AlienDive's mission is to search for extraterrestrial life in the subsurface ocean of Jupiter's moon, Europa. This mission need statement leads to the following project objective statement: "Design a conceptual mission for the in-situ exploration of Europa's subsurface ocean with life-detection capabilities by a team of 11 students in 10 weeks". To fulfil this objective, a mission consisting of a transfer stage, a lander, and an ice-penetrating probe is designed.

To detect life and investigate Europa's subsurface characteristics the following scientific payload is chosen for the probe; a Raman spectrometer, an external camera, a microscope, two thermocouples, the Planetary In Situ Capillary Electrophoresis System (PISCES), a set of life marker chips, a fluorescence spectrometer, a UV spectrometer, an ultrasonic sonar, and a wet chemistry lab. These instruments were chosen to be able to detect a broad spectrum of possible life forms that may exist in the ocean. Similarly, a lander payload is chosen to identify a suitable landing site, as well as characterise Europa's surface; a seismometer, a magnetometer, a LIDAR sensor, two wide view cameras, one narrow view camera, and an externally-designed rover which can move around and explore the surface of the moon. To arrive at Europa, the spacecraft will utilise a VEEGA trajectory after launching on a Falcon Heavy in May 2034. The transfer stage is designed to insert the spacecraft into Jupiter's orbit, perform flybys around its moons, and finally insert it into a near-polar reconnaissance orbit around Europa in February 2040. Once a suitable spot is chosen, the transfer stage will perform a deorbit burn, and the lander will separate and autonomously land on the icy crust of Europa.

On Europa's surface, the lander will start measurements with the seismometer and the magnetometer, and deploy the ice-penetrating probe into the icy crust. The lander system will be powered by a large conventional RTG and a smaller experimental ASRG due to their long-lasting power production. Critical electronics that do not need to stay on the surface shall be lowered into a gap in the crust which is left after the probe has drilled through the top layer of ice. This will serve as long term protection from the harmful radiation environment. Upon deployment, the probe will start its multiple-year journey to the subsurface ocean, using a heated drill to penetrate the 30 km thick ice crust. As two finless RTGs are used to power the probe, the large excess of generated thermal power is transported to the drill and out of the probe using a liquid cooling loop. Multiple RF relays will be placed in ice to establish communication with the lander on the surface. When the probe gets close to the ice-ocean interface, it will leave its anchor in the ice and descend into the ocean through a 1.5 km thick slushy ice-water layer, utilising a load-bearing tether to prevent sinking. Finally, the ocean will be sampled, imaged, and analysed using the relevant payload on the probe. The scientific data will be transmitted as an acoustic signal through the water and an RF signal through the ice to the lander using a relay on the anchor. Communication with Earth is done using NASA's Deep Space Network as the ground system.

The exact end-of-life strategy will be finalised in the coming week to ensure compliance with the COSPAR Planetary Protection Policy. The probe will most likely stay tethered inside or as close to the ice shell as possible. As water is an effective radiation shield, the RTGs are not expected to pose a problem for the environment in the subsurface ocean of Europa. Nonetheless, the leakage of radioactive materials should be avoided at all times.

Lastly, the V&V and production of the spacecraft will be investigated. As titanium alloys are selected for the structure, additive manufacturing will be preferred as it is convenient and more sustainable than alternatives. To not contaminate the Jovian ice moon the spacecraft will be assembled in a cleanroom and parts will be sterilised. Additionally, an inventory of organisms will be taken at the production site to be able to differentiate between life on Europa and contamination.