| عدد الساعات | مفردات المادة |
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| 18 | CH-1 Basic principles <br> Vectors, frames rotation in Cartesian coordinate, velocity and acceleration components in different coordinate systems (polar, cylindrical spherical), some mathematical operation on vectors, gradient, divergence, curl. |
| 15 | CH-2 Motion of a particle in one dimension <br> Force as a function of the velocity only, force as a function of time only, damping forces depending on the velocity, conservative force depending on position, and some applications. |
| 15 | CH-3 Motion of a particle two or three dimensions. <br> Application to a set of forces acting on a particle, motion in more than one dimension, potential energy and conservative forces in two and three dimension, translational motion of coordinate systems. |
| 12 | CH-4 Central forces <br> Gravitational field, potential energy in a central field, angular momentum, Kepler's laws, orbit of a body in a central field, energy of an orbit, motion in approximately circular motion, and some applications. |
| 12 | CH-5 Motion of a system of particles <br> Conservation of linear momentum, center of mass, conservation of angular momentum, conservation of energy, motion of varying mass bodies, rocket motion, and collision problems (in C.M. and Lab. systems). |


| 6 | CH-6 Gravitation <br> Centers of gravity for extended bodies, gravitational field and <br> gravitational potential, gravitational field equation. |
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| 12 | CH-7 Lagrange's equations and Hamiltonian functions <br> Generalized coordinates, generalized forces, Lagrange's <br> equation, generalized momentum, generalized forces in <br> conservative systems, Lagrange equation for a particle, <br> Lagrange equation for a general system, and some <br> applications. |

## References

1. Analytical Mechanics, Grant R.Fowles, $3^{\text {rd }}$ edition.
2. Mechanics, Symon.
3. Classical Mechanics, Atam P.Arya.
4. Theoretical Mechanics, Murray R.Spiegel, Schaum's Series.
