StellarXplorers Semifinal Round (SFR)

In each of the Qualifying Rounds of competition, teams can earn up to 20 points based on their completion of an online academic quiz. The quiz is taken as a team (not individually) and must be completed within the team's 6-hour competition window. There is no time limit on the quiz itself. The quiz is 20 questions (multiple choice, true/false, and/or matching) and each correct answer is worth 1 point. All questions are based on topics covered in **Nova Space's** *StellarXplorers Space Foundations* **course**.

Study guides are provided for each quiz to help teams prepare and maximize their quiz scores. The SFR quiz covers the topics from QR1 and QR2, in the Rocket Science and Space Launch Foundational Module, and Space Systems Engineering Foundational Module.

<u>Rocket Science and Space Launch Foundational Module</u>

Physics Primer
- Four Forces of Flight
- Bernoulli's Principle
- Functions of rocket systems
- Newton's Laws of Motion
- Momentum Equation
- Conservation of Linear Momentum
- Total Energy and the Conservation of Energy Principle
- Thermodynamics and fluid dynamics
- Ideal gas law
- Venturi Effect
- Specific Enthalpy
- Mass Flow Rate

Rocket Science
- Thrust
- Payload
- Orbiting
- Deceleration
- Acceleration
- Simply Put
- Conservation of Momentum
- Rocket Equation

Basic Rocket Design
- Combustion chamber
- Nozzle design and function
- Pressure
- Efficiency

Propulsion Systems
- Types of propulsion systems
- Propulsion basics
- Thermodynamic Rockets
- Electric Rockets

Launch Vehicles
- Launch Vehicle Subsystems
- Launch Vehicle Staging

Satellite Launch
- Vernal Equinox
- Solar Day
- Sidereal Day
- Orbital Plane
- Launch Windows
- Launch Equation
- Geographic Considerations

Space Systems Engineering Foundational Module

Systems Engineering Overview
- Integrated Systems
- Verification and Validation
- Close to Flawless Design
- Major Subprocesses
- V Diagram

Space Systems
- Payload
- Spacecraft Bus and Subsystems
- Spacecraft Design Process

Payloads
- Remote Sensing
- Communications
- Position, Navigation, Timing Payloads
- Science and exploration
- Defense Industry
- Futures

Subsystems
- Structure and mechanisms
- Spacecraft Design
- Launch Environment
- Mechanisms

Specific Subsystems
- Command and Data Handling Subsystems
- Electrical Power Subsystems
- Thermal Control Subsystems
- Attitude Determination and Control Subsystems
- Telemetry, Tracking & Control Subsystems
- Environmental Control and Life Support Subsystems
- Propulsion