JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ECE - I Sem	L	T/P/D	C
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(55012) CONTROL SYSTEMES

Objective :

In this course it is aimed to introduce to the students the principles and applications of control systems in every day life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

UNIT – I : INTRODUCTION

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems

UNIT II : TRANSFER FUNCTION REPRESENTATION

Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT-III : TIME RESPONSE ANALYSIS

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – IV : STABILITY ANALYSIS IN S-DOMAIN

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability

Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT – V : FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-

Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

UNIT – VI : STABILITY ANALYSIS IN FREQUENCY DOMAIN

Polar Plots-Nyquist Plots-Stability Analysis.

UNIT – VII : CLASSICAL CONTROL DESIGN TECHNIQUES

Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers.

UNIT – VIII : STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability

TEXT BOOKS:

1. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.,
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.

REFERENCE BOOKS:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
3. Control Systems Engg. by NISE 3rd Edition – John wiley
4. "Modelling & Control Of Dynamic Systems" by Narciso F. Macia George J. Thaler, Thomson Publishers.

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(55021) COMPUTER ORGANIZATION

UNIT I : BASIC STRUCTURE OF COMPUTERS :

Computer Types, Functional unit, Basic OPERATIONAL concepts, Bus structures, Software, Performance, multiprocessors and multi computers. Data Representation. Fixed Point Representation. Floating – Point Representation. Error Detection codes.

UNIT II : REGISTER TRANSFER LANGUAGE AND MICRO OPERATIONS :

Register Transfer language.Register Transfer Bus and memory transfers, Arithmetic Mircrooperatiaons, logic micro operations, shift micro operations, Arithmetic logic shift unit. Instruction codes. Computer Registers Computer instructions – Instruction cycle.

Memory – Reference Instructions. Input – Output and Interrupt. STACK organization. Instruction formats. Addressing modes. DATA Transfer and manipulation. Program control. Reduced Instruction set computer.

UNIT III : MICRO PROGRAMMED CONTROL :

Control memory, Address sequencing, microprogram example, design of control unit Hard wired control. Microprogrammed control

UNIT IV : COMPUTER ARITHMETIC :

Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit Decimal Arithmetic operations.

UNIT V : THE MEMORY SYSTEM :

Basic concepts semiconductor RAM memories. Read-only memories Cache memories performance considerations, Virtual memories secondary storage. Introduction to RAID.

UNIT-VI : INPUT-OUTPUT ORGANIZATION :

Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt Direct memory Access, Input –Output Processor (IOP) Serial communication; Introduction to peripheral component,

Interconnect (PCI) bus. Introduction to standard serial communication protocols like RS232, USB, IEEE1394.

UNIT VII : PIPELINE AND VECTOR PROCESSING :

Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.

UNIT VIII : MULTI PROCESSORS :

Characteristics or Multiprocessors, Interconnection Structures, Interprocessor Arbitration. InterProcessor Communication and Synchronization Cache Coherance. Shared Memory Multiprocessors.

TEXT BOOKS :

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson

REFERENCES :

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI
3. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.
4. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition Elsevier
5. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.

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(55022) ANTENNAS AND WAVE PROPAGATION

Unit I

Antenna Basics: Introduction, Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height, Illustrative Problems.

Fields from Oscillating Dipole, Field Zones, Shape-Impedance Considerations, Antenna Temperature, Front - to-back Ratio, Antenna Theorems, Radiation– Basic Maxwell's Equations, Retarded Potentials – Helmholtz Theorem

Unit II

Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small and Large Loops (Qualitative Treatment).

Unit III

Antenna Arrays: Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays, Illustrative Problems.

Unit IV

VHF, UHF and Microwave Antennas - I : Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes. Horn Antennas –

Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

Unit V

VHF, UHF and Microwave Antennas - II: Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Impact of Different Parameters on Characteristics, Reflector Antennas – Introduction, Flar Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features, Illustrative Problems.

Unit VI

Lens Antennas – Introduction, Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications.

Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods)

Unit VII

Wave Propagation – I: Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts. Ground Wave Propagation (Qualitative Treatment) – Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation – Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption. Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Tropospheric Propagation, Fading and Path Loss Calculations.

Unit VIII

Wave Propagation – II: Sky Wave Propagation – Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual HIght and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation, Energy Loss in Ionosphere, Summary of Wave Characteristics in Different Frequency Ranges.

TEXT BOOKS:

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4th ed., (Special Indian Edition), 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.

REFERENCES:

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th edition, 1955.
5. Antennas – John D. Kraus, McGraw-Hill (International Edition), 2nd ed. 1988.

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(55023) ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

UNIT – I

Block Schematics of Measuring Systems, Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gausian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag ;Measuring Insturments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT – II

Electronic Voltmeters, Multimeters, AC, DC Meters, Digital Voltmeters: Ramp Type, Staircase Ramp, Dual slope Integrating type, Successive Approximation Type, Autoranging, $3\frac{1}{2}$, $3\frac{3}{4}$ Digit display, Pico ammeter, High Resistance Measurements, Low Current Ammeter, Applications; Signal Generators: AF, RF Signal Generators, Sweep frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary waveform Generator, Video signal Generators, Specifications.

UNIT – III

Signal Analyzers, AF, HF Wave Analyzers, Harmonic Dustortion, Heterodynewave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators.

UNIT – IV

DC and AC Bridges: Wheat stone Bridge, Kelvin Bridge, AC Bridges, Maxwell, Hay, Schering, Wien, Anderson Bridges, Resonance Bridge, Similar Angle Bridge, Wagners' ground connection, Twin T, Bridged T Networks, Detectors.

UNIT – V

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications, Specifications.

UNIT – VI

Special purpose oscilloscopes: Dual Trace, Dual Beam CROs, Sampling oscilloscopes, Storage oscilloscopes, Digital Storage CROs, Frequency Measurement, Period Measurement, Errors in Time/Frequency measurements, universal counters, Extension of range; Recorders: Strip-Chart, X-Y, Oscillographic recorders.

UNIT – VII

Transducers: Classification, Strain gauges, Bonded, unbounded; Force and Displacement Tranducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Themocouples, Synchros. Special Resistance Thermometers, Digital Temperature sensing system. Piezoelectric Transducers, Variable Capacitance Transducers, Magneto strictive Transducers.

UNIT – VIII

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature - Measurements, Data Acquisition Systems.

TEXT BOOKS:

1. Electronic Measurements and Insturmentation – K. Lal Kishore, Pearson Education 2010.
2. Electronic Instrumentation: H.S.Kalsi – TMH, 2nd Edition 2004.

REFERENCE BOOKS:

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurment Techniques: A.D. Helbincs, W.D. Cooper: PHI 5th Edition 2003.
3. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage TMH Reprint 2009.
4. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

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(55024) ANALOG COMMUNICATIONS

UNIT I : INTRODUCTION :

Introduction to communication system, Need for modulation, Amplitude Modulation, Definition, Time domain and frequency domain description, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

UNIT II : DSB MODULATION :

Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Radio Transmitters-Classification of Transmitters, AM transmitter block diagram and explanation of each block.

UNIT III : SSB MODULATION :

Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

UNIT IV : ANGLE MODULATION CONCEPTS:

Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Comparison of FM & AM.

UNIT V : ANGLE MODULATION METHODS:

Generation of FM Waves: Direct Method: Parametric Variation Method: Varactor Diode, Reactance Modulator, indirect Method: Armstrong Method , Detection of FM Waves: Balanced Frequency discriminator, Zero crossing

detector, Phase locked loop, Foster Seeley Discriminator, Ratio detector, FM transmitter block diagram and explanation of each block.

UNIT VI : NOISE :

Noise in Analog communication System, Noise in DSB& SSB System, Noise in AM System, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis

UNIT VII : RECEIVERS :

Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

UNIT VIII : PULSE MODULATION :

Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM

TEXTBOOKS :

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007 3rd Edition
2. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Edition,.

REFERENCES :

1. Electronics & Communication System – George Kennedy and Bernard Davis, 4th Edition TMH 2009
2. Analog Communications- KN Hari Bhat & Ganesh Rao, Pearson Publications, 2nd Edition. 2008.
3. Communication Systems Second Edition – R.P. Singh, SP Sapre, TMH, 2007
4. Communication Systems – B.P. Lathi, BS Publication, 2006.

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(55009) IC APPLICATIONS

PART 1 : LINEAR INTEGRATED CIRCUITS

UNIT I : INTEGRATED CIRCUITS

- Classification, Chip Size and Circuit Complexity, Ideal and Practical Op-Amp, Op-amp characteristics-DC and AC Characteristics, 741 Op-Amp and its Features, Modes of operation-inverting, non-inverting, differential.

UNIT II : OP-AMP APPLICATIONS

- Basic Applications of Op-Amp, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converters, Sample & Hold Circuits, Differentiators and Integrators, Comparators, Schmitt Trigger, Multivibrators, Introduction to Voltage Regulators, Features of 723 Regulator.

UNIT III : ACTIVE FILTERS & OSCILLATORS

- Introduction, First Order and Second Order Low Pass, High Pass and Band Pass Filters, Active Band Reject and All Pass Filters.
- Principle of Operation and Types of Oscillators – RC, Wien Bridge and quadrature type. Waveform Generators – Triangular, Saw Tooth, Square Wave.

UNIT IV: TIMERS & PHASE LOCKED LOOPS

- Introduction to 555 Timer, Functional Diagram, Monostable and Astable Operations and Applications, Schmitt Trigger, PLL - Introduction, Block Schematic, Principles and Description of Individual Blocks of 565, VCO.

PART 2: DATA CONVERTER INTEGRATED CIRCUITS

UNIT V : D-AAND A- D CONVERTERS

- Introduction, Basic DAC Techniques - Weighted Resistor Type, R-2R Ladder Type, Inverted R-2R Type. Different types of ADCs – Parallel Comparator Type, Counter Type, Successive Approximation Register Type and Dual Slope Type. DAC and ADC Specifications.

PART 3: DIGITAL INTEGRATED CIRCUITS

UNIT VI : INTRODUCTION

- Classification of Integrated Circuits, Standard TTL NAND Gate-Analysis & Characteristics, TTL Open Collector Outputs, Tristate TTL, MOS & CMOS open drain and tristate outputs, Comparison of Various Logic Families, IC interfacing- TTL driving CMOS & CMOS driving TTL.

UNIT VII : COMBINATIONAL CIRCUIT ICs

- Use of TTL-74XX Series & CMOS 40XX Series ICs, TTL ICs - Code Converters, Decoders, Demultiplexers, Encoders, Priority Encoders, multiplexers & their applications, Priority Generators, Arithmetic Circuit ICs-Parallel Binary Adder/Subtractor Using 2's Complement System, Magnitude Comparator Circuits.

UNIT VIII : SEQUENTIAL CIRCUIT ICs

- Commonly Available 74XX & CMOS 40XX Series ICs – RS, JK, JK Master-Slave, D and T Type Flip-Flops & their Conversions, Synchronous and asynchronous counters, Decade counters, Shift Registers & applications.

TEXT BOOKS:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 3rd Ed., 2008.
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005.
3. Op-Amps and Linear Integrated Circuits – Concepts and Applications by James M.Fiore, Cengage/ Jaico, 2/e, 2009.

REFERENCES:

1. Modern Digital Electronics – RP Jain – 4/e – TMH, 2010.
2. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 1987.
3. Operational Amplifiers and Liner Integrated Circuits by K.Lal Kishore – Pearson, 2008.
4. Operational Amplifiers with Linear Integrated Circuits, 4/e William D.stanley, Pearson Education India, 2009.

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(55606) ANALOG COMMUNICATIONS LAB

Note: Minimum 12 experiments should be conducted:

All these experiments are to be simulated first either using Commsim, MATLAB, SCILAB, OCTAVE or any other simulation package and then to be realized in hardware

1. Amplitude modulation and demodulation.
2. DSB-SC Modulator & Detector
3. SSB-Sc Modulator & Detector (Phase Shift Method)
4. Frequency modulation and demodulation.
5. Study of spectrum analyzer and analysis of AM and FM Signals
6. Pre-emphasis & de-emphasis.
7. Time Division Multiplexing & De multiplexing
8. Frequency Division Multiplexing & De multiplexing
9. Verification of Sampling Theorem
10. Pulse Amplitude Modulation & Demodulation
11. Pulse Width Modulation & Demodulation
12. Pulse Position Modulation & Demodulation
13. Frequency Synthesizer.
14. AGC Characteristics.
15. PLL as FM Demodulator

Equipment required for Laboratories:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. RF Generators - 0 – 1000 M Hz./0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for Analog Communication
7. Components
8. Radio Receiver/TV Receiver Demo kits or Trainees.
9. Spectrum Analyzer - 60 M Hz.
10. Any one simulation package

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(55607) IC APPLICATIONS LAB

Note: Minimum of 12 experiments have to be conducted (Six from each part):

List of Experiments:

Part-1 : TO VERIFY THE FOLLOWING FUNCTIONS.

Adder, Subtractor, Comparator using IC 741 Op-Amp.
Integrator and Differentiator using IC741 Op-Amp.
Active Low Pass & High Pass Butterworth (second Order).
RC Phase Shift and Wien Bridge Oscillators using IC 741 Op-Amp.
IC 555 timer in Monostable operation.
Schmitt trigger circuits using IC 741 & IC 555.
IC 565 – PLL applications
Voltage regulator IC 723, three terminal voltage regulators- 7805, 7809, 7912.
Sample and Hold LF 398 IC.

Part-2 : TO VERIFY THE FUNCTIONALITY of the following 74 series TTL ICs.

D Flip –Flop (74LS74) and JK Master-Slave Flip-Flop (74 LS73}.
Decade counter (74LS90) and UP-Down Counter(74 LS192).
Universal Shift registers- 74LS194/ 195.
3 -8 decoder- 74LS138.
4 bit comparator 74LS85.
8X1 Multiplexer — 74151 and 2X4 demultiplexer – 74155.
RAM (16X4) – 74189 (read and write operations).
Stack and queue implementation using RAM, 74189.

EQUIPMENT REQUIRED:

4. 20 MHz/ 40 MHz/60 MHzOscilloscope.
5. 1 MHz Function Generator (Sine, Square, Triangular and TTL) .
6. Regulated Power Supply.
7. Multimeter / Volt Meter.