COURSE TITLE	INDIAN ASTRONOMY AND MATHEMATICS
COURSE CODE	02PY0292
COURSE CREDITS	3

Objective:

1 To provide information about great mathematicians and astronomers who given significant contribution in Indian mathematics and astronomy.

2 Understand the basic concepts of Vedic and Post Vedic theories.

Course Outcomes: After completion of this course, student will be able to:

1 Gain knowledge about the mathematicians and astronomers who have given contributed in the society.

2 Understand the basic concepts of Vedic and Post Vedic theories

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	0	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**The Introduction to Ancient Mathematics & Astronomy** Introduction to Brief introduction of inception of Mathematics & Astronomy from vedic periods. Details of different authors who has given mathematical & astronomical sutra (e.g. arytabhatta, bhaskara, brahmagupta, varamahira, budhyana, yajanvlkya, panini, pingala, bharat muni, sripati, mahaviracharya, madhava, Nilakantha somyaji, jyeshthadeva, bhaskara-II, shridhara) , Periodical enlisting of Mathematical & Astrological achievement in India. Evolution of Indian Numerals (Brahmi (1st century), Gupta (4th century) & Devanagri Script (11th century)	6
2	**Ancient Mathematics –I** Veda & Sulvasutras (Pythagoras theorem, Square root & Squaring Circle) (baudhayana sulbhasutra, apastamba sulbhasutra, katyayana sulbhasutra, manava sulbhasutra, maitrayana sulbhasutra, Varaha sulbhasutra, vadhula sulbhasutra Pingala's chandasutras, sunya, yaat -tavat, Aryabhata (Aryabhatiya, Asanna, ardha-jya, kuttaka,), Bhaskara (trigonometory,shridhara, mahavira), Bhaskara Acharya (Sidhantashiromani), Varamahira panchasiddhantika.	9

Contents : Unit	Topics	Contact Hours
3	**Ancient Mathematics –II** Brahamgupta (vargaprakrati, bhramasphuta siddhanta, bhavana), ayatavrtta, ganitasarasamgraha, lilavathi, Ganesadaivajna, randavantika, suryasidhhanta, grahalaghava, sadratnamala, mandavrtta, sighrartta, Bijaganita, Bakshali manuscript, Golavada, Madhyamanayanaprakara, Mahajyanayanaprakara (Method of Computing Great Sines), Lagnaprakarana, Venvaroha, Sphutacandrapti, Aganita-grahacara , Chandravakyani (Table of Moon-mnemonics)	9
4	**Ancient Astronomy –I** Parahita system of astronomy and drk system of astronomy, Manda samskara, sighra samskara. Vedanga Jyotisha (astronomical calculations, calendrical studies, and establishes rules for empirical observation), Aryabhatiya (earth rotation, shining of moon), Brahmasphutasiddhanta (motion of planets), Varahmihira (pancasiddhantika), Mahabhaskariya, lahubhaskariya & arybhatiya bhashya (Planetary longitudes, heliacal rising and setting of the planets, conjunctions among the planets and stars, solar and lunar eclipses, and the phases of the Moon), Sisyadhiveddhida (grahadhyaya, goladhyaya), siddhantasiromani, karanakutuhala (planetary positions, conjunctions, eclipses, cosmography), siddhantasekhara, yantra-kirnavali, Sphu?anir?aya, Uparagakriyakrama.	9
5	**Ancient Astronomy –II** Positional astronomy (sun, planets, moon, coordinate systems, precision of the equinox and its effects, eclipses, comets and meteors), Mahayuga & Kalpa system Yuga system, Ayanas, months, tithis and seasons, time units, sun and moon's motion, planet position, ayanachalana, zero-precision year, katapayaadi system, Indian nakshatra system, astronomy, Instruments for naked eye astronomy (vedic observatories). The principal and application of Samrat Yantra, Jai Prakash Yantra, Disha Yantra, Rama Yantra, Chakra Yantra, Rashiwalya Yantra, Dingash Yantra, Utaansh Yantra	9
Total Hours		**42**

Textbook :

1 Glimpse of Indian Engineering and Technology (Ancient & Medieval period, R P Kulkarni, Manoharlal Publishers Pvt. Ltd. , 2018

2 Science and Technology in India, AK Pathak, Anshika prakashan pratapgarh, 2016

3 Indian Scientific Traditions, NVP, Unithiri, University Of Calicut, 2006

4 Indian science and technology in the eighteen century, Dharmpal, Academy of Gandhian Studies, 1983

5 Vedic Science and technology, S Biswal, B L Ray, DK Print world, 2009

References:

1   Ganita-Yukti-Bha?a (Rationales in Mathematical Astronomy) of Jye??hadeva, Ganita-Yukti-Bha?a (Rationales in Mathematical Astronomy) of Jye??hadeva, K.V. Sarma , K. Ramasubramanian , M. D. Srinivas , M. S. Sriram, Springer London, 2009

2   Indian Mathematics and Astronomy: Some Landmarks (Revised Third Edition), Indian Mathematics and Astronomy: Some Landmarks (Revised Third Edition), Dr.S.Balachandra Rao , Bharathiya Vidya Bhavan, 2012

3   Indian Mathematics: Engaging with the World from Ancient to Modern Times, Indian Mathematics: Engaging with the World from Ancient to Modern Times, George Gheverghese Joseph, Speaking Tiger, 2016

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking
20.00	30.00	25.00	15.00	10.00	0.00

Instructional Method:

1   The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2   The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3   Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

Supplementary Resources:

1   https://www.youtube.com/@CentreforIndicStudies