

# Schedule of Classes

## ZZU102 ENGINEERING MECHANICS II– DYNAMICS

### Module 1: Kinematics of a particle – simple relative motion

1. Introduction, general notions, differentiation of a vector with respect to time
2. Velocity and acceleration calculations, rectangular components
3. Velocity and acceleration in terms of path variables
4. Examples using path variables
5. Cylindrical coordinates
6. Simple kinematical relations and applications, simple relative motion
7. Motion of a particle relative to a pair of translating axes
8. Particle dynamics: Introduction, rectangular coordinates, rectilinear translation
9. Newton's law for rectangular coordinates, rectilinear translation
10. Cylindrical coordinates, Newton's law for cylindrical coordinates
11. Path variables, Newton's law for path variables
12. System of particles, the general motion of a system of particles
13. Tutorial 1

### Module 2: Energy methods for particles

14. Analysis for a single particle, power considerations
15. Conservative force field, conservation of mechanical energy
16. Alternative form of work-energy equation, systems of particles, work-energy equations,
17. Kinetic energy expression based on centre of mass
18. Work-kinetic energy expressions based on centre of mass.
19. Methods of momentum for particles, linear momentum, impulse and momentum relations for a particle
20. Linear momentum considerations for a system of particles, impulsive forces
21. Impact
22. Moment of momentum, moment of momentum equation for a single particle
23. Moment of momentum for a system of particles
24. Examples
25. Tutorial 2

### Module 3: Kinematics of rigid bodies: Relative Motion

26. Introduction, translation and rotation of rigid bodies, Chasles' theorem
27. Derivative of a vector fixed in a moving reference
28. Applications of the fixed-vector concept
29. General relationship between time derivatives of a vector for different references
30. The relationship between velocities of a particle for different references
31. Acceleration of a particle for different references
32. Examples
33. Tutorial 3

### Module 4: Kinetics of plane motion of rigid bodies

34. Calculation of moments and products of inertia
35. Translation of coordinate axes
36. Examples
37. Moment-of-momentum equations
38. Pure rotation of a body of revolution about its axis of revolution
39. General plane motion concept of a slablike body
40. Pure rotation of an arbitrary rigid body
41. Tutorial 4