B Tech. (Electronics and Instrumentation)

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	University Exam	Teacners Assessment*				
BTMA 301		**Applied Mathematics - 3**	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objective

To introduce the students with the Fundamentals of the Calculus of the Complex Variable, Random Variable and Fourier analysis.

Course Outcomes

After the successful completion of this course students will be able to

1. Understand and apply the basics of the Calculus of the Complex variables.
2. Know the fundamentals of the Probability Theory and Random Process.
3. Apply the concepts of the Fourier Analysis
4. Know the techniques of the Fourier Transform.
5. Find the solution of the PDE.

Course Content:

UNIT – I
Complex Analysis
Complex numbers, geometric representation, powers and roots of complex numbers. Functions of a complex variable: Limit, Continuity, Differentiability, Analytic functions, Cauchy-Riemann equations, Harmonic functions, Harmonic conjugates. Elementary Analytic functions (polynomials, exponential function, trigonometric functions), Complex integration, Cauchy's integral theorem, Cauchy's integral formula. Taylor series and Laurent series. Zeros, Singularities and its classifications, Residues, Residue theorem and its applications.

UNIT – II
Probability Theory and Random Process

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Axiomatic construction of the theory of probability, independence, conditional probability, and basic formulae, random variables, binomial, poisson and normal random variable, probability distributions, functions of random variables; mathematical expectations, Definition and classification of random processes, discrete-time Markov chains, Poisson process, Correlation and Regression; Expectation and Variance

UNIT – III

Fourier series

Fourier Integral, Fourier series of 2p periodic functions, Fourier series of odd and even functions, Half-range series, Convergence of Fourier series, Gibb's phenomenon, Differentiation and Integration of Fourier series, Complex form of Fourier series.

UNIT – IV

Fourier Transformation

Fourier Integral Theorem, Fourier Transforms, Properties of Fourier Transform, Convolution and its physical interpretation, Statement of Fubini's theorem, Convolution theorems, Inversion theorem

UNIT – V

Partial Differential Equations

Introduction to PDEs, basic concepts, Linear and non-linear first order PDE, Higher order linear homogeneous PDE, Separation of variable and its application to the one dimensional wave and heat equation.

Texts:

1. R. V. Churchill and J. W. Brown, Complex Variables and Applications, 5th Edition, McGraw-Hill, 1990.
2. K. Sankara Rao, Introduction to Partial Differential Equations, 2nd Edition, 2005.
3. G. R. Grimmett and D. R. Stirzaker, Probability and Random Processes, Oxford University Press, 2001.
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2000.
5. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Edition, Wiley, 1968.
6. K. S. Trivedi, Probability and Statistics with Reliability, Queuing, and Computer Science Applications, Prentice Hall of India, 1998.
7. Papoulis and S. Unnikrishna Pillai, Probabilities, Random Variables and Stochastic Processes, 4th Edition, Tata McGraw-Hill, 2002.
8. S.M. Ross, Stochastic Processes, 2nd Edition, Wiley, 1996.
9. J. Medhi, Stochastic Processes, New Age International, 1994.
10. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi

References:

1. J. H. Mathews and R. W. Howell, Complex Analysis for Mathematics and Engineering, 3rd Edition, Narosa, 1998.

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2. N. Sneddon, Elements of Partial Differential Equations, McGraw-Hill, 1957.
3. E. Kreyszig, Advanced Engineering Mathematics, 5th / 8th Edition, Wiley Eastern / John Wiley, 1983/1999

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEI401		Microprocessor & Microcontroller	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To gain knowledge of basics of Microprocessor & microcontroller & Learn development of assembly language programs.
2. To learn the programming skills of 8086 microprocessor & 8051 microcontroller.
3. To learn the interfacing of external devices (LED, LCD, ADC, DAC) with the microcontroller 8051.

Course Outcomes (COs):
The students will be able to

1. Apply the concept of buses, microprocessor & microcontroller architecture and interrupts.
2. Interface memory and I/O devices with 8051 microcontroller
3. Program assembly language / C programming of 8051 & 8086.
4. Design microcontroller based small system
5. Interface 8051 with LED, LCD, ADC, DAC etc.

Syllabus

UNIT I **08hr.**

Introduction to 8086 Microprocessor
Overview of 8086 microprocessor. Architecture of 8086, Signals and pins of 8086 microprocessor, Concept of Memory Segmentation in 8086. Maximum Mode , Minimum Mode, Timing diagram, Comparative study of Salient features of 8086, 80286 & 80386.

UNIT II **10hr.**

Microprocessor 8086 programming
8086 Instructions set . Addressing mode of 8086, Assembly directives. Stack , Interupts of 8086, Assembly language programs of 8086.

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Input-Output interfacing: Peripherals I/O. PPI 8255 Architecture and modes of operation, Interfacing to 16-bit microprocessor and programming, DMA controller (8257) Architecture, Programmable interval timer 8254, USART 8251.

UNIT III **08hr.**

Introduction to 8051 Microcontroller

Introduction, Difference between Microprocessors and Microcontrollers. Overview of 8051 Microcontroller family, Architecture of 8051 Microcontroller, The program counter and ROM space in the 8051, registers, 8051 register banks

UNIT IV **10hr.**

8051 Assembly Language Programming

Introduction to 8051 assembly programming, Structure of Assembly language, Assembling and running an 8051 program, 8051 data types and directives, interrupts

8051 Addressing Modes & Instruction set

Addressing modes, Accessing memory using various Addressing modes, Bit addresses for I/O and RAM, Arithmetic instructions, Signed number concepts and arithmetic operations, Logic and compare instructions, Rotate instruction, Jump, Loop, And Call Instructions, Call instructions time delay for various 8051 chips.

UNIT V **10hr.**

8051 Programming in C

Data types and time delay in 8051 C, I/O programming in 8051 C, Logic operations in8051 C, Data conversion programs in 8051 C, Accessing code ROM space in 8051 C, Interfacing with LEDs, LCDs ADCs, DACs.

Text Books:

1.A.K. Ray & K.M.Bhurchandi, Advanced Microprocessors and peripheral-Architecture, Programmingand Interfacing, Tata McGraw –Hill, 2012(Third Edition)

2.The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2/e by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay,2008(SecondEdition,PearsonEducation)

3.The 8051 Microcontroller & Embedded Systems using Assembly and C By Kenneth J. Ayala, Dhananjay V. Gadre, 2008 (Cengage Learning , India Edition).

Reference Books:

1.Hall Douglas V.,Microprocessor and interfacing, Revised second edition 2006, Macmillan, McGraw Hill

2.Using the MCS-51 Microcontrollers By Han Way Huang Oxford Uni Press,2000

3. Programming and Customizing the 8051 Microcontroller by Myke Predko Tata McGraw Hill,1999

4. Microcontrollers Architecture, programming, interfacing and system design by Rajkamal Pearson education,2009

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List of Experiment:

1. Introduction to 8086 & 8051 kit, hardware features & modes of operationand Technique of programming & basic commands of kit.

2. Design programs for Arithmetic Operations.
3. Develop a program to find 1's complement and then 2's complement of a 16-bit numbers.
4. Develop a program to find larger of two numbers.
5. Write a program to shift an 8-bit number left by 2-bits.
6. Write a program to generate a square wave of 2 KHz Frequency on input pin.
7. Introduction to IDE and Assembler directives.
8. Develop 8051 Assembly language programs using Arithmetic/ Logical instructions.
9. 8051 Assembly language programming for block data transfer between internal and external memory including overlapping blocks.
10. 8051 Assembly language programming for
    a. code conversions
    b. Timers in different modes.
    c. I/O port programming in embedded C.
    d. Programming of LCD in embedded C.

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEI-402		SENSORS & TRANSDUCERS	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

- Student will be able to understand the structural and functional principles of sensors and transducers used for various physical and nonelectric quantities.
- Explain the principles of operation of the sensor.
- Interpretation of the measurement results by using transducers.
- Development of measurement schemes for different non electrical quantities
- Assimilating knowledge about the implementation of sensors and transducers into a control system structure.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

The students will be able to

1. To apply knowledge of sensors and transducer.
2. To identify, formulate, and solve engineering problems
3. Demonstrate various types of force transducer and their analysis.
4. Demonstrate various types of pressure transducer and their analysis.

Syllabus

Unit-I

Motional and Dimensional measurement:

Introduction, Aim of measurement, Roll of sensors in engineering, classification of transducers,

Fundamental Standards, units , Resistive Potentiometers, stain gauge, LVDT, Hall Effect sensors, magnetostricitive, magnetoresisitive, Optical displacement sensor fiber optic sensor, Ultrasonic distance

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Sensor,Piezoresistive, Linear encoder, Proximity sensors RVDT, DC tachometer, AC tachometer , eddy current , drag cup type tachometer, magnetic, gyroscope.

Unit-II

Force, Torque measurement:
Standards and Calibration, Strain gauge: basic principal, gauge factor, types of strain gauge, materials and their properties, bonding material compensation techniques, bridge configuration, Rosettes, Tactile sensors, Piezoelectric sensors, LVDT as secondary sensor
Torque: Flat Spiral Spring, Magenetostrictive Torsion Transducer, Dynamometers.

Unit-III

Pressure Measurement:
Standards and calibration Units and relations. Positive Pressure Sensors
Pressure and sound measurement: Moderate pressure Bourdon tube, Bellows &diaphragms, High pressure measurement, Piezo electric, Electric resistance, Low pressure measurement, Mcleod gauge, Knudsen gauge, Viscosity gauge, Thermal conductivity, Ionization gauge, Dead weight gauge, sound level measurement using different types of microphone
Unit-IV

Flow measurement: Obstruction meter: Orifice, Nozzle, venturi, Pitot tube, Annubar tubes, Target, rotameter, Turbine, Electromagnetic, Vortex, Positive displacement, Anemometers, Weirs & flumes, Laser Doppler, Anemometer, Ultrasonic flow meter, fluidic oscillator, Mass flow meter, Flow visualization, Level measurement: Visual lev el indicators, Ordinary float type, Purge method, Buoyancy method, resistance, Capacitance and inductive Probes, Ultrasonic, Laser, Optical fiber. Thermal, Radar radiation.

Unit-V

Temperature measurement:

Bimetallic thermometers, Liquid in glass, Pressure thermometer, thermocouples, RTD, Thermistors, Semiconductor sensors, Digital thermometers,Pyrometers, Miscellaneous Measurement: Humidity, Dew point, Viscosity, Thermal and nuclear radiation measurements.

Text Book

1. *H.N. Norton "Handbook of transduc*ers".
2. E.O. Doebelin "Measurement systems applications and design"

Reference Book

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1. DVS Murthy "Transducers and instrumentation"
2. Nakra and Chaudhry "Instrumentation measurement and analysis *& Co*

List of experiments

1. Calibration of pressure gauge using dead weight pressure tester and preparation of report for the same.
2. Characterization of strain gauge indicator and weight measurement using load cell.
3. Measurement of displacement using LVDT.
4. Study of linear and rotary encoder as displacement sensor.
5. Measurement of Pressure using Bellows, Bourdon gauge, Diaphragm.
6. Calibration of vacuum gauge using vacuum gauge tester and preparation of the report.
7. Characterization of Thermocouples (J/T/K/R/S)
8. Characterization of RTD.
9. To study characteristics of thermistor.
10. Calibration of Rotameter.

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC401	EC	Linear Integrated Circuits	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
This course provides the foundation education in operational amplifier and other linear integrated circuits and also familiarizes students with applications of various ICs.

Course Outcomes:
After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The student will be able to:

1. Inculcate the basic principles, configurations and practical limitations of op-amp.
2. Explain and design the linear and non-linear applications of an Op-Amp and special application ICs.
3. To analyze, design and explain the characteristics and applications of active filters.
4. Elucidate and compare the working of Multivibrators, Oscillators.
5. Illustrate the function of application specific ICs such as Voltage regulators, PLL and its application in communication.

Syllabus

Unit 1

Op Amps: Block diagram of Op-Amp, Basic Differential amplifier using transistors and its operation, characteristics and equivalent circuits of an ideal op-amp, Power supply configurations for OPAMP applications, Voltage Transfer Curve, open loop op-amp configurations: inverting, non-inverting and differential amplifier configurations, Closed loop op-amps or feedback amplifiers.
Linear Applications of Op-Amp: Voltage follower, Summing amplifier, Scaling and averaging amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Log/ Antilog amplifier, V-I and I-V converter, analog multiplier-MPY634.

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Unit 2

The Practical Op-Amp: Introduction, Input offset voltage, offset current, Bias Current, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and gain –bandwidth product, frequency limitations and compensations, interpretation of TL082 datasheet.

Unit 3

Active Filters: Characteristics of filters, Classification of filters, Magnitude and frequency response, Design of Butterworth 1st and 2nd order Low pass, High pass filters, Band pass and Band reject filters, All pass filters.

Unit 4

Signal Generators and Waveform Shaping Circuits: Oscillator-Phase-shift oscillators, Wein bridge oscillator, Quadrature Oscillator, Monostable and Astable Multivibrator, Precision rectifiers, Square and Triangular wave generator, VCO. Comparator, Zero Crossing Detector, Schmitt Trigger, Voltage limiters, Clipper and clampers, Absolute value output circuit, Peak detector, Sample and hold Circuit.

Unit 5

Advanced IC applications: Applications as Frequency Divider, PLL, AGC, AVC using op-AMP, simple OP-AMP Voltage regulator, Fixed and Adjustable Voltage Regulators, Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs – TPS40200, TPS40210

Text Books:

1. Ramakanth A. Gayakwad, "Op-Amps & Linear ICS", PHI, 4th edition, 1987.
2. D. Roy Chowdhury, " Linear Integrated Circuits", New Age International (P) Ltd, 2nd Edition, 2003.

Reference Books:

1. R.F. Coughlin & Fredrick Driscoll, "Operational Amplifiers & Linear Integrated Circuits" , 6thEdition, PHI
2. David A. Bell, "Operational Amplifiers & Linear ICs", Oxford University Press, 2nd edition, 2010.
3. Sergio Franco, "Design with Operational Amplifiers & Analog Integrated Circuits" Mcgraw Hill, 1988.
4. C.G. Clayton , "Operational Amplifiers " , Butterworth & Company Publ. Ltd./Elsevier, 1971.
5. K. Lal Kishore, " Operational Amplifiers and Linear Integrated Circuits", Pearson Education, 2007.
6. L. k. Maheshwari, M M S Anand , Analog Electronics, PHI
7. TL082:Data Sheet:http://www.ti.com/lit/ds/symlink/t1082.pdf

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8. Application Note:http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
9. MYP634: Data Sheet:http://www.ti.com/lit/ds/symlink/mpy634.pdf
10. Application Note:http://www.ticom/lit/an/sbfa006/sbfa006.pdf

List of Experiments:

1. Introduction of ASLKv2010 starter-kit & Simulation software
2. Measurements of Op-Amp parameters- CMRR, slew rate ,open loop gain.
3. To develop an understanding of Inverting and non-inverting Op-Amp.
4. To Learn about AC electrical characteristic of Op-Amp.
5. To Learn about Integrator and Differentiator.
6. To Learn about Instrumentation Amplifier.
7. To learn about Analog low pass and high pass filter.
8. To learn about Astable Multivibrator.
9. To learn and study about frequency generation using VCO.
10. To learn and study ADC/DAC circuits.
11. Design a function generator capable of generating a square wave and a triangular wave of a known frequency f.
12. Perform an experiment to plot the Input Vs Output characteristics for the AGC/AVC.

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC408	EC	Signals & Systems	60	20	20	30	20	3	1	2	5

Legends: **Th** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components:
Quiz/Assignment/Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

The objective of this course is to have an introduction to approaches of signals & systems analysis with an increased emphasis on the frequency response and Analysis of system with continuous signal and discrete time signal. To enable the students to understand the fundamentals of signals, their time & frequency characteristics.

Course Outcomes (COs):

Students will be able to-

1. Classify both continuous and discrete time signals and systems.
2. Analyze continuous signals in complex plain.
3. Understand Laplace transform and z transform.
4. Understand the random signals and systems.

UNIT-1:

Introduction to signal and systems: Classification, definition and representation of various types of Signals, representation of basic time domain functions, Various signal operations: shifting, scaling and inversion. System properties: Linearity, Causality, time invariance and stability, Dirichlet's conditions, Determination of Fourier series coefficients of signal.

UNIT-2:

Signal Transformation: Fourier transformation of continuous and discrete time signals and their properties, Fourier transformation-analysis with examples and properties, Parseval's theorem. Convolution in time and frequency domain with magnitude and phase response of LTI systems.

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UNIT-3:

Laplace Transform: Definition, Region of Convergence, Laplace Transform of some important functions, Convolution Integral and Inverse Laplace Transform. Properties of Laplace Transform. Concepts of s-plane Poles and Zeros & its Plot. Applications of Laplace Transformation in analysing networks.

UNIT-4:

Z-Transforms: Basic principles of z-transform, z-transform definition, Relationship between z-transform and Fourier transform. Region of convergence and properties of ROC, Properties of z-transform, Poles and Zeros, inverse z-transform using Contour integration, Residue Theorem, Power Series expansion and Partial fraction expansion.

UNIT-5:

Random Signals & Systems: Definitions, distribution & density functions, mean values & moments, function of two random variables, concepts of correlation, random processes, spectral densities, response of LTI systems to random inputs.

Text books:

1. Alan V. Oppenheim, Alan S. Willsky, with S. Hamid, Signals and Systems 2/E, 1996 Prentice Hall.
2. J. G. Proakis, D. G. Manolakis, Digital Signal Processing –Principles, algorithms and applications, 3rd Edition, 1996 PHI.

Reference books:

1. Hwei Hsu, Schaum's Outline of Signals and Systems 1st, 1995 McGraw-Hill.
2. Simon Haykin and Van Veen, Signals & Systems 2nd Edition, 2002, Wiley.
3. Robert, Signals & Systems Analysis Using Transformation Methods & MATLAB, 2003 TMH.
4. C. L. Philips, J.M.Parr and Eve A.Riskin Signals, Systems and Transforms 3rd Edition, 2004 Pearson education.
5. I. J. Nagrath, S.N.Sharan, R.Ranjan, S.Kumar, Signals & Systems, 2001.

List of Experiments:

1. Introduction to MATLAB.
2. Write a program to generate continuous time signals (i) Sine wave (ii) Cosine Wave (iii) Square wave (iv) Triangular wave
3. Write a program to generate the discrete sequences (i) unit step (ii) unit impulse (iii) ramp (iv) periodic sinusoidal sequences. Plot all the sequences.
4. Find the Fourier transform of a square pulse .Plot its amplitude and phase spectrum.
5. Write a program to convolve two discrete time sequences. Plot all the sequences. Verify the result by analytical calculation.
6. Generate a discrete time sequence by sampling a continuous time signal.
7. Write a program to find the autocorrelation and cross correlation of sequences.
8. Write a program to generate a random sinusoidal signal and plot four possible realizations of the random signal.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEI403		PCB Designing Lab-II	0	0	0	30	20	0	0	2	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEO's): -

1. To be familiar with PCB design and to develop and improve the PCB from design phase.
2. To provide in depth knowledge of PCB fabrication.
3. To provide the knowledge in assembling of the PCB based electronic circuits continues through material selection, testing and implementation.

Course Outcomes (CO's):-

Students will be able to:

1. Apply basic electronics component knowledge along with the functional understanding of electronic circuits so as to design and conduct experiments.
2. Identify, formulate, and solve engineering problems related to PCB design.
3. Design and simulate various PCB circuits using industry standard PCB design software tools like Eagle, Orcad, Power PCB and TINA packages.
4. Identify, formulate, and solve engineering problems associated with assembly and testing of electronic circuits and also understand the process of PCB manufacturing
5. Design and simulate various electronic PCB's required for prototyping and testing using software tools and testing equipments.
6. Know the concept of EMI/EMC and take precautionary steps in the design of PCB's.

List of Experiments:

1. Familiarization/Identification of all electronic components with their specifications (Functionality, type, size, package, symbol, cost etc).

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2. Introduction to PCB design software (OrCAD schematic capture tool) and Industry standard PCB design software tools like Eagle, Power PCB and TINA packages.
3. To simulate simple electronic circuit, Schematic to layout transfer, Layout Printing.
4. Etching the PCB, Cleaning, drying, drilling holes, identification of components and its location on the PCB, soldering the components on PCB and testing the assembled circuit for correct functionality.
5. To check and verify connection of electronic components using conductive pathways, tracks or signal traces etched from copper sheets.
6. To understand various PCB techniques - Soldering techniques, drill-size, minimum track-width, minimum track-to-track and track-to-pad distance, tolerances, etc.
7. To understand and implement PCB assembly and PCB design control techniques – Routing, Partitioning, Board stack-up, Board level shields, Use of isolating lines.
8. Case study on Single and double sided plated through hole (PTH) and multi-layered PCBs.
9. To study High-density interconnect (HDI) and flexible PCBs, used in liquid crystal displays (LCDs) and touch screens.
10. Develop one mini project using all above process.

Text Books:

1. Electronic Devices, Thomas L. Floyd, Pearson (9th Edition), 9-Jan-2011.
2. Electronic Devices and Circuits, David A. Bell, Oxford Press (5th Edition) 30- April-2008.

References:

1 Printed Circuit Boards: Design, Fabrication, Assembly and Testing R.S. Khandpur Tata McGraw-Hill Education, 24-Feb-2005.
2 The PCB Design Magazine – an iConnect007 publication.
3 PCB Design, Device Handling and Assembly Guidelines AN-001 mCube Inc.
4 Printed Circuits Handbook Clyde Coombs McGraw Hill Professional, 22-May-2007.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEI404	Electronics	PLC Lab	0	0	0	0	50	0	0	2	1

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
Q/A – Quiz/Assignment/Attendance, MST Mid Sem Test.

Course Objectives: -

1. To be familiar with PLC and design processes involved.
2. To provide in depth knowledge of PLC programming.
3. To learn the testing of the PLC based programs.

Course Outcomes:-

Students will be able to:

1. Apply the knowledge of engineering to design and conduct experiments using PLC software.
2. Identify, formulate, and solve engineering problems related hydraulic and pneumatic.
3. Design and simulate various PLC programs and implement it on a process.
4. Identify, formulate, and solve engineering problems associated with PLC design software.

List of Experiments:

1. To understand PLC and its types with their applications.
2. To introduce ladder logic, its hardware and software terminology.
3. To implement the basic logic gates using universal logic gates through PLC.
4. To analyze Boolean logic expression and program it through PLC.
5. Implement half adder, full adder, and subtractors.
6. Design multiplexers and Demultiplexer through PLC ladder logic.
7. Design Encoder and Decoder through PLC.
8. To implement and design timer and counter logic functions using PLC.
9. To analyze various pneumatic control valve and design its ladder logic.
10. Design and program ladder logic for traffic controller.

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Text Books:

1. Madhuchhanda Mitra and Samarjit Sen Gupta, "Programmable Logic Controllers (PLC) and Industrial Automation", Penram International Publishing (India) Pvt. Ltd. 2007.

References:

1. Gary Dunning, 'Introduction to Programmable logic Controllers',(Delmar Publisher),19 July 2011.
2. Webb & Reis, Programmable logic Controllers: Principles and Applications',(Prentice Hall of India), fifth edition, 25 march 2002

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