1. *Course number and name*
   ENGR 201: Dynamics

2. *Credits and contact hours*
   3 credit hours; three 50-minute lecture sessions/week, or two 1-hr-15-minute lecture sessions/week, depending on semester

3. *Instructor's or course coordinator's name*
   Instructor: Kwok Siong Teh, Associate Professor of Mechanical Engineering

   Course coordinator: Kwok Siong Teh, Associate Professor of Mechanical Engineering

4. *Text book, title, author, and year*
   Hibbeler, R.C. *Engineering Mechanics: Dynamics*, 14th ed. Pearson, 2015

   c. *other supplemental materials*
   Meriam, J. L., Engineering Mechanics: Dynamics, 8th ed., Wiley, 2015.

5. *Specific course information*
   g. *brief description of the content of the course (catalog description)*
   Vector treatment of kinematics and kinetics of particles, systems of particles and rigid bodies. Methods of work, energy, impulse and momentum. Vibrations and time response. Applications to one– and two–dimensional engineering problems

   h. *prerequisites or co-requisites*
   ENGR 102: Statics

   i. *indicate whether a required, elective, or selected elective course in the program*
   Required for Civil Engineering; required for Mechanical Engineering

6. *Specific goals for the course*
   e. *specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.*
   - Students will demonstrate a good understanding of the motion, velocity and acceleration of a point.
   - Students will demonstrate a good understanding of the difference between a curve and its parameterization.
   - Students will demonstrate a good understanding of the use of the instantaneous state to derive equations of motion.
   - Students will demonstrate a good understanding of the meaning of the terms in Newton's Laws of Motion, especially the second law F= ma.
   - Students will demonstrate a good understanding of the concepts of work, energy, and power.
   - Students will demonstrate a good understanding of conservative and non-conservative system.
   - Students will demonstrate a good understanding of the concept of angular velocity of a rigid body or reference frame.

- Students will demonstrate a good understanding of time rates of change of unit vectors in a rotating reference frame.
- Students will demonstrate a good understanding of absolute and relative velocity and acceleration in a rotating reference frame.
- Students will demonstrate a good understanding of the computation of linear momentum and moment of a rigid body.
- Students will demonstrate a good understanding of the use of Euler's laws of motion for two-dimensional problems.
- Students will demonstrate a good understanding of the concept of frequency and period for simple harmonic motion.
- Students will demonstrate a good understanding of the governing equation for the simple harmonic oscillator.

f. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
Course addresses ABET Student Outcome(s): a, c, e, g, h, i, j, k.

7. Brief list of topics to be covered

- Position vector and its derivatives – velocity and acceleration.
- Rectilinear motion.
- Curvilinear motion in Cartesian, normal-tangential, and cylindrical coordinate systems.
- Constrained motion.
- Newton's laws of motion, especially the second law F = ma.
- Work, energy, and conservation of energy.
- Power.
- Linear impulse and momentum.
- Angular impulse and momentum.
- Conservation of linear and angular momentums.
- Impact and collisions.
- Two-dimensional rigid body kinematics.
- Euler's laws of motion for rigid bodies.
- Energy methods in rigid body motion.
- Free vibration (with and without damping)
- Forced vibration (with and without damping)