# ME 624 SPATIAL AND ANALYTICAL DYNAMICS
# 2019-2020 I. SEMESTER

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**Grading**
Two Midterm Exams (25% each), Final Exam (35%), Homeworks (15%).

**References**
Advanced dynamics books

**Examinations**
All examinations will be open book and notes.

**Course Outline:**

***Review of Planar Kinematics***

***Spatial Kinematics***

Representation of vectors in different reference frames.
Transformation and rotation matrices. Direction cosine matrices. Euler angles.
Rotation of vectors.
Angular velocity and acceleration relationships.
Motion of a particle using components in a moving frame.

***Review of Newtonian Dynamics***

Force-acceleration relationships.
Impulse-momentum relationships. Impulsive forces.
Work-energy relationships. Conservative and nonconservative forces. Potential energy.

***Dynamics of Rigid Bodies***

Inertia tensor and its matrix representation in different reference frames.
Newton-Euler equations.
Interacting rigid bodies.
Gyroscopes.

***Dynamics via Work and Energy Principles***

Generalized coordinates and forces.
Virtual work principle.
Lagrange's equations.
Constrained systems.