

## Teaching Plan of 4<sup>th</sup> Semester 2025-2026

**Subject:** Physics

**Semester:** FYUGP 4<sup>th</sup> Semester

**Paper Name:** Analog Electronics

**Paper Code:** PHY4400804MN

**Total Number of Classes/Lectures:** 45

**Period:** January-June

**Total Credit:** 4 (Theory 3 + Laboratory 1)

**Existing Base Syllabus:** HS Physics

**Faculty:** Dr. Manisha Phukan and Dr. Palash Jyoti Boruah

Lecture No.	Unit/Topic	Mode of Teaching	Assessment Method	Faculty
07	<b>Unit-I: Semiconductor Diodes</b>  P and N type semiconductors. Energy Level Diagram. Conductivity and Mobility, Concept of Drift velocity. PN Junction Fabrication (Simple Idea). Barrier Formation in PN Junction Diode.  Static and Dynamic Resistance. Current Flow Mechanism in Forward and Reverse Biased Diode. Drift Velocity.  Derivation for Barrier Potential, Barrier Width, and Current for Step Junction.	Lectures  Oral Questions-P  Problem Solving  Previous year Question paper solving	Sessional & Class-tests	Dr. Palash Jyoti Boruah
05	<b>Unit-II: Two-terminal Devices and their Applications</b>	Lectures	Sessional & Class-tests	Dr. Palash Jyoti Boruah

	<p>Rectifier Diode: Half- wave Rectifiers. Centre-tapped and Bridge type Full-wave Rectifiers. Calculation of Ripple Factor and Rectification Efficiency. C-filter.</p> <p>Zener Diode and Voltage Regulation. Power supply without filter circuit and with C-filter circuit.</p> <p>Principle LEDs, Photodiode, and Solar Cell (Basic concept).</p>	<p>Oral Questions-P</p> <p>Problem Solving</p> <p>Previous year Question paper solving</p>		
05	<p><b>Unit-III: Bipolar Junction Transistors</b></p> <p>n-p-n and p-n-p Transistors. Characteristics of CB, CE, and CC Configurations. Current gains <math>\alpha</math> and <math>\beta</math>. Relations between <math>\alpha</math> and <math>\beta</math>.</p> <p>Load line analysis of Transistors. DC Load line and Q-point.</p> <p>Physical Mechanism of Current Flow. Active, Cutoff, and Saturation Regions.</p>	<p>Lectures</p> <p>Oral Questions-P</p> <p>Problem Solving</p> <p>Previous year Question paper solving</p>	Sessional & Class-tests	Dr. Manisha Phukan
07	<p><b>Unit-IV: Amplifiers</b></p> <p>Transistor Biasing and Stabilization Circuits. Fixed Bias and Voltage Divider Bias. Transistor as a 2-port Network. h-parameter. Equivalent Circuit.</p> <p>Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage, and Power Gains.</p>	<p>Lectures</p> <p>Oral Questions-P</p> <p>Problem Solving</p> <p>Previous year Question paper solving</p>	Sessional & Class-tests	Dr. Manisha Phukan

	Classification of Class A, B & C Amplifiers (Basic Concept). Differential amplifier using transistor (Working Principle Only).			
02	<b>Unit-V: Coupled Amplifier</b>  Two-stage RC-coupled amplifier and its frequency response.	Lectures  Oral Questions-P  Problem Solving  Previous year Question paper solving	Sessional & Class-tests	Dr. Manisha Phukan
04	<b>Unit-VI: Feedback in Amplifiers</b>  Effects of Positive and Negative Feedback on Input Impedance. Output Impedance. Gain. Stability. Distortion and Noise	Lectures  Oral Questions-P  Problem Solving  Previous year Question paper solving	Sessional & Class-tests	Dr. Manisha Phukan
05	<b>Unit-VII: Sinusoidal Oscillators</b>  Barkhausen's Criterion for self-sustained oscillations. RC Phase shift oscillator.  Wein Bridge Oscillator.	Lectures  Oral Questions-P  Problem Solving  Previous year Question paper solving	Sessional & Class-tests	Dr. Manisha Phukan
03	<b>Unit-VIII: Operational Amplifiers (Black Box approach)</b>	Lectures	Sessional & Class-tests	Dr. Palash Jyoti Boruah

	<p>Characteristics of an Ideal and Practical Op-Amp (IC 741). Open-loop and Closed-loop Gain.</p> <p>Frequency Response. CMRR. Slew Rate and Concept of Virtual Ground.</p>	<p>Oral Questions-P</p> <p>Problem Solving</p> <p>Previous year Question paper solving</p>		
04	<p><b>Unit-IX: Applications of Op-Amps</b></p> <p>Inverting and non-inverting amplifiers. Adder. Subtractor. Differentiator. Integrator.</p> <p>Log and Anti Log amplifier. Comparator. Zero Crossing Detector.</p>	<p>Lectures</p> <p>Oral Questions-P</p> <p>Problem Solving</p> <p>Previous year Question paper solving</p>	Sessional & Class-tests	Dr. Palash Jyoti Boruah
03	<p><b>Unit-X: Introduction to CRO</b></p> <p>Block Diagram of CRO. Electron Gun, Deflection System, and Time Base. Deflection Sensitivity.</p> <p>Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, and Frequency (Basic Concept only)</p>	<p>Lectures</p> <p>Oral Questions-P</p> <p>Problem Solving</p> <p>Previous year Question paper solving</p>	Sessional & Class-tests	Dr. Palash Jyoti Boruah
Sl. No.	<b>Experiment No. and Aim of the Experiment</b>		<b>Mode of Teaching</b>	<b>Faculty</b>
1.	1. To study V-I characteristics of PN junction diode, and light emitting diode.		Demonstrating the concepts clearly.	Dr. Manisha Phukan
2.	2. To study the V-I characteristics of a Zener diode and its use as a voltage regulator			Dr. Palash Jyoti Boruah

3.	4. To study the characteristics of a Bipolar Junction Transistor in CE configuration.	Engaging students in hands-on experimental work for better understanding	
4.	16. To investigate the use of an Op-amp as an Integrator.		
5.	17. To investigate the use of an Op-amp as a Differentiator.		

## Reference Books

1. Integrated Electronics, J. Millman and C. C. Halkias, 1991, Tata Mc-Graw Hill.
2. Electronics: Fundamentals and Applications, J. D. Ryder, 2004, Prentice Hall.
3. Solid State Electronic Devices, B. G. Streetman & S. K. Banerjee, 6th Edn., 2009, PHI Learning.
4. Electronic Devices & circuits, S. Salivahanan & N. S. Kumar, 3rd Ed., 2012, Tata McGraw Hill
5. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
6. Microelectronic circuits, A. S. Sedra, K.C. Smith, A. N. Chandorkar, 2014, 6th Edn., Oxford University Press.
7. Electronic circuits: Handbook of design & applications, U. Tietze, C. Schenk, 2008, Springer.
8. Semiconductor Devices: Physics and Technology, S. M. Sze, 2nd Ed., 2002, Wiley India.
9. Microelectronic Circuits, M. H. Rashid, 2nd Edition, Cengage Learning.
10. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India.
11. Electronics Fundamentals and Applications, D. Chattopadhyay and P. C. Rakshit, 17th Ed, 2023, New Age International Publishers.