Preview

The Department of Physics at Yarmouk University is pleased to announce the Second Winter School in Physics, dedicated this year to the theme Space Measurements. This annual event is designed to highlight vibrant areas of physics, with each edition carefully selecting a topic that reflects current scientific trends and research priorities. The 2026 school focuses on theoretical, observational, and measurement techniques in space science. It provides an interactive environment that brings together distinguished scientists in the field to engage with our students, facilitating knowledge exchange and fostering collaboration through lectures, applications and discussions; that should promote scientific dialogue, knowledge exchange, and collaboration between researchers and students.

This year’s school also holds special significance as it coincides with the celebration of the 50th anniversary of the founding of Yarmouk University, marking five decades of academic excellence and scientific contribution to global knowledge.

Organizing Committee

Professor Muhammad Bawaaneh — Chair

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Schedule

Second Winter School in Physics;
Space Measurements

Organized by

Department of Physics, Yarmouk University

15 – 16 Feb. 2026

	Sunday 15/2/2026	Monday 16/2/2026
09:00 – 09:15	Opening ceremony	Astrometry and Photometry from Space Telescopes: Insights into Stellar Astrophysics. *Prof. Mashhoor A. Al-Wardat[3,4], Prof. Hatem Widyan[5]*
09:30 – 11:30	Space weather: Theory and measurement. *Dr Qays Omari[1], Dr Ammar Sakaji[1]*	
11:30 – 12:00	Tea/Coffee break	Tea/Coffee break
12:00 – 02:30	Space measurements of the sun: From observation to simulations. *Dr Mohammed H. Talafha[2]*	Remote sensing: Mineral exploration and drone surveying. *Prof. Habes Ghrefat[6], Dr Abdalla Rawabdeh[6]*

[1] Regional Center for Space Science and Technology for Western Asia (RCSSTWA), Jordan.
[2] Research Institute of Science and Engineering (RISE), University of Sharjah, UAE.
[3] Director of Academic Affairs Department, Sharjah Academy for Astronomy, Space Science and Technology.
[4] Department of Applied Physics and Astronomy, University of Sharjah, UAE.
[5] Al al-Bait University, Mafraq 25113, Jordan.
[6] Yarmouk University, Irbid 21163, Jordan.

Note: Certificates issued by YU will be granted to participants who complete the workshop.

Abstract – Day 1, session 1

Space Weather: Theory and Measurements

Qays Omari[1], Hanna Sabat[1] and Ammar Sakaji[1]

[1]Regional Center for Space Science and Technology Education for Western Asia RCSSTEWA-Jordan, Amman-Jordan

Space weather is an interdisciplinary field of heliophysics and aeronomy that examines the dynamic conditions within our solar system, driven primarily by the Sun's internal nuclear reactions and magnetic activity. This complex environment is shaped by the constant outflow of solar wind and explosive events like solar flares, which originate near sunspots—dark regions of intense magnetic activity on the solar photosphere. While "space climate" refers to long-term trends in solar variability, space weather focuses on short-term phenomena such as geomagnetic storms. These storms are quantitatively assessed using the Kp-index and G-scale, which measure the degree of disturbance in Earth's magnetosphere and its cascading effects through the ionosphere, thermosphere, and exosphere.

To monitor and predict these effects, researchers employ a dual approach of space-based satellite telemetry and rigorous ground observations. observations conducted at Yarmouk University utilize telescopes equipped with specialized solar filters to perform direct sunspot tracking. These local observations will be integrated into the global network through the systematic measurement of sunspot areas and the analysis of their local magnetic fields.
By comparing ground-based data with satellite high-resolution imagery, researchers can more accurately calculate the Sun's rotation and the evolution of active regions, providing essential data for protecting technological infrastructure from solar disturbances.

Abstract – Day 1, session 2

Space Measurements of the Sun: From Observations to Simple Simulations

M. H. Talafha[1]

[1]Research Institute of Science and Engineering (RISE), University of Sharjah, UAE

Space missions provide an unprecedented volume of measurements of the Sun and the near-Earth environment, yet these observations are often indirect, incomplete, and strongly influenced by instrumental and geometric effects. Understanding what spacecraft actually measures, and how these measurements relate to underlying physical processes, is therefore a central challenge in space and solar physics. In this module, undergraduate students are Introduced to the fundamentals of space measurements using the Sun as a natural laboratory.

The session begins with a conceptual overview of remote sensing and in-situ observations, with particular emphasis on solar magnetic field measurements and their limitations. Building on this foundation, participants engage in a guided hands-on session in which they construct simple numerical models of the solar surface magnetic field and simulate how such fields would be observed by a spacecraft. Through these exercises, students explore the effects of projection, instrumental noise, and limited spatial coverage, and learn how physical modeling helps bridge the gap between observations and true solar conditions. By combining physical intuition, simplified simulations, and data interpretation, this session provides a realistic view of how space measurements are acquired, analyzed, and understood in modern solar and space physics. The module is designed for undergraduates with a basic background in physics and introduces key ideas that underpin contemporary research in heliophysics, space weather, and astrophysical data analysis.

Abstract – Day 2, session 1

Astrometry and Photometry from Space Telescopes: Insights into Stellar Astrophysics

Mashhoor A. Al-Wardat[1,2], Hatem Widyan[3]

[1]Director of Academic Affairs Department, Sharjah Academy for Astronomy, Space Science and Technology
[2]Professor, Department of Applied Physics and Astronomy, University of Sharjah, UAE
[3]Professor, Al al-Bait University, Mafraq 25113, Jordan

Space-based astrometric and photometric missions have transformed stellar astrophysics by providing high-precision measurements that are inaccessible from the ground. Space telescopes enable detailed observations of stars and stellar systems across a wide range of wavelengths, allowing fundamental advances in our understanding of stellar structure, formation, and evolution. Among the most important targets of these missions are binary and multiple stellar systems, which constitute a large fraction of the stellar population in the Galaxy and serve as key laboratories for testing stellar evolution models and dynamical theories.

The physical and geometrical characterization of binary and multiple systems relies critically on accurate orbital solutions derived from precise positional measurements. Orbital parameters, including the period, eccentricity, semi-major axis, inclination, longitude of the ascending node, argument of periastron, and time of periastron passage, provide direct constraints on stellar masses and system geometry. In this work, orbital solutions are obtained using the method developed by Tokovinin (2016), which employs initial astrometric measurements from the Fourth Catalog of Interferometric Measurements of Binary Stars. The combination of space-based astrometry and robust orbital modeling demonstrates the power of modern space missions in deriving fundamental parameters of stellar systems and advancing our understanding of stellar astrophysics.

Abstract – Day 2, session 2

Remote sensing principles and applications

Habes Ghrefat[1], Abdalla Rawabdeh[1]

[1]Yarmouk University, Irbid 21163, Jordan.

The presentation is designed to explore the fundamental principles and uses of remote sensing technology. It will include an overview of electromagnetic radiation, satellite sensors, spatial and spectral resolution, as well as key Earth observation systems like Landsat, ASTER, and Sentinel. Additionally, the discussion will emphasize the methods by which remote sensing data are collected and utilized to observe and analyze the Earth's surface. Practical exercises utilizing ENVI software will demonstrate various image processing techniques relevant to remote sensing applications. Furthermore, real-world case studies will illustrate the diverse applications of remote sensing in mineral exploration and environmental monitoring.