w.e.f. 2010-2011 academic year

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA-533003, Andhra Pradesh (India)

ELECTRONICS AND INSTRUMENTATION ENGINEERING

COURSE STRUCTURE

I YEAR **I SEMISTER**

S. No.	Subject	T	P	Credits
1	English – I	3	-	2
2	Mathematics - I	3	-	2
3	Engineering Physics – I	3	-	2
4	Engineering Chemistry I	3	-	2
5	C Programming	3	-	2
6	Mathematical Methods	3	-	2
7	Engineering Physics & Engineering Chemistry Laboratory -I	-	3	2
8	Engineering Workshop (Carpentry, Fitting, House wiring,)	-	3	2
9	C Programming Lab	-	3	2
10	English Proficiency Lab	-	3	2
	Total			**20**

I YEAR **II SEMISTER**

S. No.	Subject	T	P	Credits
1	English – II	3	-	2
2	Mathematics – II	3	-	2
3	Engineering Physics – II	3	-	2
4	Engineering Chemistry-- II	3	-	2
5	Engineering Drawing	3	-	2
6	Environmental Studies	3	-	2
7	Engineering Physics & Engineering Chemistry Laboratory -II	-	3	2
8	English - Communication Skills Lab	-	3	2
9	IT Workshop	-	3	2
	Total			**18**

w.e.f. 2010-2011 academic year

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA-533003, Andhra Pradesh (India)

ELECTRONICS AND INSTRUMENTATION ENGINEERING

COURSE STRUCTURE

II YEAR **I SEMISTER**

S. No.	Subject	T	P	Credits
1	Managerial Economics and Financial Analysis	4	-	4
2	Electronic Devices and Circuits	4	-	4
3	Calibration and Electronic Measurements	4	-	4
4	Network Analysis	4	-	4
5	Signals & Systems	4	-	4
6	Electrical Technology	4	-	4
7	EDC Lab	-	3	2
8	Networks &Electrical Technology Lab	-	3	2
9	English Communication Practice	-	2	1
10	Professional Ethics and Morals - I	2	-	-
	Total			**29**

II YEAR **II SEMISTER**

S. No.	Subject	T	P	Credits
1	Electronic Circuit Analysis	4	-	4
2	Control Systems	4	-	4
3	Pulse & Digital Circuits	4	-	4
4	Switching Theory & Logic Design	4	-	4
5	EM Waves and Transmission Lines	4	-	4
6	Sensors and Signal Conditioning	4	-	4
7	Electronic Circuits & P D C Lab	-	3	2
8	Instrumentation Lab-I	-	3	2
9	English Communication Practice	-	2	1
10	Professional Ethics and Morals - II	2	-	-
	Total			**29**

w.e.f. 2010-2011 academic year

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA-533003, Andhra Pradesh (India)

ELECTRONICS AND INSTRUMENTATION ENGINEERING

COURSE STRUCTURE

III YEAR **I SEMISTER**

S. No.	Subject	T	P	Credits
1	Linear IC Applications	4	-	4
2	Computer Architectures & Organization	4	-	4
3	Digital IC Applications	4	-	4
4	Industrial Instrumentation	4	-	4
5	Principles of Communication	4	-	4
6	Electronic Measurement and Instrumentation	4	-	4
7	Instrumentation Lab - II	-	3	2
8	IC Applications Lab	-	3	2
9	I P R & Patents – I	2	-	-
	Total			**28**

III YEAR **II SEMISTER**

S. No.	Subject	T	P	Credits
1	Data Acquisition Systems	4	-	4
2	VLSI Design	4	-	4
3	Analytical Instrumentation	4	-	4
4	Management Science	4	-	4
5	Microprocessors and Microcontrollers	4	-	4
6	Biomedical Instrumentation	4	-	4
7	Electronic Computer Aided Design Lab	-	3	2
8	Microprocessors and Microcontrollers Lab	-	3	2
9	I P R & Patents - II	2	-	-
	Total			**28**

w.e.f. 2010-2011 academic year

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA-533003, Andhra Pradesh (India)

ELECTRONICS AND INSTRUMENTATION ENGINEERING

COURSE STRUCTURE

IV YEAR **I SEMISTER**

S. No.	Subject	T	P	Credits
1	Automation of Industrial Processes	4	-	4
2	Digital Signal Processing	4	-	4
3	Process Control Instrumentation	4	-	4
4	P C Based Instrumentation	4	-	4
5	Open Elective	4	-	4
6	**Elective – I** 1. Computer Networks 2. Power Plant Instrumentation 3. Embedded and Real Time Systems	4	-	4
7	Digital Signal Processing Lab	-	3	2
8	Process Control Instrumentation Lab	-	3	2
	Total			**28**

IV YEAR **II SEMISTER**

S. No.	Subject	T	P	Credits
1	Industrial Electronics	4	-	4
2	**Elective – II** 1. Embedded Systems 2. Virtual Instrumentation 3. Digital Control Systems	4	-	4
3	**Elective – III** 1. Robotics & Automation 2. Digital Image Processing 3. Real Time Operating Systems	4	-	4
4	Elective – IV 1. Analog IC Design 2. Data Base Management Systems 3. Artificial Neural Networks	4	-	4
5	PROJECT			12
	Total			**28**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

III Year B. Tech. Electronics and Instrumentation Engineering – I Sem.

LINEAR IC APPLICATIONS

UNIT I

INTEGRATED CIRCUITS : Differential Amplifier- DC and AC analysis of Dual input Balanced output Configuration, Properties of other differential amplifier configuration (Dual Input Unbalanced Output, Single Ended Input – Balanced/ Unbalanced Output), DC Coupling and Cascade Differential Amplifier Stages, Level translator.

UNIT II

Characteristics of OP-Amps, Integrated circuits-Types, Classification, Package Types and temperature ranges, Power supplies, Op-amp Block Diagram, ideal and practical Op-amp specifications, DC and AC characteristics, 741 op-amp & its features, FET input. Op-Amps, Op-Amp parameters & Measurement, Input & Out put Off set voltages & currents, slew rates, CMRR, PSRR, drift, Frequency Compensation technique.

UNIT III

LINEAR APPLICATIONS OF OP- AMPS : Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers.

UNIT IV

NON-LINEAR APPLICATIONS OF OP- AMPS: Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log amplifiers, Precision rectifiers.

UNIT V

ACTIVE FILTERS: Introduction, Butter worth filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and All pass filters.

UNIT VI

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, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566).

UNIT VII

D to A & A to D CONVERTERS : Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC Specifications, Specifications AD 574 (12 bit ADC).

UNIT VIII

ANALOG MULTIPLIERS AND MODULATORS : Four Quadrant multiplier, balanced modulator,IC1496,Applications of analog switches and Multiplexers, Sample & Hold amplifiers.

TEXT BOOKS:

1. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.

REFERENCES:

1. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, McGraw Hill, 1988.
2. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, Cenage Learning India Ltd.
3. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll, PHI, 6th Edition.
4. Operational Amplifiers – C.G. Clayton, Butterworth & Company Publ.Ltd./ Elsevier, 1971.
5. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition
6. Linear Integrated Circuits – S Salivahana, VSK Bhaskaran TMH, 2008

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

III Year B. Tech. Electronics and Instrumentation Engineering – I Sem.

COMPUTER ARCHITECTURE & ORGANAGATION

Unit 1:
Computer System:
Computer components, computer function, interconnection structures, Bus interconnection, arithmetic and logic unit, integer representation, integer arithmetic, fixed point representation, floating point representation.

Unit 2:
Central Processing Unit:
Instruction Sets: Characteristics and addressing modes – Machine instruction characteristics, Types of operands and operators, addressing modes, instruction formats, and Assembly language
Process Structure and Functions – Process organization, register organization, instruction cycle, instruction pipelining.

Unit 3:
Control Unit and Micro Programmed Control:
Micro operations, control of the processor, hardwired implementation, micro programmed control, micro instruction sequencing, micro instruction execution,

Unit 4:
Computer Arithmetic:
Addition and subtraction, multiplication algorithms, division algorithms, floating point arithmetic operations, decimal arithmetic unit, decimal arithmetic operations.

Unit 5:
The Memory System:
Memory Hierarchy, main memory, auxiliary memory, associative memory, cache memory and Cache organization, virtual memory, memory management hardware.

Unit 6:
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.

Unit 7:
Parallel Organization: Parallel Processing – use of multiprocessors, symmetric multi processors, cache coherence and MESI protocol, multi-threading and chip multiprocessors, non-uniform memory access computers, vector computations.

Unit 8:
Multiprocessors – Characteristics of multiprocessors, interconnection structures, inter processor arbitration, inter process arbitration, interprocessor communication and synchronization.

Text Books:

1. Computer System Architecure, 3/e, M. Morris Mano, Pearson.
2. Computer Organization and Architecure, 8/e, William Stallings, Pearson.

References:

1. Computer Organization, 5/e, Hamachar, Vranesic, TMH.
2. Computer Organization and Architecture, V. Rajaraman, T. Radhakrishnan, PHI Learning.
2. Computer Organization and Design, Pal Choudary, PHI.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

III Year B. Tech. Electronics and Instrumentation Engineering – I Sem.

DIGITAL IC APPLICATIONS

UNIT I
CMOS LOGIC: Introduction to logic families, CMOS logic, CMOS steady state electrical behaviour, CMOS dynamic electrical behaviour, CMOS logic families.

UNIT II
BIPOLAR LOGIC AND INTERFACING: Diode Logic, Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families, Familiarity with standard 74XX and CMOS 40XX series-ICs – Specifications.

UNIT III
COMBINATIONAL LOGIC DESIGN-I: Introduction, Design and Analysis procedures, Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, EX-OR gates and parity circuits, comparators, adders & sub tractors, Design considerations of the above combinational logic circuits with relevant Digital ICs.

UNIT IV
COMBINATIONAL LOGIC DESIGN-II: Ripple Adder, Look Ahead Carry Generator, Binary Parallel Adder, n-Bit Parallel Subtractor, Binary Adder-Subtractor**,** ALUs, Combinational multipliers, Barrel Shifter, Simple Floating-Point Encoder, Cascading Comparators, Dual Priority Encoder, Design considerations of the above combinational logic circuits with relevant Digital ICs.

UNIT V
SEQUENTIAL LOGIC DESIGN-I: Introduction, The Basic Bistable Element, Latches, and flip-flops, Flip-Flop Conversions, SSI Latches and Flip-Flops, Counters, Design of Counters using Digital ICs, Counter applications, Synchronous design methodology, Impediments to synchronous design, Design considerations of the above sequential logic circuits with relevant Digital ICs.

UNIT VI
SEQUENTIAL LOGIC DESIGN-II: MSI Registers, Shift Registers, Modes of Operation of Shift Registers, Universal Shift Registers, MSI Shift Registers, Ring Counter, Johnson Counter, Basic sequential logic Design steps, Design of Modulus N Synchronous Counters, Design considerations of the above sequential logic circuits with relevant Digital ICs.

UNIT VII
PROGRAMMABLE LOGIC DEVICES (PLDs): Introduction, Programmable Read Only Memory, Programmable Logic Array, Programmable Array Logic Devices, Comparison between PROM, PLA and PAL. Design considerations of PLDs with relevant Digital ICs.

UNIT-VIII

MEMORIES: ROM: Internal structure, 2D-Decoding, Commercial ROM types, timing and applications,. Static RAM: Internal structure, SRAM timing, standard SRAMS, synchronous SRAMS, Dynamic RAM: Internal structure, timing, synchronous DRAMs, Familiarity with Component Data Sheets-Cypress CY6116, CY7C1006, Specifications.

TEXT BOOKS:

1. Digital Design Principles & Practices By John F. Wakerly, PHI Publications,Third Edition., 2005.
2. Digital IC Applications By Atul P.Godse and Deepali A.Godse, Technical Publications, Pune, 2005.

REFERENCES :

1. Digital Integrated Circuits-A Design Perspective By Jan M.Rabaey, Anantha Chandrakasan, Borivoje Nikolic, Pearson Education, 2005.
2. Introduction to Logic Design – Alan B. Marcovitz,TMH, 2nd Edition,2005.
3. Digital Logic and Computer Design By Mano, Pearson Education.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

III Year B. Tech. Electronics and Instrumentation Engineering – I Sem.

INDUSTRIAL INSTRUMENTATION

UNIT – I: METROLOGY
Measurement of length – Plainness – Area – Diameter – Roughness – Angle – Comparators – Gauge blocks – Optical Methods of length and distance measurements.

UNIT – II: VELOCITY AND ACCELERATION MEASUREMENT
Relative velocity – Translational and Rotational velocity measurement – Revolution counters and Timers - Magnetic and Photoelectric pulse counting stroboscopic methods - Accelerometers of different types - Gyroscopes.

UNIT – III: FORCE AND TORQUE MEASUREMENT
Force measurement – Different methods –Torque measurement – Dynamometers- Gyroscopic Force and Torque Measurement – Vibrating wire Force transducer

UNIT – IV: PRESSURE MEASUREMENT
Basics of Pressure measurement – Deadweight Gages and Manometers types – Force-Balance and Vibrating Cylinder Transducers – High and Low Pressure measurement – McLeod Gage, Knudsen Gage, Momentum Transfer Gages, Thermal Conductivity Gages, Ionization Gazes, Dual Gage Techniques.

UNIT – V: FLOW MEASUREMENT
Head type, Area type (Rota meter), electromagnetic type, Positive displacement type, mass flow meter, ultrasonic type ,vertex shedding type, Hotwire anemometer type.. Laser Doppler Veloci-meter.

UNIT – VI: DENSITY MEASUREMENT
Volume Flow meter Plus Density measurement – Strain Gauge load cell method – Buoyancy method - Air pressure balance method – Gamma ray method – Vibrating probe method. Direct Mass Flow meters.

UNIT – VII: RADIATION MEASUREMENT
Radiation Fundamentals. Radiation Detectors. Radiation Thermometers. Optical Pyrometers.

UNIT – VIII: OTHER MEASUREMENTS
Sound-Level Meter. Microphones. Time, Frequency, and Phase-Angle measurement. Liquid Level. Humidity. Chemical Composition. Particle Instruments and Clean-Room

TEXT BOOKS:
1. Measurement Systems – Applications and Design – by Doeblin E.O., 4/e, McGraw Hill International, 1990.
2. Principles of Industrial Instrumentation – Patranabis D. TMH. End edition 1997.

REFERENCES:
1. Process Instruments and Control Handbook – by Considine D.M., 4/e, McGraw Hill International, 1993.

2. Mechanical and Industrial Measurements – by Jain R.K., Khanna Publishers, 1986.
3. Instrument Technology, vol. I – by Jones E.B., Butterworths, 1981.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

III Year B. Tech. Electronics and Instrumentation Engineering – I Sem.

PRINCIPLES OF COMMUNICATIONS

UNIT I

Amplitude modulation: Block diagram of Electrical communication system, Radio communication, Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC,VSB, Power and BW requirements, Generation of AM, DSB SC, SSB SC, Demodulation of AM : Diode detector, Product demodulation for DSB SC & SSB SC.

UNIT II

Angle Modulation: Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM, FM modulators and FM demodulators, Armstrong method of generation, necessity of pre-emphasis and de-emphasis .

UNIT III

Pulse Modulations : Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM, Time Divison Multiplexing, Frequency Divison Multiplexing, Asynchronous Multiplexing.

UNIT IV

Digital Communication: Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison.

UNIT V

Digital Modulation: ASK, FSK, PSK, and DPSK, QPSK demodulation, coherent and incoherent reception, Comparison of binary and quaternary modulation schemes, M-ary modulation techniques.

UNIT VI

Information Theory and Coding: Discrete messages and information content, source coding, Shanon ‘s theorem, channel capacity, Block codes- coding and decoding, burst error correction(BRC), Convolutional coding, decoding convolutional code, comparison of error rates in coded and uncoded transmission, turbo codes.

UNIT VII

Spread Spectrum Modulation: Use of spread spectrum, direct sequence spread spectrum, spread spectrum and CDMA, ranging using DS spread spectrum, frequency hopping spread spectrum, Pseudo random sequences – generation and characteristics, synchronization in spread spectrum systems.

UNIT VIII

Advanced Communication Systems: Telephone switching, Computer communication, Optical communications, Mobile telephone communication- the Cellular concept, Satellite communications, RADAR systems.

TEXT BOOKS:

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 2nd Edition, 2008.
2. Principles of Communications – H. Taub and D. Schilling, Goutham saha, TMH, Third edition,2nd reprint,2008.

REFERENCE BOOKS:

1. Communication Systems – Simon Haykin, John Wiley, 3rd edition.
2. Digital and Analog Communication Systems – K Sam Shanmugam,WSE,2006.
3. Electronic &Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.
4. Modern Digital and Analog communication Systems – B.P Lathi, Oxford 3rd edition

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

III Year B. Tech. Electronics and Instrumentation Engineering – I Sem.

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

UNIT I

Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltimeters- Multirange, Range extension/Solid state and differential voltmeters, AC voltmeters- multi range, range extension, shunt. Thermocouple type RF ammeter, Ohmmeters series type, shunt type, Multimeter for Voltage, Current and resistance measurements.

UNIT II

Signal Generator- fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform.

UNIT III

Wave Analyzers, Haromonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT IV

Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, simple CRO, triggered sweep CRO, Dual beam CRO, Measurement of amplitude and frequency.

UNIT V

Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, probes for CRO- Active & Passive, attenuator type, Frequency counter, Time and Period measurement.

UNIT VI

AC Bridges Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance - Schearing Bridge. Wheat stone bridge. Wien Bridge, Errors and precautions in using bridges. Q-meter.

UNIT VII

Transducers- active & passive transducers : Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors.

UNIT VIII

Measurement of physical parameters force, pressure, velocity, humidity, moisture, speed, proximity and displacement. Data acquisition systems.

TEXTBOOKS :

1. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES :

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2nd Ed., 2004.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

III Year B. Tech. Electronics and Instrumentation Engineering – I Sem.

INSTRUMENTATION LAB – II

(Minimum of ten experiments should be conducted.)

1. Design and simulation of Analog Circuits using CAD Package.
2. Design of PCBs using Packages and Fabrication of PCB.
3. Linearization of Thermistor using Microprocessor.
4. Study of Level monitoring Instruments using PLC.
   pH measurements.
5. Measurement of Blood Pressure.
6. Calibration of P to I and I to P converters.
7. RPM indicator using Strobostrom/Gyroscope.
8. Measurement of Humidity.
9. Measurement of velocity of liquid using Ultrasonic (Doppler effect) method and also flow measurement.
10. Measurement of Level using Capacitance method/Transducer.
11. Displacement measurement using inductive pickup and capacitive pickup.
12. PID Controller setup (Flow/Temp. Level).

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

III Year B. Tech. Electronics and Instrumentation Engineering – I Sem.

IC APPLICATIONS LAB

Minimum Twelve Experiments to be conducted :

1. Study of OP AMPs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning, parameters and Specifications.
2. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
3. Integrator and Differentiator Circuits using IC 741.
4. Active Filter Applications – LPF, HPF (first order)
5. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
6. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
7. Function Generator using OP AMPs.
8. IC 555 Timer – Monostable Operation Circuit.
9. IC 555 Timer – Astable Operation Circuit.
10. Schmitt Trigger Circuits – using IC 741 and IC 555.
11. IC 565 – PLL Applications.
12. IC 566 – VCO Applications.
13. Voltage Regulator using IC 723.
14. Three Terminal Voltage Regulators – 7805, 7809, 7912.
15. 4 bit DAC using OP AMP.

Equipment required for Laboratories:

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:- IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 and other essential components.
8. Analog IC Tester

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

III Year B. Tech. Electronics and Instrumentation Engineering – I Sem.

IPR & Patents - I