# 2 DOF BALL BALANCER

Vision-based experimental platform for teaching and research

The 2 DOF Ball Balancer module is a vision-based control experiment designed to teach intermediate to advanced control concepts. You can use it to demonstrate and explore real-world control challenges encountered in vision-based motion platforms, such as pan-tilt cameras.

The 2 DOF Ball Balancer module consists of a plate connected through 2 DOF gimbals to two Rotary Servo Base Units. The plate can swivel about in any direction. By controlling the position of the servo load gears, the angle of the plate can be controlled to balance a ball moving freely on the plate to the desired position. An overhead digital camera captures two-dimensional images of the plate and tracks coordinates of the ball in real time.

Features
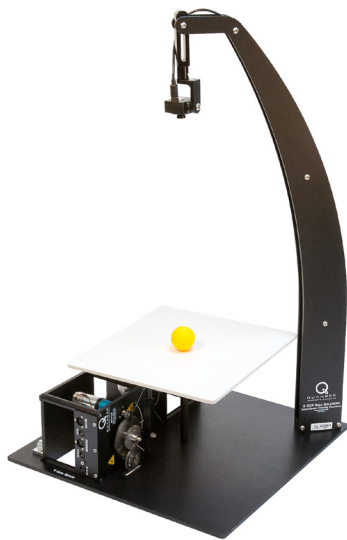
Precise
The system's inherent precision helps deliver accurate, repeatable results required for teaching & research labs.

Robust
A durable system able to accommodate enthusiastic undergraduate students.

Comprehensive Courseware
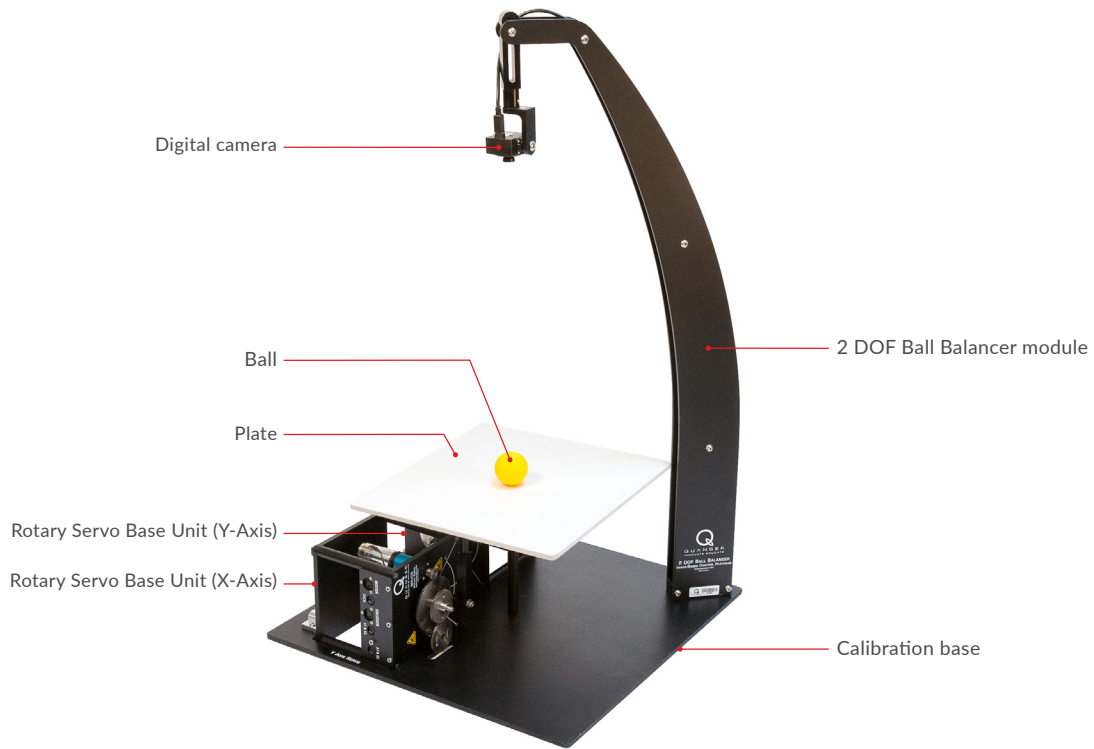Courseware for MATLAB®/Simulink® or LabVIEW™ covers modelling and control topics.

Expandable
Use each Rotary Servo Base Unit on its own, or add one of other nine modules[1] for experiments of varying complexity across a wide range of topics and disciplines.

Workstation Components

Plant	Two Rotary Servo Base Units 2 DOF Ball Balancer module
Data acquisition device	Quanser Q2-USB
Amplifier	Quanser VoltPAQ-X2
Control design environment	QUARC for MATLAB®/Simulink® QRCP for LabVIEW™

[1] The add-on modules are sold separately

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Product Details

Digital camera

Ball

Plate

Rotary Servo Base Unit (Y-Axis)

Rotary Servo Base Unit (X-Axis)

2 DOF Ball Balancer module

Calibration base

Courseware

Modelling Topics
- Model derivation
- Transfer function representation
- Lineariazation

Control Topics
- PD control
- Multiple loops
- Sensor calibration

Device Specifications

Calibration base dimensions (L x W)	41.75 x 41.75 cm
Plate dimensions (L x W)	27.5 x 27.5 cm
Camera support height	69.5 cm
Camera	IIDC 1394-based digital camera
Camera standard resolution	640 x 480
Camera frame rate (at full resolution)	30 FPS

About Quanser:

For 30 years, Quanser has been the world leader in innovative technology for engineering education and research. With roots in control, mechatronics, and robotics, Quanser has advanced to the forefront of the global movement in engineering education transformation in the face of unprecedented opportunities and challenges triggered by autonomous robotics, IoT, Industry 4.0, and cyber-physical systems.