Max. Marks: **25+75**	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: **4-0-0**		
Unit	**Topics**	**No. of Lectures**
Part A: Perspectives of Modern Physics		
I	**Relativity-Experimental Background:** Structure of space & time in Newtonian mechanics and inertial & non-inertial frames. Galilean transformations. Newtonian relativity. Galilean transformation and Electromagnetism. Attempts to locate the Absolute Frame: Michelson-Morley experiment and significance of the null result. Einstein's postulates of special theory of relativity.	7
II	**Relativity-Relativistic Kinematics:** Structure of space & time in Relativistic mechanics and derivation of Lorentz transformation equations (4-vector formulation included). Consequences of Lorentz Transformation Equations (derivations & examples included): Transformation of Simultaneity (Relativity of simultaneity); Transformation of Length (Length contraction); Transformation of Time (Time dilation); Transformation of Velocity (Relativistic velocity addition); Transformation of Acceleration; Transformation of Mass (Variation of mass with velocity). Relation between Energy & Mass (Einstein's mass & energy relation) and Energy & Momentum.	8
III	**Inadequacies of Classical Mechanics:** Particle Properties of Waves: Spectrum of Black Body radiation, Photoelectric effect, Compton effect and their explanations based on Max Planck's Quantum hypothesis. Wave Properties of Particles: Louis de Broglie's hypothesis of matter waves and their experimental verification by Davisson-Germer's experiment and Thomson's experiment.	8
IV	**Introduction to Quantum Mechanics:** Matter Waves: Mathematical representation, Wavelength, Concept of Wave group, Group (particle) velocity, Phase (wave) velocity and relation between Group & Phase velocities. Wave Function: Functional form, Normalization of wave function, Orthogonal & Orthonormal wave functions and Probabilistic interpretation of wave function based on Born Rule.	7
PART B: Basic Electronics & Introduction to Fiber Optics		
V	**Transistor Biasing:** Faithful amplification & need for biasing. Stability Factors and its calculation for transistor biasing circuits for CE configuration: Fixed Bias (Base Resistor Method), Emitter Bias (Fixed Bias with Emitter Resistor), Collector to Base Bias (Base Bias with Collector Feedback) &, Voltage Divider Bias. Discussion of Emitter-Follower configuration.	7
VI	**Amplifiers:** Classification of amplifiers based on Mode of operation (Class A, B, AB, C & D), Stages (single & multi stage, cascade & cascode connections), Coupling methods (RC, Transformer, Direct & LC couplings), Nature of amplification (Voltage & Power amplification) and Frequency capabilities (AF, IF, RF & VF). Theory & working of RC coupled voltage amplifier (Uses of various resistors & capacitors, and Frequency	7

	response) and Transformer coupled power amplifier (calculation of Power, Effect of temperature, Use of heat sink & Power dissipation). Calculation of Amplifier Efficiency (power efficiency) for Class A Series-Fed, Class A Transformer Coupled, Class B Series-Fed and Class B Transformer Coupled amplifiers.	
VII	**Feedback & Oscillator Circuits:** Feedback Circuits: Effects of positive and negative feedback. Voltage Series, Voltage Shunt, Current Series and Current Shunt feedback connection types and their uses for specific amplifiers. Estimation of Input Impedance, Output Impedance, Gain, Stability, Distortion, Noise and Band Width for Voltage Series negative feedback. Oscillator Circuits: Use of positive feedback for oscillator operation. Barkhausen criterion for self-sustained oscillations. Feedback factor and frequency of oscillation for RC Phase Shift oscillator and Wein Bridge oscillator. Qualitative discussion of Reactive Network feedback oscillators (Tuned oscillator circuits): Hartley & Colpitts oscillators.	8
VIII	**Introduction to Fiber Optics:** Basics of Fiber Optics, step index fiber, graded index fiber, light propagation through an optical fiber, acceptance angle & numerical aperture, qualitative discussion of fiber losses and applications of optical fibers.	8

Suggested Readings:

PART A

1. A. Beiser, Shobhit Mahajan, "Concepts of Modern Physics: Special Indian Edition", McGraw Hill, 2009, 6e
2. H. K. Malik and A.K. Singh "Engineering Physics", McGraw Hill Education (India) Private Limited, 2018, 2e.
3. John R. Taylor, Chris D. Zafiratos, Michael A.Dubson, "Modern Physics for Scientists and Engineers", Prentice-Hall of India Private Limited, 2003, 2e
4. R.A. Serway, C.J. Moses, and C.A. Moyer, "Modern Physics", Cengage Learning India Pvt. Ltd, 2004, 3e
5. R. Resnick, "Introduction to Special Relativity", Wiley India Private Limited, 2007
6. R. Murugeshan, Kiruthiga Sivaprasath, "Modern Physics", S. Chand Publishing, 2019, 18e

PART B

7. H. K. Malik and A.K. Singh "Engineering Physics", McGraw Hill Education (India) Private Limited, 2018, 2e.
8. R.L. Boylestad, L. Nashelsky, "Electronic Devices and Circuit Theory", Prentice-Hall of India Pvt. Ltd., 2015, 11e
9. J. Millman, C.C. Halkias, Satyabrata Jit, "Electronic Devices and Circuits", McGraw Hill, 2015, 4e
10. B.G. Streetman, S.K. Banerjee, "Solid State Electronic Devices", Pearson Education India, 2015, 7e
11. J.D. Ryder, "Electronic Fundamentals and Applications", Prentice-Hall of India Private Limited, 1975, 5e
12. John M. Senior, "Optical Fiber Communications: Principles and Practice", Pearson Education Limited, 2010, 3e
13. John Wilson, John Hawkes, "Optoelectronics: Principles and Practice", Pearson Education Limited, 2018, 3e
14. S.L. Gupta, V. Kumar, "Hand Book of Electronics", Pragati Prakashan, Meerut, 2016, 43e

Local Author's Books

15. Modern Physics, R. Murugeshan & K. Sivaprasath, S. Chand Publication.
16. Refresher Course in Physics; Vol-II, C.L. Arora, S. Chand Publication.

Suggestive Digital Platforms / Web Links:

17. MIT Open Learning - Massachusetts Institute of Technology, https://openlearning.mit.edu/
18. National Programme on Technology Enhanced Learning (NPTEL), https://www.youtube.com/user/nptelhrd

19. Uttar Pradesh Higher Education Digital Library, http://heecontent.upsdc.gov.in/SearchContent.aspx
20. Swayam Prabha - DTH Channel, https://www.swayamprabha.gov.in/index.php/program/current_he/8

Suggested Continuous Evaluation Methods:
Continuous internal evaluation shall be based on allotted assignment and class tests. The marks shall be as follows:

Quiz/ Assignment	**(05 marks)**
Class Test-I	**(10 marks)**
Class Test-II	**(10 marks)**

- The course is elective and open to all.
- **PREREQUISITE:** Passed Semester I, Theory Paper-1 (B010101T)

Programme Class: **Diploma**	Year: **Second**	Semester: **Fourth**
Subject: **PHYSICS**		
Course Code: **(B010402P)**	Course Title: **Basic Electronics Instrumentation**	

Course Outcomes:
Basic Electronics instrumentation has the most striking impact on the industry wherever the components / instruments are used to study and determine the electronic properties. Measurement precision and perfection is achieved through Lab Experiments. Online Virtual Lab Experiments give an insight in simulation techniques and provide a basis for modeling.

Credits: 2	Core Compulsory / Elective
Max. Marks: **25+75**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 0-**0-4**

Unit	**Topics**	**No. of Lectures**
	Lab Experiment List	
	1. Transistor Bias Stability 2. Comparative Study of CE, CB and CC amplifier 3. Clippers and Clampers 4. Study of Emitter Follower 5. Frequency response of single stage RC coupled amplifier 6. Frequency response of single stage Transformer coupled amplifier 7. Effect of negative feedback on frequency response of RC coupled amplifier 8. Study of Schmitt Trigger 9. Study of Hartley oscillator **10.** Study of Wein Bridge oscillator	60
	Online Virtual Lab Experiment List/Link	
	Virtual Labs an initiative of MHRD Govt. of India http://vlabs.iitkgp.ac.in/psac/#	

	1. Diode as Clippers 2. Diode as Clampers 3. BJT as switch and Load Lines Virtual Labs an initiative of MHRD Govt. of India http://vlabs.iitkgp.ac.in/be/# 4. RC frequency response Virtual Labs at Amrita Vishwa Vidyapeetham https://vlab.amrita.edu/index.php?sub=1&brch=201 5. Hartley oscillator 6. Colpitt oscillator Virtual Labs at Amrita Vishwa Vidyapeetham http://vlab.amrita.edu/index.php?sub=59&brch=269 7. Fiber Optic Analog and Digital Link 8. Fiber Optic Bi-directional Communication 9. Wavelength Division Multiplexing 10. Measurement of Bending Losses in Optical Fiber 11. Measurement of Numerical Aperture 12. Study of LED and Detector Characteristics	

Suggested Readings:

1. R.L. Boylestad, L. Nashelsky, "Electronic Devices and Circuit Theory", Prentice-Hall of India Pvt. Ltd., 2015, 11e
2. J. Millman, C.C. Halkias, Satyabrata Jit, "Electronic Devices and Circuits", McGraw Hill, 2015, 4e
3. B.G. Streetman, S.K. Banerjee, "Solid State Electronic Devices", Pearson Education India, 2015, 7e
4. J.D. Ryder, "Electronic Fundamentals and Applications", Prentice-Hall of India Private Limited, 1975, 5e
5. John M. Senior, "Optical Fiber Communications: Principles and Practice", Pearson Education Limited, 2010, 3e
6. John Wilson, John Hawkes, "Optoelectronics: Principles and Practice", Pearson Education Limited, 2018, 3e
7. S.L. Gupta, V. Kumar, "Hand Book of Electronics", Pragati Prakashan, Meerut, 2016, 43e

Suggestive Digital Platforms / Web Links:

1. Virtual Labs an initiative of MHRD Govt. of India, http://vlabs.iitkgp.ac.in/psac/#
2. Virtual Labs an initiative of MHRD Govt. of India, http://vlabs.iitkgp.ac.in/be/#
3. Virtual Labs at Amrita Vishwa Vidyapeetham, https://vlab.amrita.edu/index.php?sub=1&brch=201
4. Virtual Labs at Amrita Vishwa Vidyapeetham, http://vlab.amrita.edu/index.php?sub=59&brch=269
5. Digital Platforms /Web Links of other virtual labs may be suggested / added to this lists by individual Universities

Suggested Continuous Evaluation Methods:

Continuous internal evaluation shall be based on allotted assignment and class tests. The marks shall be as follows:

Record File	**(15 marks)**
Viva Voce	**(05 marks)**
Class Interaction	**(10 marks)**

- The course can be opted by Botany / Chemistry / Computer Science / Mathematics / Statistics / Zoology
- **PREREQUISITE:** Opted / Passed Semester IV, Theory Paper-1 (B010401T)

Further Suggestions: