Leon H. Charney School of Marine Sciences
UNIVERSITY OF HAIFA

Autonomous Underwater Vehicles Navigation- 229.4007

Instructor: Prof. Itzik Klein kitzik@univ.haifa.ac.il

Course description: A graduate-level course on aided inertial navigation system (INS) theory and applications for autonomous underwater vehicles (AUV). This course covers the fundamentals of linear and nonlinear estimation theory with applications to INS fusion with external sensors and information.

Syllabus:

Part I – Inertial Navigation Systems

- Navigation equations of motion and error state dynamics
- Simplified error analysis

Part II – Estimation Theory

- Linear and Extended Kalman Filter (KF/EKF)
- Nonlinear system observability

Part III – Applications: Autonomous Underwater Navigation

- INS and global navigation satellite system (GNSS) fusion
- INS Fine alignment at sea
- Doppler velocity log fusion with INS
- Geophysical navigation
- Information-aided navigation

Textbooks:

- P. D. Groves, Principles of GNSS, inertial and multisensor integrated navigation systems, Artech House, 2013.
- J., A.Farrell, Aided navigation GPS with high rate sensors, McGraw-Hill, 2008.

Grading policy:

Participation: 10%

Final project: 90%