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(Accredited by NAAC with Grade A+)

GU/Acad –PG/BoS - GU-ART /2025-26/628 Date: 11.12.2025

CIRCULAR

The syllabus for the Goa University–Admission Ranking Test (GU-ART) of **Master of Science in Remote Sensing and Geographical Information System** Programme, approved by the Academic Council in its meeting held on 7th November 2025 is attached.

The Dean/Vice-Dean (Academic) of the School of Earth, Ocean and Atmospheric Sciences and the Principals of all the affiliated Colleges are requested to take note of the above and bring the contents of this Circular to the notice of all concerned, including students aspiring to pursue the Master's Programme.

ASHWIN VYAS LAWANDE
Digitally signed by ASHWIN VYAS LAWANDE
Date: 2025.12.11 12:49:45 +05'30'

(Ashwin V. Lawande)
Deputy Registrar – Academic

To,
1. The Dean, School of Earth, Ocean and Atmospheric Sciences, Goa University.
2. The Vice-Dean (Academic), School of Earth, Ocean and Atmospheric Sciences, Goa University.
3. Principals of all the affiliated Colleges.

Copy to:
1. Controller of Examinations, Goa University.
2. Assistant Registrar (Admissions), Goa University.
3. Assistant Registrar Examinations (UG/PG), Goa University.
4. Director, Directorate of Internal Quality Assurance, Goa University for uploading the Syllabus on the University website.

GOA UNIVERSITY

SYLLABUS FOR GOA UNIVERSITY-ADMISSIONS RANKING TEST (GU-ART) FOR MASTER OF SCIENCE IN REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM PROGRAMME

Effective from AY: 2026-2027

Modules	Content
Module 1:	**Fundamentals of Geography and Cartography**
	Physical geography – landforms/geomorphology, climate, hydrology, soils, vegetation; Human and economic geography - population, settlements, resources, land use, transport; Cartography - map scale, projections, coordinate systems, latitude/longitude, GPS; Map interpretation - topographic, thematic, climatic, resource maps.
Module 2:	**General Engineering**
	Laws of motion, energy and power, heat transfer, waves, sound, light, and electricity. Algebra, trigonometry, calculus (differentiation and integration), differential equations, vectors, matrices, complex numbers, probability, and statistics. Quantitative aptitude, analytical reasoning, interpretation of graphs, units, and dimensional analysis.
Module 3:	**Earth and Environmental Sciences**
	Earth structure, rocks, minerals, plate tectonics, geomorphology; Atmosphere - weather, climate, pressure systems, monsoon, climate change; Oceanography - tides, waves, currents, ocean circulation; Environment - ecosystems, biodiversity, pollution, natural hazards, sustainability, conservation.
Module 4:	**Physics and Mathematics for Remote Sensing**
	Optics, electromagnetic radiation, spectrum, reflection, absorption, scattering, transmission; Mechanics, thermodynamics, wave phenomena, energy balance; Algebra, trigonometry, calculus, coordinate geometry, matrices; Logical reasoning and aptitude. Statistics - mean, median, mode, variance, correlation, regression, probability, sampling, hypothesis testing. Logarithms, polynomials and factorisation, linear and quadratic equations, sequences and series, limits, continuity, derivatives and their applications, basic integration and area under curves, vectors, matrices, determinants, eigenvalues and eigenvectors (conceptual).
Module 5:	**Computer Science and Data Handling**

Approved by: Academic Council on 7th December 2025

	Computer basics - hardware, software, operating systems, cloud computing; Programming concepts - C, Python, algorithms, flowcharts; Databases - relational, SQL, queries, data management; Data formats - CSV, NetCDF, shapefiles, GeoTIFF; Networking - internet, web services, data sharing, open-source tools.
Module 6:	**Principles of Remote Sensing and GIS**
	Remote sensing - history, aerial photography, satellite sensors, platforms; Resolutions - spatial, spectral, radiometric, temporal; GIS - raster, vector, attributes, map layers, spatial analysis, geodatabases; GPS and GNSS; Applications - natural resources, agriculture, forestry, environment, urban studies, water resources, disaster management.
Module 7:	**Applied Aspects in Agriculture, Environment, and Natural Resources**
	Agriculture - soil science, crop science, irrigation, precision farming, yield estimation; Environment - deforestation, biodiversity, land degradation, climate impacts, pollution monitoring; Water resources - hydrology, watershed, groundwater, flood/drought studies; Natural hazards - cyclones, landslides, earthquakes, coastal hazards, disaster risk reduction.
References/ Readings:	1. Agarwal, B. L. (2006). Basic statistics (3rd ed.). New Age International Publishers. 2. Ahrens, C. D., & Henson, R. (2018). Essentials of meteorology: An invitation to the atmosphere (8th ed.). Cengage Learning. 3. Arora, C. L., & Hemne, P. S. (2010-2014). *Physics for Degree Students (B.Sc. I–III)*. S. Chand Publishing. 4. Bhat, L. S. (2009). Geography in India: Selected themes. Pearson Education India. 5. Burrough, P. A., & McDonnell, R. A. (2015). Principles of geographical information systems (2nd ed.). Oxford University Press. 6. Burzynski, D. & Wade, E. (2008). Fundamentals of mathematics. Connexions. https://archive.org/details/cnx-org-col10615 7. Chang, K. T. (2019). Introduction to geographic information systems (9th ed.). McGraw-Hill Education. 8. Fletcher, C. H. (2017). Physical geology (3rd ed.). Wiley. 9. Halliday, D., Resnick, R., & Walker, J. (2014). Fundamentals of physics (10th ed.). Wiley. 10. Holden, J. (2021). Physical geography: The basics. Routledge. 11. Husain, M. (2019). Human geography. Rawat Publications. 12. Husain, M. (2020). Geography of India. McGraw-Hill Education (India). 13. Jain, A. K. (2015). Fundamentals of digital image processing. Pearson Education India. 14. Jensen, J. R. (2015). Introductory digital image processing: A remote sensing perspective (4th ed.). Pearson Education. 15. Jha, M. M. (2019). Geoinformatics: Fundamentals and applications. McGraw-Hill Education India. 16. Lillesand, T. M., Kiefer, R. W., & Chipman, J. W. (2015). Remote sensing and image interpretation (6th ed.). Wiley India.

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