Name of the Department/Centre: Physics

Course Type (Please tick appropriate box):

Major		Discipline Specific Core		Ability Enhancement	
Minor		Multidisciplinary		**Skill Enhancement**	**X**
Value Added		Any other			

Course Title: ANALOG SYSTEMS

Semester: I

Total Credits: 3 **Lecture-Tutorial-Practical (LTP) breakup:** NOT APPLICABLE

Maximum Marks: 100 **No of seats:** ……

Course Advisor Name: Dr. Pumlian Munga

Course Advisor's Email: pumlianmunga@jmi.ac.in

Prerequisites: Class XII Physics

Special Requirements (if any): No

Expected Learning Outcomes: The objective of this course is to impart basic background in analog circuits. The course would use simple models; description of the semiconductors, different diodes and applications, transistors and applications and operational amplifiers will be covered. The broad behavioral description of the blocks in the op-amp will be used to explain the circuit operation.

Course Syllabus (Unit wise):

Unit I: Circuits Analysis

Kirchhoffs Laws, Mesh and Node Analysis of Circuits. RC circuits, Networks, Equivalent Star (T) and delta Networks. Star to Delta and Delta to Star Conversion. Network Theorems, Superposition theorem, Thevenin Theorem, Norton theorem.

Unit II: Semiconductor Diodes

P and N Type Semiconductors. Energy Level Diagram. Conductivity and Mobility, Drift velocity, PN junction Diodes and its characteristics. Barrier Formation, Static and Dynamic Resistance. Current Flow Mechanism in Forward and Reverse Biased Diode, Barrier Width and Current for Step Junction. PN junction Rectifier Diode, Half-wave Rectifier, Full-wave Rectifiers its Ripple Factor and Efficiency. Idea of Filters. Zener diode and voltage regulation,Photo diode, varactor diode, LED, solar cell.

Unit III: Transistors and Amplifiers

N-P-N and P-N-P Transistors, Characteristics of CB, CE and CC configurations. Active, Cut-off, and Saturation Regions. Load line and Q- point. Current gains and relation between them, Amplifiers and their classification, Class A, B, and C Amplifiers. Ideal amplifier, Voltage gain, current gain, Power gain, Input resistance, output resistance, load line. Transistor Biasing and Stabilization Circuits. Fixed Bias and Voltage Divider Bias. Transistor as 2-port Network. h-parameter Equivalent Circuit. Hybrid model of single-stage CE amplifier, RC-coupled amplifier

and its frequency response. Oscillators : Barkhausen criterion for self-sustained oscillations, Hartley oscillator, Colpitts oscillator, RC phase shift oscillator, multivibrators, crystal oscillator.

Unit IV: Operational Amplifier

Principle of Operational Amplifier, Properties of ideal OPAMP, Open-loop and closed loop gain, Frequency response, CMMR, Slew rate, Virtual ground, Applications of operational Amplifiers : inverting, non-inverting, adder, subtractor, integrator, differentiator, Log amplifier, Zero crossing detector, Schmitt trigger, Wein bridge oscillator, Resistive network (Weighted and R-2R Ladder). Accuracy and Resolution. A/D Conversion

References Books:

1. Basic Electronics : D C Tayal,.
2. Principles of Electronics : V. K. Mehta.
3. Electronic Devices and Circuit : Robert Boylestad, Louis Nashelsky,
4. Basic Electronics and Linear Circuits : N. N. Bhargava, D. C. KulShreshtha.

Name of the Department/Centre: Physics

Course Type (Please tick appropriate box):

Major		Discipline Specific Core		Ability Enhancement	
Minor		Multidisciplinary	X	Skill Enhancement	
Value Added		Any other			

Course Title: PROPERTIES OF MATTER

Semester: I

Total Credits: 3 **Lecture-Tutorial-Practical (LTP) breakup:** NOT APPLICABLE

Maximum Marks: 100 **No of seats:** ……

Course Advisor Name: Dr. Javid Ali

Course Advisor's Email: jali1@jmi.ac.in

Prerequisites: Class XII Physics

Special Requirements (if any): No

Expected Learning Outcomes: The objective of this course is to make students understand different physical properties of matter. The knowledge of these properties for different matter is very important for the usage of the matter for different applications or purposes.

Course Syllabus (Unit wise):

Unit I: Elasticity

Hooke's law, Relation between elastic constants, Torsion of a cylinder, Bending moment, Cantilever, Beam supported at both ends, Beams clamped at both ends, Reciprocity theorem, Elastic energy in different types of deformation, Rigidity modulus, Modulus of rigidity, Poisson's ratio, relation connecting different elastic- constants, twisting couple of a cylinder(solid and hollow), Statical method (Barton's method), Dynamical method (Maxwell's needle) for determining the modulus of rigidity, Bending moment, Cantilever (neglecting mass), Young modulus by bending of beam.

Unit II: Surface Tension

Surface Tension and Surface energy, Surface Tension determination by Jaeger's & Quincke's Methods, Angle of contact, Variation of surface tension with temperature, Excess of pressure over a curved surface, Shape of liquid drops, Application to spherical and cylindrical drops and bubbles.

Unit III: Viscosity

Viscosity, Rate flow of liquid in a capillary tube, Poiseuille's formula, Streamlined and turbulent motion, Reynolds number, Poiseuille's formula, Determination of coefficient of viscosity, capillary flow method, Stoke's formula, viscosity of highly viscous liquids, Variation of viscosity of a liquid with temperature

Unit IV: Fluid Mechanics

The equation of continuity, Euler's equation for ideal fluids, Hydrostatics, Bernoulli's theorem, Potential flow, Incompressible fluids, Newtonian fluids, Navier-Stokes equation and its applications. Poiseuille's formula, Couette flow, Turbulent flow and Reynold's number, Modern Applications

References Books:

1. General properties of Matter : Newman and Searle
2. Properties of Matter : Newman and Searle
3. Treatise on General Properties of matter : Newman and Searle