SEMESTER-IV

CLASSICAL & QUANTUM MECHANICS AND ELECTRONICS.

TOTAL HOURS: 64

Unit –1	16 hours
Lagrangian Formulation: Constraints, Holonomic constraints, Non-Holonomic Constraints, Scleronomic and Rheonomic Constraints, Generalized Co-ordinates, Degree of Freedom, Principal of Virtual work, D' Alembert's Principle, Lagrange equation, Newton's Equation of motion from Lagrange equation, Simple pendulum, Atwood's machine and linear harmonic Oscillator. Problems **Variational Principle:** Variational Principle, Hamilton's Principle, Deduction of Hamilton's Principle , Lagrange's Equation of motion from Hamilton's Principle, Hamilton's Principle for non-Holonomic systems. **Hamiltonian Mechanics:** The Hamiltonian of a system, Hamilton's equation of motion, Hamilton's equation from variational Principle, Integrals of Hamilton's equitation, Energy Integrals, Canonical Transformations, Poison Brackets, Fundamental Properties and equation of motion in Poison brackets. Problems.	
Unit –2	**16 hours**
Introduction To Quantum Mechanics: Brief Discussion on Failure of Classical Physics to Explain Black body radiation, Photo electric Effect, Compton Effect, Stability of atoms and Spectra of atoms, Compton Scattering, Experiment for Compton Shift (with derivation), Matter Waves: de-Broglie hypothesis of Matter Waves, Electron Microscope, Wave description of particle by Wave Packets, Group and phase Velocities and relation between them, Experimental Evidence for matter waves, Davison–Germer experiment, G P Thomson's experiment and its significance. Problems **Heisenberg Uncertainty Principle:** Heisenberg uncertainty principle, Elementary Proof of Heisenberg's relation between momentum and position, Energy and Time, angular momentum and angular position, illustration of uncertainty principle by Gama ray microscope thought Experiment, Consequences of the uncertainty relation, Foundation of Quantum Mechanics: Probabilistic interpretation of the wave function- Normalization and orthogonality of wave function, Admissibility Condition on Wave Function, Schrödinger Wave equation for free particle in one dimension, Time dependent and Time-independent wave equation. Problems.	
Unit –3	**16 hours**
Electronics -I: Introduction: **Current and voltage sources and Network Theorems**: Concept of voltage source: ideal and practical voltage source. Concept of current source: ideal and practical current source. Thevenin's and Norton's Theorems: statement and proof.	

Power supply: Power supply with filters (LC and π- section), IC regulated power supply. **Bipolar Junction Transistor:** BJT characteristics in CE mode, Operating point. Biasing of BJT: Mention different types of biasing, analysis of voltage divider biasing, derivation of I_C and V_{CE}. DC *h*-parameters and their determination using low frequency transistor model. Single stage RC coupled CE amplifier, Transistor as an oscillator: Hartley, Colpitts and Phase shift oscillators (qualitative only). **Junction Field Effect Transistor:** Types, characteristics and parameters of JFET. Problems.
Unit –4 **16 hours**
Electronics - II: **Integrated Circuits (ICs):** Introduction of ICs, Types of ICs, IC555 internal configuration, IC555 timer as a stable multi vibrator. **Operational Amplifier (Op-Amp):** Ideal Op-Amp and its characteristics, practical Op-Amp, concept of virtual ground, Op-Amp parameters, Op-Amp with negative feedback, Inverting Op-amp: close loop voltage gain expression, input and output impedance. **Digital Electronics:** Positive and negative logic levels, logic operations, NOT, OR, AND operations, construction of truth table. Digital logic gates: NOT, OR, AND, NOR, NAND, XOR, XNOR gates. Input-output timing diagram for NAND and NOR gates. Boolean theorems, De Morgan's theorems using truth table, using gates. Design of basic gates using NAND and NOR. Simplification of Boolean expressions. Problems.

References Books:

Sl. No.	Title of the Book	Authors Name	Publisher	Year of Publication
1	Classical Mechanics	Herbert Goldstein,Charles P.Pook,John L.Safko	Pearson Education	1980
2	Modern Physics	R.Murugeshan, Kiruthiga Sivaprasath	S.Chand Publication	1984
3	Quantum Mechanics	B.S Srivastava	PHI Learning Pvt.Ltd	2007
4	Quantum Mechanics	Satyaprakash	Pragati Publication	2007
5	Classical Mechanics	G Aruldhas	Prentice Hall India Learning Private Limited	2008
6	Quantum Mechanics	P M Mathews and K Venkateshan	Mc Graw Hill	1921
	Principles of Electronics	V K Mehata, Rohit Mehata	S Chand Publication New Delhi	2005
7	Basic Electronics	B. L. Theraja	S. Chand Publication,	2006

8	Electronic Devices and Circuits	Allen Mottershead	McGraw Hill, New Delhi.	1985
9	Electronic Devices and Circuits	David A.	Bell PHI, NewDelhi	2004

Practical Content

List of Experiments to be performed in the Laboratory (Minimum of 8 Experiments)

1	To determine the 'g ' the acceleration due to gravity at a given place from the L v/s T^2 graph by using simple pendulum.
2	Studying the effect of mass of the bob on the time period of the simple pendulum
3	Studying the effect of Amplitude of oscillation on the time period of the Simple pendulum
4	To determine the Acceleration due to gravity is to use an at wood's machine.
5	To study the conservation of energy and momentum using projectile motion
6	verification of the principle of conservation of linear momentum.
7	Determination of planks constant and work function of the material of the Cathode Using Photo Electric cell.
8	To study the spectral characteristics of a Photo-Voltaic Cell (solar cell)
9	Determination of electron charge 'e' by Millikan's oil drop experiment.
10	To find the value of e/m for an electron by magnetron method.
11	To determine the value of e/m for an electron by Thomson's method using bar magnets.
12	To study the tunneling in Tunnel diode using I-V Characteristics.
13	Determination of quantum efficiency of photodiode.
14	Verification of Basic Logic Gates AND,OR, and NOT
15	Verification of Logic Gates of NAND, and NOR

16	To determine the V-I Characteristics of semiconductor diode in Forward and Reverse biase
17	To determine the V-I Characteristics of a Zener diode in Reverse Biase
18	To construct the Inverting amplifiers using op-Amp amplifier.
19	To verify the Thevenin's and Norton's Theorems
20	Related any Electronics Experiments

Reference Books:

Sl. No.	Title of the Book	Authors Name	Publisher	Year of Publication
1	B. Sc. Practical Physics	Harnamsingh, Dr. P. S. Hemne	S. Chand & Co.	2014
2	Physics throughexperiments	B. Saraf	Vikas Publication	2015
3	B.Sc. Practical Physics	C.LArora	S.Chand&co.	2020

Note: For all B.Sc IV semester Students are Preparation of one project Report is compulsory for all Affiliated Colleges

Guidelines for Preparation of Project Report:

1.The project Work have 2 credits for 50 Marks

2.Students has to finalise the Project title and discussion with Project guide.

3. As per Guidelines, Project Guide to Choose the Project Work and Allotment to the Students. (20 Students for one Teacher)

4.The project Report Should be Submit their Respective Department in College.

5.The Project Work Have Following Guidelines, i) Project Title page ii) Certificate iii) Abstract/preface iv) introduction v) Acknowledgement, vi)Table of Content vii)Theory of Part and Summary viii) Conclusion. If any availability of Reference

5. To Finally Conduct the viva-Voce Based on the project Work at the end of the Exam.

The project Work based on any Physics Principles Related Equipments (Ex: Sensors , transistors , Solar Panels, Wind Power, Hall Effect, Heat Engine RocketLaunching,Lasers,Photons,Polymers,Hydraulic Power,Capacitors,G.M Counters, Nuclear Detectors,Semiconductor Devices, Electronics, any other Physics related Topics)

BOS Commite Members

1.Prof.M N Kalsad Department of Physics Davanagere University Davangere	Chairman
2. Dr.Vijayashree Patil Associate Professor of Physics Govt F.G College Raichur.	Member
3. Devindrappa Patil Associate Professor of Physics Govt. F.G College Shorapur	Member.
4. Dr. Purushottam Joshi Associate Professor of Physics Govt F G College Gurmitkal	Member

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