

## PULSE AND DIGITAL CIRCUITS

<b>IV Semester: ECE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEC006	<b>Foundation</b>	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
<b>Contact Classes: 45</b>		<b>Tutorial Classes: 15</b>		<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>	
<p><b>OBJECTIVES:</b></p> <p><b>The course should enable the students to:</b></p> <ol style="list-style-type: none"> <li>I. Be proficient in the use of linear and non linear wave shaping circuits for sinusoidal, pulse and ramp inputs.</li> <li>II. Construct various multivibrators using transistors, and design sweep circuits and sampling gates.</li> <li>III. Evaluate the methods to achieve frequency synchronization and division using uni-junction transistors, multivibrators and symmetric circuits.</li> <li>IV. Realize logic gates using diodes and transistors and distinguish between various logic families.</li> </ol> <p><b>COURSE LEARNING OUTCOMES (CLOs):</b></p> <ol style="list-style-type: none"> <li>1. Understand the response of high pass RC and low pass RC circuits to different non sinusoidal inputs with different time constants and identify RC circuit's applications.</li> <li>2. Understand the various clipper circuits using switching components like diodes, transistors and design various clipper circuits with and without reference voltages.</li> <li>3. Formulate clamping circuit theorem and design practical clamping circuits by understanding the different diode clamper circuits.</li> <li>4. Illustrate the bistable multi with various triggering methods and apply design procedures to different bistable multivibrator circuits.</li> <li>5. Evaluate triggering points, hysteresis width of Schmitt trigger circuit and also design practical Schmitt trigger circuit.</li> <li>6. Analyze the monostable, astable multivibrator circuits with applications and evaluate time, frequency parameters.</li> <li>7. Understand the different types of sampling gates with operating principles using diodes, transistors and also evaluate various parameters of sampling gates.</li> <li>8. Implement different methods to generate time base waveforms using various sweep circuits like Bootstrap and Miller circuits.</li> <li>9. Apply the various time base generator circuits in applications like cathode ray oscilloscope and television circuits.</li> <li>10. Understand the concept of frequency division, synchronization and pulse synchronization of various Relaxation circuits.</li> <li>11. Analyze the frequency division with sweep circuits and various relaxation circuits like Astable multi, Monostable multi circuits.</li> <li>12. Implement the synchronization of different sweep circuits with symmetrical signals and sinusoidal signals.</li> <li>13. Understand and analyze the different bipolar, unipolar logic families like DTL, RTL, DCTL, TTL, MOS and CMOS.</li> </ol>								

<p>14. Understand the specifications of logic families such as propagation delay, fan in, fan out, noise immunity and compare various logic families.</p> <p>15. Understand and analyze the tri state logic and interfacing of transistor transistor logic and complementary metal oxide semi conductor logic families.</p>		
<b>Unit-I</b>	<b>WAVE SHAPING CIRCUITS</b>	<b>Classes: 10</b>
<p>Linear wave shaping circuits: High pass RC and low pass RC circuits, response to impulse and pulse inputs with different time constants, high pass RC circuit as a differentiator, low pass RC circuit as an integrator, switching characteristics of diode; Non-linear wave shaping circuits: Clipping circuits, diode clippers, shunt clippers, series clippers, clipping at two independent levels; Clamping circuits: Clamping theorem.</p>		
<b>Unit -II</b>	<b>MULTIVIBRATORS</b>	<b>Classes: 10</b>
<p>Multivibrators: Introduction, classification; Bistable multivibrator: Fixed bias, self bias, unsymmetrical triggering, symmetrical triggering; Schmitt trigger: Upper trigger point, lower trigger point, hysteresis, applications of Schmitt trigger; Monostable multivibrator: Collector coupled, triggering of monostable Multivibrator. Astable multivibrator: Collector coupled, voltage to frequency converter.</p>		
<b>Unit -III</b>	<b>SAMPLING GATES AND TIME BASE GENERATORS</b>	<b>Classes: 08</b>
<p>Sampling gates: basic operating principle of sampling gate, uni and bi directional sampling gates.</p> <p>Time base generators: General features of a time base signal; Methods of generating a time base waveform: Exponential sweep circuits, sweep circuit using uni junction transistor, Miller sweep circuit and Bootstrap sweep circuit. Bootstrap sweep circuit.</p>		
<b>Unit -IV</b>	<b>SYNCHRONIZATION AND FREQUENCY DIVISION</b>	<b>Classes: 09</b>
<p>Synchronization and frequency division: Pulse synchronization of relaxation devices, frequency division with sweep circuits, other astable relaxation circuits, synchronization of astable multivibrator, monostable relaxation circuits as dividers, stability of relaxation dividers; Synchronization of a sweep circuit with symmetrical signals: Sinusoidal synchronization signals and sine wave frequency division with a sweep circuit.</p>		
<b>Unit -V</b>	<b>DIGITAL LOGIC FAMILIES</b>	<b>Classes: 08</b>
<p>Bipolar logic families: RTL, DTL, DCTL, HTL, TTL, ECL, MOS, and CMOS logic families, tristate logic; Interfacing of CMOS and TTL families.</p>		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. A. Anand Kumar, "Pulse and Digital Circuits", PHI learning, 2nd Edition, 2005.</li> <li>2. David A. Bell, "Solid State Pulse circuits", PHI learning, 4th Edition, 2002.</li> <li>3. David J.Comer, "Digital Logic State Machine Design", Oxford University Press, 3rd Edition, 2008.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Ronald J. Tocci, "Fundamentals of Pulse and Digital Circuits", PHI learning, 3rd Edition, 2008.</li> <li>2. Millman J., Taub, "Pulse, Digital and Switching Waveforms", Tata McGraw-Hill, 2nd Edition, 2007.</li> </ol>		
<b>Web References:</b>		
<ol style="list-style-type: none"> <li>1. <a href="http://www.nptel.ac.in">www.nptel.ac.in</a></li> <li>2. <a href="http://notes.specworld.in/pdc-pulse-and-digital-circuits">notes.specworld.in/pdc-pulse-and-digital-circuits</a></li> <li>3. <a href="http://surkur.blogspot.in/p/pdc.html">surkur.blogspot.in/p/pdc.html</a></li> <li>4. <a href="https://books.google.co.in/books?isbn=8131721353">https://books.google.co.in/books?isbn=8131721353</a></li> </ol>		

**E-Text Books:**

1. [http:// www.introni.it/pdf/Millman-Taub- Pulse and Digital Switching Waveforms 1965.pdf](http://www.introni.it/pdf/Millman-Taub-Pulse%20and%20Digital%20Switching%20Waveforms%201965.pdf)
2. <https://www.jntubook.com/pulse-digital-circuits-textbook-free-download/>