Annexure

Syllabus for BITSAT-2016

Part I: Physics

1. Units & Measurement

1.1 Units (Different systems of units, SI units, fundamental and derived units)

1.2 Dimensional Analysis

1.3 Precision and significant figures

1.4 Fundamental measurements in Physics (Vernier calipers, screw gauge, Physical balance etc)

2. Kinematics

2.1 Properties of vectors

2.2 Position, velocity and acceleration vectors

2.3 Motion with constant acceleration

2.4 Projectile motion

2.5 Uniform circular motion

2.6 Relative motion

3. Newton's Laws of Motion

3.1 Newton's laws (free body diagram, resolution of forces)

3.2 Motion on an inclined plane

3.3 Motion of blocks with pulley systems

3.4 Circular motion – centripetal force

3.5 Inertial and non-inertial frames

4. Impulse and Momentum

4.1 Definition of impulse and momentum

4.2 Conservation of momentum

4.3 Collisions

4.4 Momentum of a system of particles

4.5 Center of mass

5. Work and Energy

5.1 Work done by a force

5.2 Kinetic energy and work-energy theorem

5.3 Power

5.4 Conservative forces and potential energy

5.5 Conservation of mechanical energy

6. Rotational Motion

6.1 Description of rotation (angular displacement, angular velocity and angular acceleration)

6.2 Rotational motion with constant angular acceleration

6.3 Moment of inertia, Parallel and perpendicular axes theorems, rotational kinetic energy

6.4 Torque and angular momentum

6.5 Conservation of angular momentum

6.6 Rolling motion

7. Gravitation

7.1 Newton's law of gravitation

7.2 Gravitational potential energy, Escape velocity

7.3 Motion of planets – Kepler's laws, satellite motion

8. Mechanics of Solids and Fluids

8.1 Elasticity

8.2 Pressure, density and Archimedes' principle

8.3 Viscosity and Surface Tension

8.4 Bernoulli's theorem

9. Oscillations

9.1 Kinematics of simple harmonic motion

9.2 Spring mass system, simple and compound pendulum

9.3 Forced & damped oscillations, resonance

10. Waves

10.1 Progressive sinusoidal waves

10.2 Standing waves in strings and pipes

10.3 Superposition of waves, beats

10.4 Doppler Effect

11. Heat and Thermodynamics

11.1 Kinetic theory of gases

11.2 Thermal equilibrium and temperature

11.3 Specific heat, Heat Transfer - Conduction, convection and radiation, thermal conductivity, Newton's law of cooling

11.4 Work, heat and first law of thermodynamics

11.5 2^{nd} law of thermodynamics, Carnot engine – Efficiency and Coefficient of performance

12. Electrostatics

12.1 Coulomb's law

12.2 Electric field (discrete and continuous charge distributions)

12.3 Electrostatic potential and Electrostatic potential energy

12.4 Gauss' law and its applications

12.5 Electric dipole

12.6 Capacitance and dielectrics (parallel plate capacitor, capacitors in series and parallel)

13. Current Electricity

13.1 Ohm's law, Joule heating

13.2 D.C circuits – Resistors and cells in series and parallel, Kirchoff's laws, potentiometer and Wheatstone bridge,

13.3 Electrical Resistance (Resistivity, origin and temperature dependence of resistivity).

14. Magnetic Effect of Current

14.1 Biot-Savart's law and its applications

14.2 Ampere's law and its applications

14.3 Lorentz force, force on current carrying conductors in a magnetic field

14.4 Magnetic moment of a current loop, torque on a current loop, Galvanometer and its conversion to voltmeter and ammeter

15. Electromagnetic Induction

15.1 Faraday's law, Lenz's law, eddy currents

15.2 Self and mutual inductance

15.3 Transformers and generators

15.4 Alternating current (peak and rms value)

15.5 AC circuits, LCR circuits

16. Optics

16.1 Laws of reflection and refraction

16.2 Lenses and mirrors

16.3 Optical instruments – telescope and microscope

16.4 Interference – Huygen's principle, Young's double slit experiment

16.5 Interference in thin films

16.6 Diffraction due to a single slit

16.7 Electromagnetic waves and their characteristics (only qualitative ideas), Electromagnetic spectrum

16.8 Polarization – states of polarization, Malus' law, Brewster's law

17. Modern Physics

17.1 Dual nature of light and matter – Photoelectric effect, De Broglie wavelength

17.2 Atomic models – Rutherford's experiment, Bohr's atomic model

17.3 Hydrogen atom spectrum

17.4 Radioactivity

17.5 Nuclear reactions : Fission and fusion, binding energy

18. Electronic Devices

18.1 Energy bands in solids (qualitative ideas only), conductors, insulators and semiconductors;

18.2 Semiconductor diode – *I-V* characteristics in forward and reverse bias, diode as a rectifier; *I-V* characteristics of LED, photodiode, solar cell, and Zener diode; Zener diode as a voltage regulator.

18.3 Junction transistor, transistor action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator

18.4 Logic gates (OR, AND, NOT, NAND and NOR). Transistor as a switch.