

University of Mumbai



No.AAMS(UG)/ 71 of 2021-22
Mumbai-400 032,
24th September, 2021.

To,
Co-Ordinator,
Charitrakar Padma Bhushan Dr.Dhananjay Keer,
Sub -Centre, Ratnagiri,
University of Mumbai,
P-61, MIDC, Mirjole
Ratnagiri – 415 639

Madam/Sir,

I am to invite your attention to Ordinances, Regulations and Syllabus relating to the **Certificate Course in Astronomy** and to inform you that the resolution passed by the Board of Deans at its meeting held on 28th June, 2021 vide item No. 5 have been accepted by the Academic Council at its meeting held on 29th June, 2021 vide item No. 9.19 and that in accordance therewith, for O.6719 & O.6720 relating to the **Certificate Course in Astronomy**, has been introduced and accepted by the Hon'ble Vice Chancellor as per the power confirmed upon him under Section 12(7) of the Maharashtra public Universities Act, 2016, has been brought into force with effect from the academic year 2021-22, accordingly. (The same is available on the University's website www.mu.ac.in).

MUMBAI – 400 032
24th September, 2021


(Dr. B.N. Gaikwad)
I/c REGISTRAR

A.C/5.19/29/06/2021

No. AAMS (UG)/71 of 2021

MUMBAI-400 032

24th September, 2021

Copy forwarded with Compliments for information to:-

- 1) The Chairman, Board of Studies,
- 2) The Director, Board of Examinations and Evaluation,
- 3) The Director, Board of Students Development,
- 4) The Co-ordinator, University Computerization Centre,


(Dr. B.N. Gaikwad)
I/c REGISTRAR

University of Mumbai

ordinance, Regulations and Syllabus related to the

CERTIFICATE COURSE IN ASTRONOMY

Title of Course

O. 6719

Certificate Course in ASTRONOMY

Eligibility

O. 6720

Candidate who has passed 10+2 examination in Arts/ Science/ Commerce or equivalent.

Duration of Course

6 months (July to September, January to March)

Intake Capacity:

R. 9462

Maximum 40 in each batch.

Teachers:

Graduate with teaching experience in astronomy workshops

Fees - R. 9463

2500/-

Examination

(Final exam – 75, CIE – 25)

Theory (Final paper of 60 converted in to 45, Three tests on three Units – 15) total 60

Practical (Final exam of 30 mark, Two evaluation sessions each after end of Unit – 10) total 40

Standards of Passing of Examination

Separate passing (40%) for theory and practical

0 – 39 – F

40 – 49 – D

50 – 59 – C

60 – 69 – B

70 – 79 – A

80 – 100 – O

Pedagogy (Instructional System)

Blended (Theory - Online 60%, Offline 40%

Practical - Offline 100%)

Budget:

40 students X 2500/- = 1,00,000/-

Theory lectures 36 X 1000/- = 36000/-

Practical sessions (2 batches)

6 X 2 X 1000/- = 24000/-

Traveling 5000/-

Equipment/Maintenance 10000/-

Stationary 5000/-

Administrative charges 5000/-

Miscellaneous 10000/-

Exam expenses 5000/-

Copy to :-

- 1. The Deputy Registrar, Academic Authorities Meetings and Services (AAMS),**
- 2. The Deputy Registrar, College Affiliations & Development Department (CAD),**
- 3. The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Department (AEM),**
- 4. The Deputy Registrar, Research Administration & Promotion Cell (RAPC),**
- 5. The Deputy Registrar, Executive Authorities Section (EA),**
- 6. The Deputy Registrar, PRO, Fort, (Publication Section),**
- 7. The Deputy Registrar, (Special Cell),**
- 8. The Deputy Registrar, Fort/ Vidyanagari Administration Department (FAD) (VAD), Record Section,**
- 9. The Director, Institute of Distance and Open Learning (IDOL Admin), Vidyanagari,**

They are requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to in the above circular and that on separate Action Taken Report will be sent in this connection.

- 1. P.A to Hon'ble Vice-Chancellor,**
- 2. P.A Pro-Vice-Chancellor,**
- 3. P.A to Registrar,**
- 4. All Deans of all Faculties,**
- 5. P.A to Finance & Account Officers, (F.& A.O),**
- 6. P.A to Director, Board of Examinations and Evaluation,**
- 7. P.A to Director, Innovation, Incubation and Linkages,**
- 8. P.A to Director, Board of Lifelong Learning and Extension (BLLE),**
- 9. The Director, Dept. of Information and Communication Technology (DICT) (CCF & UCC), Vidyanagari,**
- 10. The Director of Board of Student Development,**
- 11. The Director, Department of Students Welfare (DSD),**
- 12. All Deputy Registrar, Examination House,**
- 13. The Deputy Registrars, Finance & Accounts Section,**
- 14. The Assistant Registrar, Administrative sub-Campus Thane,**
- 15. The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan,**
- 16. The Assistant Registrar, Ratnagiri sub-centre, Ratnagiri,**
- 17. The Assistant Registrar, Constituent Colleges Unit,**
- 18. BUCTU,**
- 19. The Receptionist,**
- 20. The Telephone Operator,**
- 21. The Secretary MUASA**

for information.

UNIVERSITY OF MUMBAI



Syllabus for the **Certificate Course in Astronomy**

(to be introduced with effect from the academic year 2021-22)

UNIVERSITY OF MUMBAI



Syllabus for approval

1	Title of the Course	Certificate Course in Astronomy
2	Eligibility for admission	Candidate who has passed 10+2 examination in Arts/ Science/ Commerce or equivalent.
3	Intake Capacity	Maximum 40 in each batch.
4	Passing Marks	40 % in each head of passing
5	Selection	Merit based after notification of commencement of the course.
6	Credits	04
7	Duration	06 Months
8	Number of Lectures	60 (each of 1 hr)
9	Fee Structure	2500/- (Includes tuition fee, teachers remuneration, infrastructural expenses, exam fee etc.)
10	Teaching Faculty Qualification	As per UGC guidelines (Graduate with teaching experience in astronomy workshops)
11	Remuneration of Teacher	Theory – 1000/- per lecture (1 hr) Practical – 1000/- per session, per batch (3 hr)
12	Centre	Any College/ Department/ Institute under purview of University of Mumbai
13	Level	Certificate
14	Pattern	Semester
15	Evaluation / Exam pattern	(Final exam – 75, CIE – 25) Theory (Final paper of 60 converted in to 45, Three tests on three Units – 15) total 60 Practical (Final exam of 30 mark, Two evaluation sessions each after end of Unit – 10) total 40 Separate passing (40%) for theory and practical

		0 – 39 – F 40 – 49 – D 50 – 59 – C 60 – 69 – B 70 – 79 – A 80 – 100 – O
16	Medium of Instruction	English / Marathi (bilingual)
17	Mode of communication	Blended (Theory - Online 60%, Offline 40% Practical - Offline 100%)
18	Status	To be implemented from academic year 2021-22

Date
Name of BOS Chairperson / Dean -

Signature

University of Mumbai
Ordinance, Regulations and Syllabus related to the

CERTIFICATE COURSE IN ASTRONOMY

Title of Course	Certificate Course in ASTRONOMY
Eligibility	Candidate who has passed 10+2 examination in Arts/ Science/ Commerce or equivalent.
Duration of Course	6 months (July to September, January to March)
Intake Capacity:	Maximum 40 in each batch.
Teachers:	Graduate with teaching experience in astronomy workshops
Fees	2500/-

Examination

(Final exam – 75, CIE – 25)
Theory (Final paper of 60 converted in to 45, Three tests on three Units – 15) total 60
Practical (Final exam of 30 mark, Two evaluation sessions each after end of Unit – 10) total 40

Standards of Passing of Examination

Separate passing (40%) for theory and practical
0 – 39 – F
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70 – 79 – A
80 – 100 – O

Pedagogy (Instructional System)

Blended (Theory - Online 60%, Offline 40%

Practical - Offline 100%)

Budget:

40 students X 2500/- = 1,00,000/-

Theory lectures 36 X 1000/-	= 36000/-
Practical sessions (2 batches)	
6 X 2 X 1000/-	= 24000/-
Traveling	5000/-
Equipment/Maintenance	10000/-
Stationary	5000/-
Administrative charges	5000/-
Miscellaneous	10000/-
Exam expenses	5000/-

Certificate Course in Astronomy:

Preamble:

Cultural development of India is based on number of astronomical observations. Also the development of science is from astronomy. Sky, motion of planets on the background of constellations had initiated the scientific awareness among observers. The systematic study of the astronomy is essential to channelize the curiosity about sky. Scientific awareness and cultural values can be inculcated among the learners through such astronomy course.

Necessity of Starting this course:

Astronomy is the basis stream of all sciences. It is a branch through which scientific awareness and other moral values may be inculcated in the minds of citizen. The habit of Keen observations, information about general scientific terminologies enrich the learner.

Objectives:

1. To explore the composition of the universe and solar system.
2. To reveal the truths and dispel the myths related to the astronomy.
3. To explore cultural references with reference to the astronomical events.
4. To motivate Students to pursue career in Astronomy.

Corse Outcomes:

1. Learner will know the composition of the universe and solar system.
2. Learner will have scientific awareness and will be aware about astronomical truth and myths.
3. Learner will know the relation between cultural references and the astronomical events.
4. Learner will be motivated to pursue career in Astronomy.

1. Necessity of Starting this course:

Astronomy is the basis stream of all sciences. It is a branch through which scientific awareness and other moral values may be inculcated in the minds of citizen. The habits of Keen observations, information about general scientific terminologies enrich the learner.

2. Whether UGC has recommended to start the said Course?

UGC has given guidelines for introduction of career oriented courses (<https://www.ugc.ac.in/oldpdf/xiplanpdf/revisedcareerorientedcourses.pdf>).

Universities are allowed to run the diploma / certificate courses and with due approval of its governing councils/ statutory council wherever required (Ref: <https://www.ugc.ac.in/faq.aspx>). However, u/s 5(16) under Maharashtra Public Universities Act, 2016 (Mah. Act No. VI of 2017), Universities are empowered to start to prescribe the courses of instruction and studies in choice based credit system for the various examinations leading to specific degrees, diplomas or certificates in a stand-alone format or joint format with other State or national or global universities.

3. Whether all the courses have commenced from academic year 2021-22?

The above certificate course recommended by the BoS in "Lokmanya Tilak Study and Research Center, University of Mumbai" and further approved by the statutory bodies is to be introduced from the Academic Year 2021-2022.

4. The courses started by the University are self-financed, whether adequate number of eligible permanent Faculties are available?

The certificate course is purely self-financed. The department/affiliated colleges interested in its affiliation need to comply with the norms laid down as above.

5. To give details regarding duration of the course and is it possible to compress the course?

The duration of the course is maximum 6 month {6 Months (July-December /January-June)} with total 60 contact hours consist of maximum 4 Credits on completion of total 60 hours.

6. The intake capacity of each course and no. of admissions given in the current academic year (2021-22)

The intake capacity is set to maximum 40 students per batch.

7. Opportunities of employability/employment available after undertaking these courses:

This course will be very useful for self-employability. The candidate completing this course may start popular talks at school, colleges and for citizens too. Konkan being a tourist place, and taking advantage of less light polluted sky, the candidate may arrange the sky watching sessions for tourist. After getting the knowledge of basic astronomy through this course, candidate may look after advanced studies in astronomy.

University of Mumbai

CERTIFICATE COURSE IN ASTRONOMY

Total Hours: 60 hours

Syllabus:

Theory:

Unit 1 (12 hr)

- Introduction to calendar, Gregorian calendar, calendar adjustments, national calendar, year types.
 - Astronomical reference circles, Solar path, Equinox (Vernal, Autumnal), Ecliptic system, Celestial Equatorial system, Horizon system, Summer Solstice, Winter Solstice.
 - Methods of determining the position of planets and stars- Map reading. Sun signs-according to constellations and mathematics, Constellations.
 - Planetary orbits, Sidereal period, Synodic period, Conjunction, Opposition, Elongation, Retrograde motion, Planet appearance..
 - Almanac: Lunar path, Lunar month, concept of Tithi, Makar Sankranti,
-
- कॅलेंडर गमती, ग्रेगोरियन कॅलेंडर, कॅलेंडर समायोजन, राष्ट्रीय कॅलेंडर, वर्ष प्रकार
 - खगोलावरील संदर्भ वर्तुळे, सूर्य भ्रमण, संपात बिंदू (वसंत, शरद), आयनिक वृत्त पद्धत, वैषुविक वृत्त पद्धत, क्षितीज पद्धत, उत्तरायण आणि दक्षिणायन
 - ग्रह आणि तारे यांचे स्थान निश्चित करण्याच्या पद्धती- नकाशा वाचन, राशी - तारकात्मक आणि गणितात्मक, नक्षत्रे
 - ग्रह परिभ्रमण, नाक्षत्रकाळ, सांवसिक काळ, युती, प्रतियुती, इनान्तर, वक्री गती, ग्रह दर्शन
 - पंचांग: चंद्र भ्रमण, चांद्रमहिना, तिथी, मकर संक्रांत

Unit 2 (12 hr)

- Telescope Introduction, Types of telescopes - reflecting and refracting, Principle and working of reflecting and refracting telescopes, Types of telescope mounts, Binocular, Eyepieces and types, Prisms, Filters, CCD and other detectors.
- Astronomical phenomenon: Lunar phases, Eclipses and types, Review of Retrograde-Conjunction-Opposition, Occultation, Transits, difference between occultation and eclipse, Comet passing, Various phenomenon observed on earth, Tides.
- Solar System: Sun and Planets, Formation, Various Objects in solar system and their specifications, Sun (Atmosphere, spots, flares, corona, etc.), Earth

(Latitude, Longitude, Poles , magnetic and Geometric axis, Aurora, Moon),
Titius – Bode Law.

- दुर्बिणीची ओळख (Telescope), दुर्बिणीचे प्रकार -परावर्तित आणि खंडित, प्रकारानुसार दुर्बिणीचे तत्व आणि कार्य, दुर्बिण माउंटचे प्रकार, दुर्बिण (Binocular), आयपीस आणि प्रकार, प्रिझम, फिल्टर, सीसीडी आणि इतर डिटेक्टर
- अवकाशीय घटना: चंद्राच्या कला , ग्रहण आणि प्रकार, पुनरावलोकन- ग्रहांचे वक्री होणे- युती-प्रतियुती, ऑकलटेशन, संक्रमण, ऑकलटेशन आणि ग्रहण यामधील फरक, धूमकेतू, पृथ्वीवर घडणाऱ्या निरनिराळ्या घटना, भरती-ओहोटी
- सूर्यमाला: सूर्य आणि ग्रह, निर्मिती, सूर्यमालेतील विविध घटक आणि त्यांची वैशिष्ट्ये, सूर्य (वातावरण, डाग, फ्लेअर, प्रभामंडळ), पृथ्वी (अक्षांश, रेखांश, ध्रुव, चुंबकीय आणि भूमितीय अक्ष, अरोरा, चंद्र), टायटियस - बोडेचा सिद्धांत

Unit 3 (12 hr)

- Stars and their properties: Formation, Evolution, Death of star (White dwarf, Neutron and Pulsars, Black holes, Supernova), Magnitude of star, Star distances, HR-diagram, Types of stars cluster, Parallax, Magnitude scale - Apparent and Absolute, Binary system and types, Exo-planets.
 - Galaxy: Hubble fork, Mass - Luminosity Ratio, Distance between stars in a galaxy and distance between galaxies, Galactic Centre and Motion of Saggiarius A, Milky way and Magellanic clouds, Clusters and Super clusters.
 - Cosmology: Hubble's law, Olbers Paradox, Age of Universe.
 - Scientific observations of astronomy events, basic astrophotography, career and research opportunities in astronomy
-
- तारे आणि त्यांचे गुणधर्म: निर्मिती, उत्क्रांती, ताऱ्यांचा मृत्यू (white dwarf, neutrons and pulsars, black holes, supernova), तारकांची प्रत, तारकांची अंतरे, HR diagram, तारकासमूहांचे प्रकार, वस्तुस्थलभेद, परिमाण स्केल- स्पष्ट आणि परिपूर्ण, बायनरी सिस्टीम आणि प्रकार, सूर्याखेरीज अन्य ताऱ्यांभोवती फिरणारे ग्रह (Exo-planets)
 - आकाशगंगा: हबल फोर्क, वस्तुमान - प्रकाशमानता प्रमाण, आकाशगंगेमधील ताऱ्यांमधले अंतर आणि आकाशगंगांमधील अंतर, आकाशगंगेचे केंद्र आणि Saggiarius A ची गती, Milky way आणि magellanic clouds, आकाशगंगांचा समूह (Cluster) आणि आकाशगंगांच्या समूहांचा समूह (Super cluster)
 - विश्वविज्ञान(Cosmology): हबलचा सिद्धांत, ऑल्बरचा विरोधाभास, विश्वाचे युग
 - खगोलीय घटनांच्या शास्त्रीय नोंदी, प्राथमिक खगोल छायाचित्रण, खगोल शास्त्रातील करियर, संशोधनाच्या संधी

Practical: (24 hr, Any 6)

- Locating constellations-Sharmishtha/Saptarshi (whichever is there in the sky at the night of observation) and Locating Pole star with the help of either Saptarshi or Sharmishtha
 - Locating Pole star (Dhruva) and identifying geographical directions (East/West/North/South) by using Pole star (Dhruva) and observation of how the sky (i.e., objects in the sky) rotates about the Pole star
 - To layout the sky of a particular night (the night of observation) according to Panchang and accordingly try to find out planets/stars in the sky with naked eye.
 - To layout the sky of a particular night (the night of observation) according to sky map and accordingly try to find out planets/stars in the sky with naked eye.
 - Locating nakshtra and constellations (whichever observable) in the sky with naked eye
 - Telescope handling
 - Focussing moon with the help of telescope on Full Moon night and observation of moon's surface
 - Focusing planets, stars, constellations, galaxy (andromeda), other objects in the sky with the help of telescope
 - Learn to use Stellarium App and try to locate planets/stars/constellations/other objects in the sky with the help of Stellarium App
 - Field visit
-
- आकाशातील सप्तर्षी / शर्मिष्ठा तारकासमूह (आकाशदर्शनाच्या रात्री जो तारकासमूह दिसत असेल तो) ओळखणे आणि त्यानुसार ध्रुव तारा ओळखणे.
 - ध्रुव तारा ओळखणे आणि त्यानुसार भौगोलिक दिशा (पूर्व / पश्चिम / उत्तर / दक्षिण) ओळखणे आणि ध्रुव तार्याभोवती आकाश (आकाशातील वस्तू) कसे फिरते याचे निरीक्षण करणे.
 - पंचांगावरून एका ठराविक रात्रीचे (ज्या रात्री निरीक्षण करावयाचे आहे त्या रात्रीचे) आकाश मांडणे आणि त्यानुसार ग्रह/तारे यांचे आकाशात निरीक्षण करून पडताळणी करणे. (उघड्या डोळ्यांनी)
 - नकाशावर (Sky map) एका ठराविक रात्रीचे (ज्या रात्री निरीक्षण करावयाचे आहे त्या रात्रीचे) आणि आकाश मांडणे आणि त्यानुसार ग्रह/तारे यांचे आकाशात निरीक्षण करून पडताळणी करणे. (उघड्या डोळ्यांनी)
 - निरीक्षणाच्या रात्री जे नक्षत्र / तारकासमूह आकाशात दिसत असतील ते ओळखणे. (उघड्या डोळ्यांनी)
 - दुर्बिण हाताळणे.
 - पौर्णिमेच्या रात्री दुर्बिणीच्या साहाय्याने चंद्र लक्ष केंद्रित करणे आणि चंद्राच्या पृष्ठभागाचे निरीक्षण करणे.

- ग्रह /तारे/नक्षत्र/तारकासमूह /आकाशगंगा (देवयानी)/आकाशातील इतर वस्तू यांचे दुर्बिणीवर लक्ष केंद्रित करणे.
- Stellarium App च्या साहाय्याने ग्रह /तारे/नक्षत्र/तारकासमूह/आकाशातील इतर वस्तू ओळखणे.
- क्षेत्र भेट.

Reference:

1. Astronomy Principles and Practice, A E Roy & D Clarke
2. Physical Universe, Frank Shu
3. Inside Stars, Biman Basu, CSIR
4. मला उत्तर हवंय (खगोल शास्त्र), मोहन आपटे, राजहंस प्रकाशन
5. आकाशाशी जडले नाते, जयंत नारळीकर
6. तारांगण, प्रदीप नायक
7. सहस्ररश्मी, मोहन आपटे , अश्वमेध प्रकाशन

Syllabus sub-committee meetings:

First meeting

Date: May 21, 2021

Time: 08:00 pm

Proceeding:

1. Welcome by Convener Dr V V Bhide, and he introduced every one.
2. Director, University Sub Campus, Ratnagiri Dr K V Sukhatankar, guided the committee about objective of the course and expectations.
3. Discussed on structure of course and division of work. Discussed on intake capacity, fee and duration.
4. Dr Bhide proposed vote of thanks.

Second meeting

Date: May 29, 2021

Time: 08:00 pm

Proceeding:

1. Welcome by Dr V V Bhide.
2. Discussed on draft syllabus and finalize it. Finalized the draft of syllabus to put forward in BOS meeting.
3. Concluding remark by Dr K V Sukhatankar
4. Dr V VBhide proposed vote of thanks.