><td colspan="3">Individual Passing in Internal and External Examination</td></tr>
<tr><td>12.</td><td colspan="2">Internal Continuous Assessment (40%)
(20 Marks)</td><td>External Assessment, (60%)
(30 Marks)</td></tr>
<tr><td></td><td colspan="2">Continuous Evaluation through:
Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc. (at least 3)</td><td>Evaluation: through Exam at the End of the Semester / Term.</td></tr>
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Duration of the Term End Examination: One Hour</td></tr>
<tr><td></td><td>Unit - I (15 Marks)</td><td colspan="2">Q.1 A) Attempt any Two 10 Marks
i) Theory
ii) Theory
iii) Theory
iv) Theory
B) Attempt any One 05 Marks
i) Problem / Theory
ii) Problem</td></tr>
<tr><td></td><td>Unit – II (15 Marks)</td><td colspan="2">Q.2 A) Attempt any Two 10 Marks
i) Theory
ii) Theory
iii) Theory
iv) Theory
B) Attempt any One 05 Marks
i) Problem / Theory
ii) Problem</td></tr>
</table>

Name of the Course: Physics – Open Elective Course 1
OE I: Wonders of Physics - II (2 Credits)

Sr. No.	Heading	Particulars
1.	**Description the course: (Including but not limited to**)	Introduction, relevance, Usefulness, Application, interest, connection with other courses, demand in the industry, job prospects etc.
2.	**Vertical:**	Major / Minor / **Open Electives** / Skill Enhancement / Ability Enhancement / Indian Knowledge System
3.	**Type:**	Theory
4.	**Credit**:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5.	**Hours Allotted:**	**30 Hours**
6.	**Marks Allotted**:	**50 Marks**
7.	**Course Objectives**: The students are expected to:	
	CO 1	comprehend SI units for physical quantities and investigate time measurement using atomic clocks.
	CO 2	explore time constants and their role in physics and astronomy.
	CO 3	understand matter-energy relationships, wave-particle duality and logical
	CO 4	explore the wonders of the universe and practical applications.
8.	**Course Outcomes**: On successful completion of this course students will be able to:	
	OC 1	Demonstrate Knowledge of SI Units and Their Relevance in Scientific Measurements, Time-Related Concepts to Solve Practical Problems
	OC 2	Evaluate Philosophical Implications of Materialism. Connect Physics Concepts to Real-World Applications
9.	**Modules / Units**: - There will be One module / Unit Per Credit	
	Module / Unit - I: Time **(15 Lectures)**	
	1. A Physical quantity: The International System (SI) of measurement for physical quantities, the unit of time, measuring time with atomic clocks, Determining position with the aid of precise time measurements, shortest and longest time-span, Time constants and periods, Time constants and oscillation periods in physics, Time in astronomy, Time in biological systems, other aspects of physical time. **2. An anthropological quantity:** Introduction, Attributes of time, application of information science in interpreting time, the five levels of time, eternity, ideas of eternity among people, sense of eternity among people.	
	Module / Unit-II: Matter and Love of Physics **15 Lectures)**	
	1. Matter: Properties of matter, Matter and energy, wave particle duality, logic and physics, materialism, the equation of life and death, Erwin Schrödinger and the birth of information science. **2. Love of Physics:** Powers of ten, from nucleus to deep space; measurements, uncertainties and stars, bodies in motion, the rainbow, harmonies of strings and winds, wonders of electricity, mysteries of magnetism, energy conservation, physical phenomena in living	

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1. Concepts of Matter in Science Education. (2013). Netherlands: Springer Netherlands.
2. Lewin, W., Goldstein, W. (2011). For the Love of Physics: From the End of the Rainbow to the Edge of Time - A Journey Through the Wonders of Physics. India: Free Press.</td></tr>
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B) Attempt any One 05 Marks
i) Problem / Theory
ii) Problem</td></tr>
</table>

Letter Grades and Grade Points:

Semester GPA/ Programme CGPA Semester / Programme	% of Marks	Alpha-Sign / Letter Grade Result	Grading Point
9.00 - 10.00	90.0 - 100	**O** (Outstanding)	10
8.00 < 9.00	80.0 < 90.0	**A+** (Excellent)	9
7.00 < 8.00	70.0 < 80.0	**A** (Very Good)	8
6.00 < 7.00	60.0 < 70.0	**B+** (Good)	7
5.50 < 6.00	55.0 < 60.0	**B** (Above Average)	6
5.00 < 5.50	50.0 < 55.0	**C** (Average)	5
4.00 < 5.00	40.0 < 50.0	**P** (Pass)	4
Below 4.00	Below 40.0	**F** (Fail)	0
Ab (Absent)	-	**Ab** (Absent)	0

Sd/-

Sign of the BOS Chairman
Dr. T.N. Ghorude
Board of Studies in Physics

Sd/-

Sign of the
Offg. Associate Dean
Dr. Madhav R. Rajwade
Faculty of Science & Technology

Sd/-

Sign of the
Offg. Dean
Prof. Shivram S. Garje
Faculty of Science & Technology