Entrance Exam Topics for Candidates Applying to the Master's Degree Programs in Space Technologies

1. Basics of Orbital Motion
    - Understanding Orbital Mechanics:
        • Why satellites stay in orbit and don't fall to Earth or drift away.
        • The role of gravity and motion in maintaining orbital paths.
    - Types of Orbits and Their Applications:
        • Low Earth Orbit (LEO), Geostationary Orbit, and Polar Orbits.
        • Uses in weather monitoring, GPS, and communications.
    - Principles of Motion in Space:
        • How speed and altitude affect a satellite's trajectory.
        • Why objects closer to Earth move faster in orbit.
    - Orbital Transfers:
        • Basic principles of how spacecraft change orbits.
2. Space Environment
    - Unique Conditions in Space:
        • Vacuum, extreme temperatures, and radiation.
        • Effects of microgravity on materials and biological systems.
    - Radiation in Space:
        • Sources of radiation (solar and cosmic).
        • Protection strategies for spacecraft and astronauts.
    - Space Debris:
        • Definition and causes.
        • Risks to satellites and space missions.
3. Spacecraft Basics
    - Satellite Components and Functions:
        • Solar panels, antennas, and onboard systems.
        • Roles in communication, navigation, and Earth observation.
    - Power Systems:
        • Use of solar panels and batteries.
        • Challenges in energy generation and storage.

- Materials for Spacecraft:
    - Specialized materials for thermal and radiation protection.

4. Earth and Space Observations
    - Earth Monitoring:
        - Climate, weather, and natural disaster tracking.
        - Contributions to agriculture, navigation, and communication.
    - Planetary Exploration:
        - Missions to Mars, the Moon, and other celestial bodies.
        - Insights from Perseverance Rover, Artemis program, etc.
    - Space Telescopes:
        - Role of Hubble and James Webb in studying the universe.
5. Practical Problem-Solving in Space
    - Mission Challenges:
        - Handling power loss or trajectory changes.
        - Engineering solutions during space missions.
    - Human Space Travel:
        - Physical and psychological challenges of long-duration missions.
    - Mission Planning:
        - Balancing time, resources, and risks.
6. Global Importance of Space Exploration
    - Benefits for Earth:
        - Applications in communication, navigation, and research.
    - International Collaboration:
        - Joint missions like the International Space Station (ISS).
        - Treaties and regulations for peaceful exploration.
    - Sustainability in Space:
        - Addressing space debris and orbital cleanup efforts.
7. Foundations of Astronomy and Space Science
    - The Solar System:
        - Key facts about planets, moons, and celestial bodies.
        - Focus on Mars and the Moon as exploration targets.
    - Rocket Science:

    - Principles of launching rockets and deploying satellites.
    - Challenges of reaching and operating in space.
- Gravity Beyond Earth:
    - How gravity functions on the Moon, Mars, and other bodies.

8. Critical Thinking and Teamwork Skills
- Collaboration in Space Missions:
    - Importance of teamwork and communication.
    - Problem-solving among engineers and scientists.
- Decision-Making Under Pressure:
    - Simulated scenarios and emergency responses.
- Ethics in Space Exploration:
    - Debates on asteroid mining and planetary colonization.
    - Balancing science with environmental and ethical concerns.

9. Logical and Analytical Thinking
- Data Interpretation:
    - Analyzing satellite imagery and planetary data.
    - Interpretation of engineering charts and plots.
- Problem Solving:
    - Calculations for travel time and satellite speeds.
    - Basic engineering calculations and formula manipulation.
- Strategic Planning:
    - Designing space missions within budget and time constraints.

10. Broader Impacts of Space Exploration
- Space Technologies in Daily Life:
    - Spin-offs like GPS, advanced materials, and medical innovations.
- Future of Space Exploration:
    - Prospects for Moon bases, Mars missions, and private space ventures.