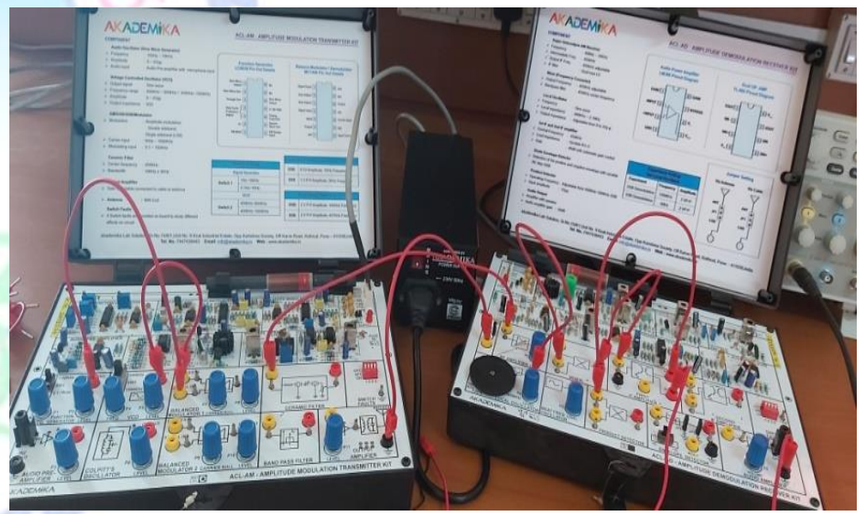
SRI PADMAVATI MAHILA VISVAVIDYALAYAM

(WOMEN'S UNIVERSITY) TIRUPATI – 517502

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ENGINEERING AND TECHNOLOGY

Analog and Digital Communication Laboratory

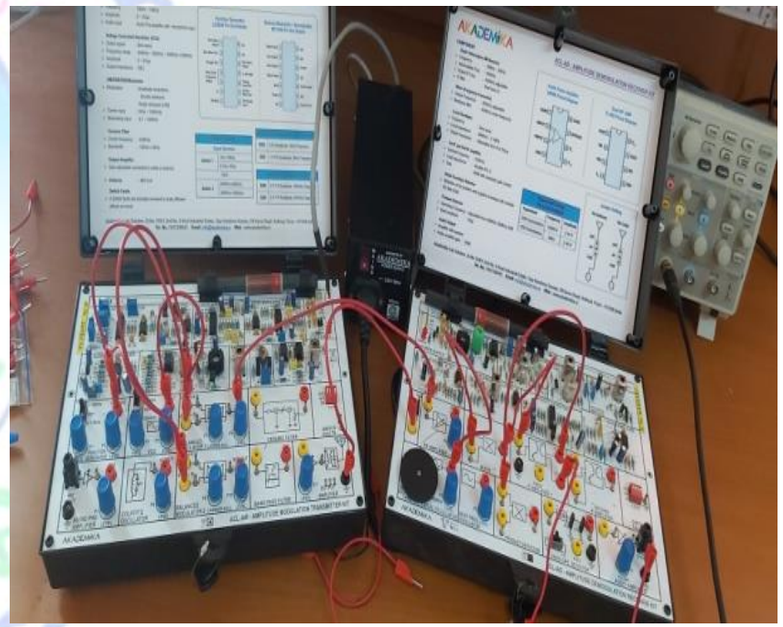
S.No	Item name/ make & model	Technical specifications	Experiment photograph
1	**Amplitude modulation and demodulation**	**Audio oscillator**(sine wave generator) Frequency: : 100Hz~10KHz Amplitude: : 0~2Vpp Audio input: Audio preamplifier with microphone input **Voltage controlled oscillator** Output signal: Sine wave Frequency range: : 1)400KHz~500KHz 2)400KHz~1500KHz Amplitude: 0~2Vpp Output impedance: 50 Ohm **AM/ DSB/ SSB/ modulator** Modulation: Amplitude modulation Double side band Single side band(LSB)	

		Carrier input: 1~1000KHz Modulating input: : 0.1~100KHz Carrier null: : Adjustable Output amplitude: Adjustable **Ceramic filter** Centre frequency : 455KHz Bandwidth : 10KHz ± 3KHz **Output amplifier** Gain adjustable connected to cable or antenna Antenna: MWCoil **Switch faults** 4 switch faults are provided on-board to study different effects on circuit Power supply: GND,+5V,+12V, -12V **Super heterodyne receiver** Frequency : 400KHz~1.5MHz Intermediate frequency: : 455KHz Inputs: : RF signal Output IF frequency : 455KHz adjustable IF filter: : Dual tune LC RF amplifier with variable gain	

		Mixer (frequency converter) Output Frequency :455 KHz adjustable Band pass filter :455 KHz centre frequency Frequency: 900KHz ~2.1MHz 1st IF and 2nd IF amplifier Central frequency : 455KHz Load impedance : Variable R-L-C Gain : 40dB with automatic gain control **Diode envelope detector** Detection of the positive and negative envelope with variable RC filter DSB **Product detector** Operating frequency: Adjustable from 400KHz ~ 500KHz SSB Input amplitude :1Vpp Audio output: Amplifier with speaker Audio amplifier gain : 20dB Receiving media MW coil antenna and via cable **Switch faults** 4 switch faults are provided on board to study different effects on circuit	

2	**Frequency modulation and demodulation**	Frequency Generator : Sine, Square, Triangular Frequency range : 1Hz~100KHz **Audio input:** Audio preamplifier with microphone **FM modulators** Varactor modulator with carrier frequency adjustment FM via PM Operating frequency: Adjustable from 400KHz~500KHz Input amplitude: 0.1 Vpp with integration circuit for indirect frequency modulation **PM modulator** Operating frequency: Adjustable from 400KHz~500KHz Input amplitude: 0.5 Vpp with integration circuit for indirect frequency modulation **Mixer (frequency converter)** Dual gate MOSFET inputs: Local oscillator and RF signal Output IF frequency: 455KHz adjustable IF filter: Dual tune LC Transmitter output : 455KHz frequency **Switch faults** 4 switch faults are provided on-board to study different effects on circuit **Power supply:** GND, +5V, +12V, -12V Foster-seely detector	

		Operating frequency: Adjustable from 400 KHz ~ 500 KHz Input amplitude: 1Vpp Ratio discriminator detector Operating frequency: Adjustable from 400 KHz ~ 500 KHz Input amplitude: 1Vpp **Phase lock loop detector (PLL)** Operating frequency: Adjustable from 400 KHz ~ 500 KHz Input amplitude: 1Vpp **Phase detector and FM quadrature detector** Operating frequency: Adjustable from 400 KHz ~ 500 KHz Input amplitude: 1Vpp **Amplitude limiter** Operating frequency : 455KHz Input amplitude : 0.5 ~ 5 Vpp Output limited amplitude: 1.5 Vpp **Low pass filter:** 4th order butter worth filter Cut-Off frequency : 3.4 KHz **Audio output** Audio amplifier gain : 20dB **Switch faults**	

		4 switch faults are provided on-board to study different effects on circuit **Power supply** GND, +5V, +12V, -12V	
3	**Balanced modulator**	**Audio oscillator**(sine wave generator) Frequency: : 100Hz~10KHz Amplitude: : 0~2Vpp Audio input: Audio preamplifier with microphone input **Voltage controlled oscillator** Output signal: Sine wave Frequency range: : 1)400KHz~500KHz 2)400KHz~1500KHz Amplitude: 0~2Vpp Output impedance: 50 Ohm **AM/ DSB/ SSB/ modulator** Modulation: Amplitude modulation Double side band Single side band(LSB) Carrier input: 1~1000KHz Modulating input: : 0.1~100KHz Carrier null: : Adjustable	

		Output amplitude: Adjustable **Ceramic filter** Centre frequency : 455KHz Bandwidth : 10KHz ± 3KHz **Output amplifier** Gain adjustable connected to cable or antenna Antenna: MWCoil **Switch faults** 4 switch faults are provided on-board to study different effects on circuit Power supply: GND,+5V,+12V, -12V **Super heterodyne receiver** Frequency : 400KHz~1.5MHz Intermediate frequency: : 455KHz Inputs: : RF signal Output IF frequency : 455KHz adjustable IF filter: : Dual tune LC RF amplifier with variable gain **Mixer (frequency converter)** Output Frequency :455 KHz adjustable Band pass filter :455 KHz centre frequency	

		Frequency: 900KHz ~2.1MHz 1st IF and 2nd IF amplifier Central frequency : 455KHz Load impedance : Variable R-L-C Gain : 40dB with automatic gain control **Diode envelope detector** Detection of the positive and negative envelope with variable RC filter DSB **Product detector** Operating frequency: Adjustable from 400KHz ~ 500KHz SSB Input amplitude :1Vpp Audio output: Amplifier with speaker Audio amplifier gain : 20dB Receiving media MW coil antenna and via cable **Switch faults** 4 switch faults are provided on board to study different effects on circuit	

4	**Characteristics of mixer**	**Audio oscillator**(sine wave generator) Frequency: : 100Hz~10KHz Amplitude: : 0~2Vpp Audio input: Audio preamplifier with microphone input **Voltage controlled oscillator** Output signal: Sine wave Frequency range: : 1)400KHz~500KHz 2)400KHz~1500KHz Amplitude: 0~2Vpp Output impedance: 50 Ohm **AM/ DSB/ SSB/ modulator** Modulation: Amplitude modulation Double side band Single side band(LSB) Carrier input: 1~1000KHz Modulating input: : 0.1~100KHz Carrier null: : Adjustable Output amplitude: Adjustable **Ceramic filter** Centre frequency : 455KHz	

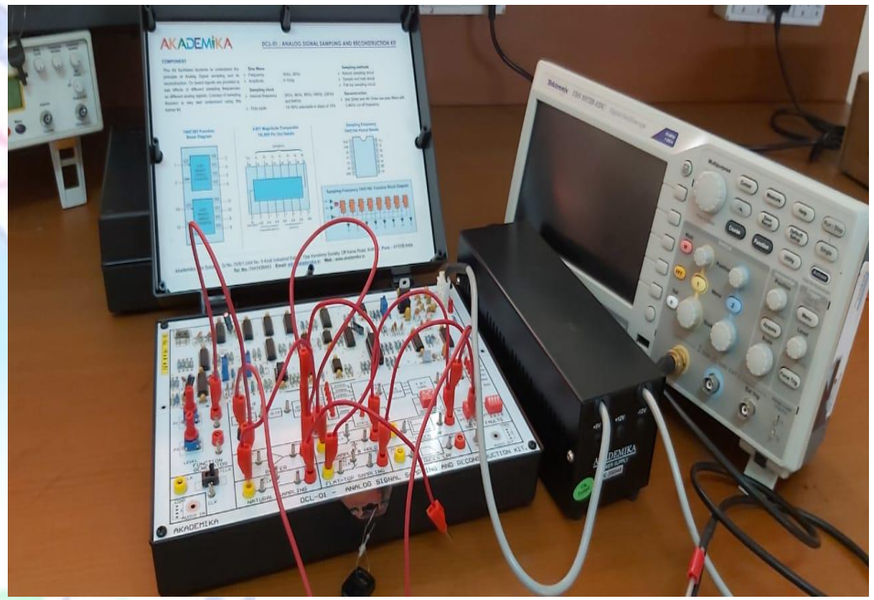
		Bandwidth : 10KHz ± 3KHz **Output amplifier** Gain adjustable connected to cable or antenna Antenna: MWCoil **Switch faults** 4 switch faults are provided on-board to study different effects on circuit Power supply: GND,+5V,+12V, -12V **Super heterodyne receiver** Frequency : 400KHz~1.5MHz Intermediate frequency: : 455KHz Inputs: : RF signal Output IF frequency : 455KHz adjustable IF filter: : Dual tune LC RF amplifier with variable gain **Mixer (frequency converter)** Output Frequency :455 KHz adjustable Band pass filter :455 KHz centre frequency Frequency: 900KHz ~2.1MHz 1st IF and 2nd IF amplifier Central frequency : 455KHz	

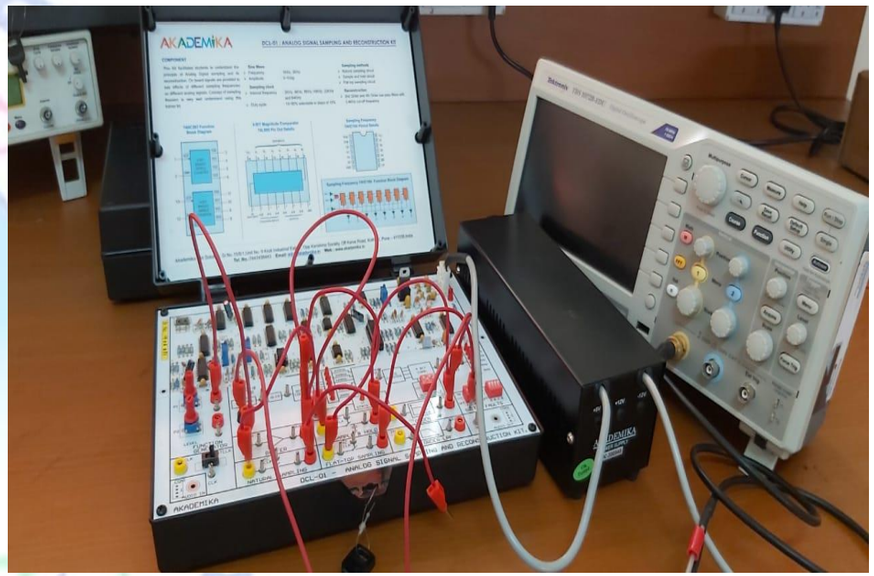
		Load impedance : Variable R-L-C Gain : 40dB with automatic gain control **Diode envelope detector** Detection of the positive and negative envelope with variable RC filter DSB **Product detector** Operating frequency: Adjustable from 400KHz ~ 500KHz SSB Input amplitude :1Vpp Audio output: Amplifier with speaker Audio amplifier gain : 20dB Receiving media MW coil antenna and via cable **Switch faults** 4 switch faults are provided on board to study different effects on circuit	

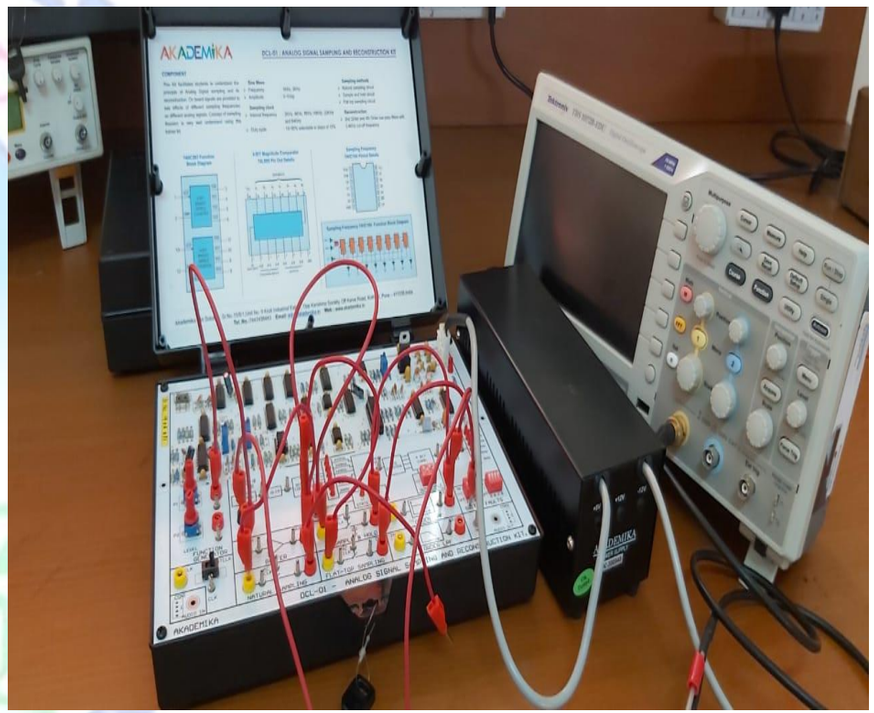
5	**SSB system**	**Audio oscillator**(sine wave generator) Frequency: : 100Hz~10KHz Amplitude: : 0~2Vpp Audio input: Audio preamplifier with microphone input **Voltage controlled oscillator** Output signal: Sine wave Frequency range: : 1)400KHz~500KHz 2)400KHz~1500KHz Amplitude: 0~2Vpp Output impedance: 50 Ohm **AM/ DSB/ SSB/ modulator** Modulation: Amplitude modulation Double side band Single side band(LSB) Carrier input: 1~1000KHz Modulating input: : 0.1~100KHz Carrier null: : Adjustable Output amplitude: Adjustable **Ceramic filter** Centre frequency : 455KHz	

		Bandwidth : 10KHz ± 3KHz **Output amplifier** Gain adjustable connected to cable or antenna Antenna: MWCoil **Switch faults** 4 switch faults are provided on-board to study different effects on circuit Power supply: GND,+5V,+12V, -12V **Super heterodyne receiver** Frequency : 400KHz~1.5MHz Intermediate frequency: : 455KHz Inputs: : RF signal Output IF frequency : 455KHz adjustable IF filter: : Dual tune LC RF amplifier with variable gain **Mixer (frequency converter)** Output Frequency :455 KHz adjustable Band pass filter :455 KHz centre frequency Frequency: 900KHz ~2.1MHz 1st IF and 2nd IF amplifier Central frequency : 455KHz	

		Load impedance : Variable R-L-C Gain : 40dB with automatic gain control **Diode envelope detector** Detection of the positive and negative envelope with variable RC filter DSB **Product detector** Operating frequency: Adjustable from 400KHz ~ 500KHz SSB Input amplitude :1Vpp Audio output: Amplifier with speaker Audio amplifier gain : 20dB Receiving media MW coil antenna and via cable **Switch faults** 4 switch faults are provided on board to study different effects on circuit	

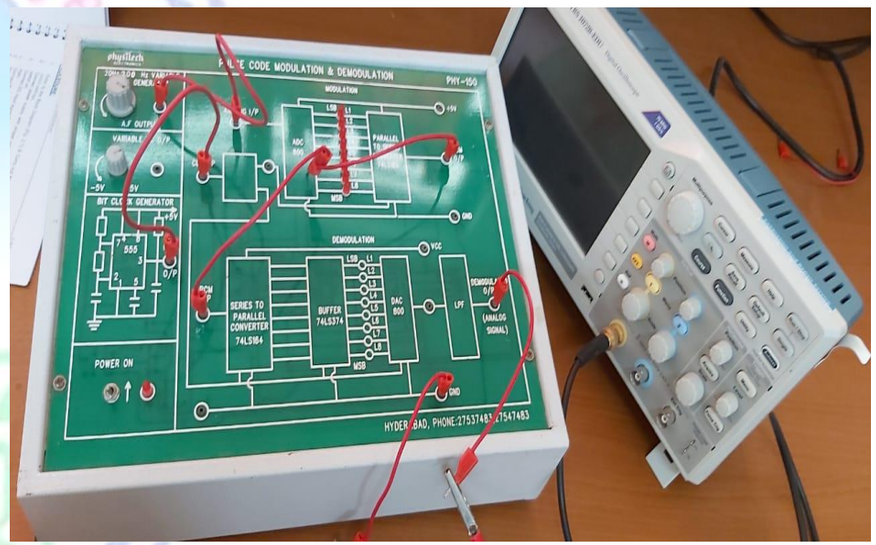
6	**Sampling and Re-construction**	Onboard signals: sine wave Frequency: 1 KHz, 2 KHz Amplitude: 0 ~ 5Vpp **Sampling clock** Internalfrequency: 2 KHz, 4 KHz, 8 KHz, 16 KHz, 32 KHz Duty cycle: 10 to 90% selectable in steps of 10% **Sampling method** Natural sampling circuit, Sample and hold circuit, Flat top sampling circuit **Reconstruction** 2nd order and 4 order low pass Butterworth filters with 3.4 KHz cut-off frequency **Switch faults** 7 switch faults are provided on-board to study different effects on circuit **Test points:** 24 test points are provided on board to observe various intermediate signals **Power supply:** GND, +5V, +12V, -12V	

7	**Pulse amplitude modulation and demodulation**	Onboard signals: sine wave Frequency: 250Hz, 500Hz, 1 KHz, 2 KHz Amplitude: 0 to 5 Vpp DC signal: 0 to 5 Vpp **Input channels: 4** **Multiplexing:** Time division multiplexing **Sampling rate:** 32 KHz **Modulation:** Pulse amplitude modulation **Receiver clock:** Phase lock loop generates receiver clock and channel information **Low pass filter** 4th order butter worth filters (3.4 KHz cut off) **Switch faults** 8 switch faults are provided on board to study different effects on circuit **Test points** 39 test points are provided on board to observe various intermediate signals **Power supply:** GND, +5V, +12V, -12V	

8	**pulse position modulation and demodulation**	**On-board signals Sine wave** Variable frequency : 1Hz to 30Hz Amplitude : 0 to 2 Vpp Fixed frequency : 500Hz and 1 KHz Amplitude : 0 to 4 Vpp **Sampling** Internal sampling clock : 8 KHz and 16 KHz Duty cycle : 50 % **Modulation techniques** Pulse amplitude modulation (with variable clock 8KHz,16KHz Pulse width modulation (with variable clock 4KHz, 8KHz ,16KHz, 32 KHz) Pulse position modulation (with variable clock 4KHz, 8KHz, 16KHz, 32KHz) **Switch faults** 8 switch faults are provided on board to study different effects on circuit **Interconnection** 2 mm banana socket Two 4 pin connector for audio input / output kit **Test points** 29 test points are provided to observe various intermediate signals **Power supply**	

		GND, +5V, +12V, -12V	

8	**Pulse Width Modulation and Demodulation**	**On-board signals Sine wave** Variable frequency : 1Hz to 30Hz Amplitude : 0 to 2 Vpp Fixed frequency : 500Hz and 1 KHz Amplitude : 0 to 4 Vpp **Sampling** Internal sampling clock : 8 KHz and 16 KHz Duty cycle : 50 % **Modulation techniques** Pulse amplitude modulation (with variable clock 8KHz,16KHz Pulse width modulation (with variable clock 4KHz, 8KHz ,16KHz, 32 KHz) Pulse position modulation (with variable clock 4KHz, 8KHz, 16KHz, 32KHz) **Switch faults** 8 switch faults are provided on board to study different effects on circuit **Interconnection** 2 mm banana socket Two 4 pin connector for audio input / output kit **Test points** 29 test points are provided to observe various intermediate signals **Power supply**	

		GND, +5V, +12V, -12V	
10	**Pulse Code Modulation and Demodulation**	Onboard signals: sine wave Frequency: 500Hz and 1 KHz Amplitude: 0 to 4 Vpp DC: 2 **Amplitude:** 0 TO 5 V **Input channels:** 2 channel time division multiplexed and pulse code modulated **Synchronization signal:** Pseudo random bit sequence synchronous code generation Serial data pattern: 14-bit PRBS and 14-bit data **Parity code facility:** Even, odd, hamming, none parity **Modes of operation** FAST: 16 KHz / channel SLOW: 0.088Hz (811ms) / channel **Switch faults:** 8 switch faults are provided on board to study different effects on circuit **Test points** 23 test points are provided to observe various intermediate signals **Power supply:** GND, +5V, +12V, -12V	

		Demodulation: **SPECIFICATION** **Input channels:** 2channel time division multiplexed pulse code modulation receiver **Receiver clock:** Generated by phase lock loop **Parity check facility:** Even, odd, hamming **Error correction:** Hamming code **Low pass filter:** Two 4th order butterworth filter, 3.4 KHz (cut-off) **Switch faults:** 4th switch faults are provided on-board to study different effects on circuit **Test points:** 25 test points are provided to observe various intermediate signals **Power supply:** GND, +5V, +12V, -12V	


AKADEMIKA
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