# JOIN ROBOSUB UCI 2026

*Build a Fully Autonomous Underwater Robot!*

**Competition Location:** Irvine, California https://robosub.org/ (July 2026)

- Develop real underwater robotics: autonomy, perception, controls, mechatronics.
- Work with NVIDIA Jetson computers, ROS2, cameras, sensors, thrusters, and more in-demand industry technologies.
- Compete in the National RoboSub 2026 Competition right here in Irvine.
- No prior robotics experience required — only strong foundational skills and a high ownership spirit.
- Seeking motivated builders, coders, thinkers, and self-starters over GPA.

**General Expectations for All Applicants:**

- You work toward goals without constant supervision.
- You have outstanding time management to handle outside-of -school responsibilities on top of coursework.
- You have completed personal (athletic, arts, etc.) or academic projects independently.
- You enjoy solving open-ended problems.
- You are comfortable learning new tools quickly and able to carry on under pressure.
- You can collaborate, communicate clearly, and finish what you start.

**How to apply?**

1. Submit proof of relevant work towards 1 position of the list below or complete the corresponding recruiting challenge.
2. Submit a letter on how you fulfill 2 aspects of the list of “General Expectations for All Applicants” above and mention interest in a secondary position for backup rotations.
3. Submit all in one email titled “LastName-Name: Position” to johans4@uci.edu

*“Joining the team is not guaranteed. Selection criteria depends on the number of applicants, their experience, and the project needs”*

UCI Samueli School of Engineering

robosub

## Vision / Perception Engineer

**Description:**
Develop the robot's visual intelligence. Work on underwater image processing, gate and buoy detection, and real-time perception pipelines. Your work enables the robot to "see" and interpret the underwater world.

**Responsibilities:**

- Process camera feed in real time using Python/OpenCV.
- Detect gates, buoys, markers, shapes, and color targets.
- Build filtering logic to stabilize noisy underwater vision.
- Integrate perception with the controls and embedded teams.
- Test in simulation and real pool environments.

**Required Background:**

- Strong Python skills.
- Comfort with debugging and iterative experimentation.
- Familiarity with arrays, matrices, coordinate systems.

**Preferred Experience:**

- OpenCV or basic computer vision projects.
- Machine learning exposure (YOLO, TensorFlow, or PyTorch).
- Any project using image analysis.
- Interest in robotics, AI, or perception.

**Recruiting Challenge:**
To demonstrate transferable subskills in image processing and object detection (key for underwater vision), submit a short Python script using OpenCV that processes an image (underwater or simulated), detects objects of a specific color (e.g., red), and draws bounding circles around them. Include comments explaining your approach and how it handles noise or variations in lighting. Upload your code and a sample output image.

## Controls & Navigation Engineer

**Description:**
Build the robot's stability and motion intelligence. You ensure it swims straight, holds depth, turns smoothly, and follows mission plans without wobbling or drifting.

**Responsibilities:**

- Implement and tune feedback controllers (depth, heading, velocity).
- Stabilize the robot with IMU and depth data.
- Convert perception outputs into navigation decisions.
- Run simulations and verify system response.
- Work closely with embedded and perception teams.

**Required Background:**

- Understanding of forces, motion, and system stability.
- Comfort with problem-solving and math.

**Preferred Experience:**

- Hands-on experience with MATLAB or Python simulations.
- Exposure to feedback systems or PID control.
- Any drone/RC project experience.
- Interest in dynamics, motion, or autonomy.

**Recruiting Challenge:**
To showcase subskills in feedback control and simulation (essential for navigation stability), submit a simple Python or MATLAB script implementing a PID controller for a basic system, such as stabilizing a simulated pendulum or vehicle speed. Include plots of the system response before and after tuning, and explain your parameter choices. This demonstrates transferable knowledge in dynamics and control tuning.

## Sub-Role: Test Engineer

**Description:** Focus on validating autonomy through simulations, dry tests, and pool trials to ensure reliable performance under real conditions.

**Responsibilities:**

- Design and execute test plans for controls and navigation modules.
- Analyze data from IMU, depth sensors, and simulations to identify issues.
- Collaborate on iterative tuning and debugging during pool sessions.
- Document test results and recommend improvements.

**Required Background:**

- Basic understanding of data analysis and testing methodologies.
- Comfort with Python or MATLAB for scripting tests.

**Preferred Experience:**

- Experience with simulation tools (e.g., Gazebo or custom scripts).
- Prior testing in robotics or engineering projects.
- Interest in quality assurance and system reliability.

**Recruiting Challenge:** Submit a test script in Python that simulates a simple navigation scenario (e.g., following a straight line with noise), logs performance metrics, and generates a report or plot. Explain how this transfers to real-world debugging.

## Embedded Systems & ROS2 Engineer

**Description:**
Build the robot's brain and make all components communicate. You integrate sensors, Jetson, ROS2, and mission logic.

**Responsibilities:**

- Write ROS2 nodes for sensors and thrusters.
- Work with MAVLink, BlueRobotics systems, and Jetson Linux.
- Build the mission planner (FSM).
- Integrate perception and controls pipelines.
- Maintain software reliability, logging, and debugging.

**Required Background:**

- Solid Python programming or C++ understanding.
- Comfortable with Linux environments.
- Ability to read documentation and connect systems.

**Preferred Experience:**

- Raspberry Pi or Arduino projects.
- Any ROS1/ROS2 experience.
- Networking or messaging systems.
- Systems programming mindset.

**Recruitment Challenge:**
To highlight transferable subskills in system integration and middleware (critical for ROS2 workflows), submit a basic ROS2 package in Python or C++ that creates a simple node publishing and subscribing to a topic (e.g., simulating sensor data like temperature). Include a launch file and a brief README explaining setup on a Linux environment. This shows your ability to handle modular communication systems.

## Sub-Role: Mission Planner

**Description:** Develop the high-level logic for task sequencing, ensuring the robot autonomously completes competition missions like gate traversal or buoy interaction.

**Responsibilities:**

- Implement finite state machines (FSM) for mission flow.
- Integrate inputs from perception and controls into decision trees.
- Simulate and debug mission scenarios in ROS2.

- Optimize for reliability and edge cases (e.g., sensor failures).

**Required Background:**

- Understanding of state-based programming and logic flows.
- Basic Python or C++ skills.

**Preferred Experience:**

- Experience with FSM tools or behavior trees (e.g., in ROS or games).
- Any autonomy or AI planning projects.
- Interest in algorithmic decision-making.

**Recruitment Challenge:** Submit a Python script outlining a simple FSM for a hypothetical robot task (e.g., “detect object → approach → interact”), using libraries like smach or basic if-else structures. Include a diagram or explanation of states and transitions, showing transferability to ROS2 missions.

## Mechanical / Rigging Engineer

**Description:**
Build the physical architecture of the robot. Ensure waterproofing, stability, mounting, and efficient hardware layout.

**Responsibilities:**

- CAD design for sensor/camera mounts.
- Waterproof sealing, epoxy use, buoyancy balancing.
- Rigging cables, connectors, thruster guards.
- Assist during hardware assembly and pool testing.
- Collaborate with all teams for structural integration.

**Required Background:**

- Understanding of materials, forces, and basic mechanical intuition.

**Preferred Experience:**

- CAD software (Fusion360, SolidWorks).
- 3D printing or fabrication projects.
- Any drone/robot building experience.
- Hands-on maker work.

**Recruiting Challenge:**
To illustrate subskills in design and fabrication (vital for robot structural integrity), submit a CAD model (e.g., in Fusion360 or SolidWorks format) of a simple thruster mount or sensor enclosure, including considerations for waterproofing and weight distribution. Provide screenshots or renders, along with a short description of material choices and how it ensures stability. This transfers to real hardware rigging tasks.

## Sub-Role: Electrical / Power Specialist

**Description:** Handle power systems, wiring, and electrical integration to support reliable operation of thrusters, sensors, and onboard computers.

**Responsibilities:**

- Design and rig power distribution (batteries, ESCs, voltage regulation).
- Ensure waterproof electrical connections and cable management.
- Test for power efficiency and safety (e.g., current draw under load).
- Integrate with mechanical and embedded teams for seamless hardware.

**Required Background:**

- Basic understanding of circuits, power, and electronics.
- Comfort with soldering or wiring projects.

**Preferred Experience:**

- Experience with batteries, ESCs, or RC electronics.
- Any Arduino/Raspberry Pi wiring projects.
- Interest in electrical systems for robotics.

**Recruiting Challenge:** Submit a simple Python simulation or diagram modeling power consumption for a system with multiple components (e.g., thrusters + sensors), calculating total draw and battery life. Explain choices and how it prevents failures, transferable to BlueROV2 setups.

## Sub-Role: Actuation / Manipulation Specialist

**Description:** Focus on adding or modifying actuators for tasks like object manipulation or marker deployment in competitions.

**Responsibilities:**

- Design and integrate manipulators or actuators (e.g., grippers, servos).
- Ensure compatibility with thrusters and overall stability.
- Test actuation in dry and wet environments.
- Collaborate on mechanical integration for mission-specific tools.

**Required Background:**

- Understanding of actuators, motors, and basic mechanics.

**Preferred Experience:**

- Hands-on with servos, pneumatics, or RC manipulators.
- Any project involving moving parts or robotics arms.
- Interest in mechatronics.

**Recruiting Challenge:** Submit a CAD sketch or simple code snippet (e.g., Arduino for servo control) for a basic manipulator mechanism, like a gripper. Include a description of force calculations and waterproofing, showing skills for advanced tasks.

## Sub-Role: Buoyancy / Waterproofing Specialist

**Description:** Optimize the robot's buoyancy and sealing to maintain neutral float and prevent leaks during operations.

**Responsibilities:**

- Calculate and adjust buoyancy with weights or foams.
- Apply seals, epoxies, and enclosures for waterproofing.
- Test for leaks and stability in pool trials.
- Iterate based on payload changes (e.g., added sensors).

**Required Background:**

- Basic physics of fluids and materials.

**Preferred Experience:**

- Experience with buoyancy in boats, drones, or DIY projects.
- Hands-on sealing or fabrication.
- Interest in hydrodynamics.

**Recruiting Challenge:** Submit a calculation sheet or Python script estimating buoyancy for a hypothetical robot (e.g., volume, density, added weights), with a short report on achieving neutral buoyancy. This transfers directly to BlueROV2 modifications.

# Operations / Business Coordinator

**Description:**
Keep the team running smoothly: money, logistics, communication, documents, and scheduling.

**Responsibilities:**

- Manage budget and purchasing.
- Write sponsorship requests.
- Coordinate pool time, meetings, and deadlines.
- Organize documentation and team website updates.
- Support travel arrangements for competition.

**Required Background:**

- Strong communication and organization skills.
- Ability to manage multiple tasks.

**Preferred Experience:**

- Leadership or project management roles.
- Writing or documentation skills.
- Social media or community engagement experience.
- Contagious energy/ persuasive/ highly organized.

**Recruiting Challenge:**
To demonstrate transferable subskills in organization and communication (key for team operations), submit a sample one-page sponsorship proposal for a hypothetical robotics project, including budget estimates, benefits to sponsors, and a timeline. Format it professionally as a PDF or document, showcasing your ability to handle logistics and clear writing. Video pitch is welcomed as well.