Enclosure-II

Courses offered by Physics Department to UG student to other department

DSE – Allied Course

Sr. No.	Semester	Course Code	Course	Name of the Program
1	III	**16UMTDA05/16UMTDA06 (THEORY/PRACTICAL)**	**PHYSICS-III**	B.Sc. Mathematics
2	IV	**16UMTDA07/16UMTDA08 (THEORY/PRACTICAL)**	**PHYISCS-IV**	B.Sc. Mathematics

Department of Physics (Ancillary) EVALUATION

The evaluation will generally comprise of Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) with percentage weightage as specified below, unless specified otherwise in the Scheme of Instruction and Examinations.

Theory Courses		***Practical Courses***	
Continuous Internal Evaluation (CIE)	30%	Continuous Internal Evaluation (CIE)	40%
Semester End Examination (SEE)	70%	Semester End Examination (SEE)	60%

For the purpose of computation of credits the following mechanism is adopted:

a) 1 hour instruction of Theory = 1 Credit
b) 1 hour instruction of Tutorial = 1 Credit
c) 2-3 hours instructions of Practical = 1 Credit

Syllabi for 3rd & 4th semester courses for UG programmes

DSE - Allied Courses for B.Sc. MATHEMATICS

SEMESTER-III

16UMTDA05	PHYSICS-III	03 Hrs/wk	03 Credit

Unit I : Electrostatics **(06 Hours)**

- Conductors: Basic Properties
- Induced charges,
- Surface charge and force on a conductor, Capacitors
- Polarization: Dielectrics
- Induced dipoles
- Alignment of polar molecules
- Polarization, Bound charges and field inside a dielectric
- Gauss law in the presence of dielectric

Unit II : Optics **(07 Hours)**

- Lasers: Interaction of radiation with matter (Spontaneous and stimulated emission)
- Einstein's relations
- Light amplification & conditions
- Population inversion, pumping
- Metastable states
- The principal pumping schemes
- Optical resonator
- Types of LASERs (only operation and working): Ruby LASER, Nd-YAG LASER, He-Ne LASER, Semiconductor LASER, Applications of LASER.

Unit III : Electronics **(10 Hours)**

- Transistor (BJT) Biasing: Introduction
- Operating point, Factors affecting Q-point
- Stability factor
- Fixed biased circuit
- Emitter stabilized bias circuit
- Voltage divider bias, DC bias with voltage feedback
- Single stage transistor amplifier: Single stage transistor amplifier
- How a transistor amplifier works
- Practical circuit of transistor amplifier, Phase reversal, Load line analysis, Voltage gain, Frequency response and bandwidth
- Special Devices: Thermister: Characteristics, Application as thermometer
- Light dependent resistor (LDR) and its applications, Phototransistor and its characteristics.

Unit IV : Digital Electronics **(07 Hours)**

- Logic gates and Boolean Algebra
- Analog and Digital signal
- Binary number system
- Decimal - Binary conversions
- Logic gates
- Combinations of Basic Logic Gates – NAND and NOR gates
- NAND gate as universal gate, Encoders and Decoders
- Merits and demerits of digital electronics
- Boolean Algebra: Boolean theorems
- DeMorgan's theorems

Unit V : Wave Mechanics **(06 Hours)**

- Schrodinger Equation
- A free particle in 1D, Generalization in 3D
- The operator correspondence and Schrodinger Equation for a particle subject to forces
- Physical interpretation in conditions on ψ: Normalization and probability interpretation
- Non-normalizable wave functions and box normalizations
- Conservation of probability
- Admissibility conditions on wave functions

Text Book:

1. Introduction to Electrodynamics by D.J. Griffiths
2. Electronic Devices and Circuit Theory by Boylestad and Nashelsky
3. A Text Book of Quantum Mechanics by Mathews and Venkatesan
4. Modern Physics by B.L.Theraja
5. Engineering Physics by R.K. Gaur and S.L. Gupta
6. Modern Physics by R. Murugeshan and K. Sivaprasath
7. A Text Book of Optics by N Subrahmanyan, B. Lal & M. Avadhanulu
8. Principles of Electronics by V.K.Mehta & R. Mehta

16UMTDA06	PHYSICS - III Practical	2 Hrs /week	1 Credit

1. Determination of wavelengths of mercury lines by diffraction grating
2. Energy band gap of a thermister
3. V-I characteristics of a thermister and determination of NTC
4. Characteristics of photo transistor
5. Varification of truth table of AND, OR, NOT, NAND and NOR gates
6. Study of NAND gate as universal gate
7. Frequency response of RC coupled amplifier and determination of B.W
8. Fabrication – A hand on practice on printed circuit board (PCB): Construction of AND gate using diodes and verification of truth table
9. Fabrication – A hand on practice on printed circuit board (PCB): Construction of OR gate using diodes and verification of truth table

Reference Book

1. Experimental Physics, University Granth Nirman Board. (Gujarati Medium)
2. B.Saraf et al-Physics through experiments Vol. I & II.
3. Chattopadhyay, Rakshit & Saha Practical Physics.

SEMESTER -IV

16UMTDA07	PHYSICS - IV	3 Hrs /week	3 Credits

Unit I : Magnetostatics **(06 Hours)**

- The Lorentz force law
- Magnetic fields and forces
- Currents Biot-Savart law (Statement)
- Steady currents and magnetic field of steady currents
- Diversions and curl of B
- Straight line current
- Diversions and curl of B
- Applications of amperes' law
- Comparison between magneto static and electro static

Unit II : Electronics **(08 Hours)**

- Oscillators: Feedback and condition for sustained oscillations
- RC and LC oscillators
- Special devices: FET Characteristics Parameters and working
- MOSFET Characteristics and working
- UJT Characteristics
- Parameters and working
- Solar cell and its characteristics

UNIT III : Relativity **(06 Hours)**

- Galilean transformations
- Ether hypothesis and Michelson Morley experiment
- Special theory of relativity
- Lorentz transformations and its consequences,
- Energy – mass relationship

Unit IV : Classical Mechanics **(08 Hours)**

- Lagrangian Formulations: Constrains
- Generalized co-ordinates
- De' Alembert principle
- Langrange' equations

- Applications of Langrange's equation
- Cyclic or Ignorable co-ordinates, symmetry and laws of conservations

Unit V : Wave Mechanics (08 Hours)

- The Schrodinger equation and probability interpretation of N – Particle system
- The fundamental postulates of wave mechanics; representation of states and dynamic variables
- Expectation values
- Ehrenfest theorem
- The adjoint of an operator
- Self adjoint operators and their properties

Text Book:

1. Introduction to Electrodynamics by D.J. Griffiths
2. Electronic Devices and Circuit Theory by Boylestad and Nashelsky
3. A Text Book of Quantum Mechanics by Mathews and Venkatesan
4. Engineering Physics by R.K. Gaur and S.L. Gupta
5. Principles of Electronics by V.K.Mehta & R. Mehta
6. Classical Mechanics by Takwale and Puranik

16UMTDA08	PHYSICS - IV Practical	2 Hrs /week	1 Credits

1. Determination of figure of merit and volt sensitivity of B.G
2. Comparision of capacitances by De'Sauty bridge
3. Magnetic field of a solenoid
4. Solar cell characteristic
5. Characteristics of JFET and determination of its parameters
6. Characteristics of UJT
7. FET as a voltmeter
8. Study of phase shift oscillator
9. Bridge rectifier with capacitive filter and Zener regulation. Study of voltage regulation.

Reference Book

1. Experimental Physics, University Granth Nirman Board. (Gujarati Medium)
2. B.Saraf et al-Physics through experiments Vol. I & II.
3. Chattopadhyay, Rakshit & Saha Practical Physics.