

DEPARTMENT OF PHYSICS				CLASS: I M.Sc. Physics				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	NME	21P1PNM1	Astrobiology	2	2	25	75	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

Course Objectives :

- To introduce the students to the interdisciplinary field of Astrobiology.
- To make the students appreciate the scope of astrobiology in light of our understanding of life, as we know it in the present form and the on the basis of discovery of exoplanets in the habitable zone.
- To appreciate the origin of life and environment of our earth and extrapolate the findings to our solar system.

Course Content :

Unit	Description	Hours	K-level	CLO
I	Astronomy and Astrobiology : Introduction - Life from the perspective of physics - the bare necessities of life - Basic astronomy - Formation of stars and galaxies - nucleosynthesis - HR diagram - spectral classification of stars - theory of formation of planets - the age of earth and moon.	7	Up to K2	1
II	Origin of life and environment : The early earth - origin of life - signs of earliest life - role of atmosphere - the great oxidation event - advent of animal life - snowball earth - occurrence of advanced life	8	Up to K2	2
III	Life in the solar system : Habitable bodies in the solar system - Sunlight's effect on habitability of inner planets - Life on venus - early atmosphere and climate on mars - Interest on europa and titan	6	Up to K2	3
IV	Life outside solar system : Hunt for exoplanets (astrometry, stellar doppler shift, transit telemetry, gravitational microlensing) - the habitable zone - biosignatures	5	Up to K2	4
V	Extraterrestrial Intelligence : Drake's equation - SETI - Fermi's paradox - Rare earth hypothesis	4	Up to K2	5

Books for study :

1. Astrobiology : A Very short introduction, David C. Catling, Oxford University Press, 2013.

Unit I : Chapter 1 : Pages 1-2, 6-12; Chapter 2 : 14-27

Unit II : Chapter 3 : Pages 28 - 37, 39-43; Chapter 4 : 44-59

Unit III : Chapter 6 : Pages 82-88, 94-96, 100-106

Unit IV ; Chapter 7 : Pages 110 - 119

Unit V : Chapter 7 : 120-124, Chapter 8 : 125-127

Web Resources:

1. https://www.terc.edu/terc_products/astrobiology-an-integrated-science-approach/

2. <https://guides.lib.uw.edu/c.php?g=341353&p=2303542>

3. <http://astrobiology.com/>

Pedagogy :

Chalk and talk, Presentation, Quiz, Seminar, Assignment

Course Designers :

S. Sivaramakrishnan

Course Plan :

Unit	Topics	Hrs	Mode
I	Introduction - Life from the perspective of physics - the bare necessities of life	2	Chalk and talk, Presentation, Quiz and assignment
	Basic astronomy - Formation of stars and galaxies - nucleosynthesis - HR diagram - spectral classification of stars - theory of formation of planets - the age of earth and moon.	3	
		2	
II	The early earth	2	Chalk and talk, Quiz and assignment
	origin of life - signs of earliest life	3	
	role of atmosphere - the great oxidation event - advent of animal life - snowball earth - occurrence of advanced life	3	
III	Habitable bodies in the solar system - Sunlight's effect on habitability of inner planets	2	Chalk and talk, Quiz,
	Life on venus - early atmosphere and climate on mars -	2	
	Interest on europa and titan	2	
IV	Hunt for exoplanets	3	Chalk and talk, quiz, Seminar
	the habitable zone - biosignatures	2	
V	Extraterrestrial Intelligence	3	Chalk and talk, Quiz,
	Rare earth hypothesis	1	

Course learning Outcomes:

On the successful completion of the course, the students will be able to

CLOs	Course Learning Outcomes	Knowledge Level
CLO-1	Understand the origin of universe and its evolution	Up to K2
CLO-2	Explain the early universe and appreciate the factors that led to the occurrence of advanced life on earth.	Up to K2
CLO-3	Comprehend the idea of habitability and identify objects in the solar system that can / could have harboured life.	Up to K2
CLO-4	Understand the techniques used to detect exoplanets and look for biosignatures.	Up to K2
CLO-5	Understand Drake's equation and its implication to extra terrestrial intelligent life forms.	Up to K2

Mapping of CLOs with PSOs :

#	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	3				1
CLO2	3				1
CLO3	3				1
CLO4	3				1
CLO5	3				1

Advance application –3, Intermediate level –2 , Basic level–1

Learning Outcome Based Education & Assessment (LOBE)
Blue Print
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section – A		Section – B		Section – C	
			Short Answers		(Either / or Choice)		(Open Choice)	
			No. of Questions	K-Level	No. of Questions	K-Level	No. of Questions	K-Level
1	CLO 1	Up to K2	1	K1	1	K2/K2	1	K1
2	CLO 2	Up to K2	1	K1	1	K2/K2	1	K1
3	CLO 3	Up to K2	1	K1	1	K2/K2	1	K1
4	CLO 4	Up to K2	1	K1	1	K2/K2	1	K1
5	CLO 5	Up to K2	1	K1	1	K2/K2	1	K1
No. of Questions to be asked			5		5		5	
No. of Questions to be answered			5		5		3	
Marks for each question			2		7		10	
Total Marks for each section			10		35		30	

Distribution of Section-Wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (No Choice)	Total Marks	% of Marks (without choice)	Consolidated
K1	10	-	50	60	46.15	100
K2	-	70	-	70	53.85	
K3	-	-	-	-	-	-
K4	-	-	-	-	-	-
Total Marks	10	35	50	130	100.00	100

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers