



**ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY  
Guwahati**

**Course Structure and Syllabus**

**(From Academic Session 2018-19 onwards)**

**B.TECH**

**POWER ELECTRONICS AND INSTRUMENTATION ENGINEERING**

**5<sup>th</sup> SEMESTER**



**ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY**  
**Guwahati**  
**Course Structure**

(From Academic Session 2018-19 onwards)

**B.Tech 5<sup>th</sup> Semester: Power Electronics and Instrumentation Engineering**  
**Semester V/ B.TECH/PEI**

Sl. No.	Sub-Code	Subject	Hours per Week			Credit	Marks	
			L	T	P		C	CE
<b>Theory</b>								
1	ECE181501	Microprocessor and Embedded System	3	0	0	3	30	70
2	ECE181502	Data Structure and Algorithm	3	0	0	3	30	70
3	PI181503	Industrial Process Control	3	0	0	3	30	70
4	ECE181504	Control Systems	3	0	2	4	30	70
5	PI181505	Electrical and Electronic Measurements	3	0	0	3	30	70
6	HS181506	Engineering Economics	3	0	0	3	30	70
<b>Practical</b>								
1	ECE181511	Microprocessor and Embedded System Lab	0	0	2	1	15	35
2	ECE181512	Data Structure and Algorithm Lab	0	0	2	1	15	35
3	PI181515	Electrical and Electronic Measurements Lab	0	0	2	1	15	35
4	SI181521	Internship-II (SAI – Academia)	0	0	0	1	-	100
<b>TOTAL</b>			<b>18</b>	<b>0</b>	<b>8</b>	<b>23</b>	<b>225</b>	<b>625</b>
<b>Total Contact Hours per week: 26</b>								
<b>Total Credits: 23</b>								

## Detailed Syllabus:

Course Code	Course Title	Hours per week L-T-P	Credit C
ECE181501	Microprocessor and Embedded System	3-0-0	3

### Course Outcomes:

At the end of this course students will be able to

**CO1:** Explain the architecture of 8085 Microprocessor and some advanced processors.

**CO2:** Apply assembly language for programming of 8085 Microprocessor.

**CO3:** Describe the architecture of 8051 and ARM Microcontrollers.

**CO4:** Make use of Assembly language and Embedded C for programming 8051 microcontroller.

**CO5:** Design suitable interfacing of peripherals with 8085 microprocessor and 8051 microcontroller.

### MODULE 1: Architecture of Microprocessors (5 Lectures)

General processor architecture, 8085 architectures, Memory classification and interfacing, Memory – map, Address decoding (Absolute and partial); Pin diagram of 8085, interfacing of I/O devices, peripheral I/O and memory mapped I/O.

### MODULE 2: Programming of 8085 (10 Lectures)

8085 instruction format and classification, addressing modes; Assembly language programming of 8085, hand assembly of a program. Program looping, counter, subroutine & linkages, delay routine. Instruction cycle, Machine cycle and T-state, Bus Timing diagram. Stack and subroutine, stack used by the microprocessor during CALL and RET instructions, stack used by the programmer, 8085 interrupt process, software and hardware interrupts, their priorities, concepts of Direct Memory Access.

### MODULE 3: Interfacing with 8085 (6 Lectures)

Study of Programmable Interfacing devices like 8255, 8254, 8257, 8279 and their applications. Interfacing of LED and switches, matrix keyboard and multiplexed displays.

### MODULE 4: Advanced Processor (5 Lectures)

Concepts of virtual memory, Cache memory, Advanced coprocessor Architectures- 286, 486, Pentium

### MODULE 5: Architecture of Microcontrollers (4 Lectures)

Overview of the architecture of 8051 microcontrollers, ARM microcontroller. RISC vs. CISC architecture. Addressing modes of 8051 and ARM 9 Microcontroller, Interrupt, Counter and Timer.

### MODULE 6: Programming and Interfacing with 8051 and ARM Microcontroller (10 Lectures)

Programming with Assembly and Embedded C. Interfacing with peripherals - timer, serial I/O, parallel I/O, A/D and D/A converters, 7 segment LEDs, LCDs, etc.

### Textbooks/Reference Books:

1. R. S. Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing, 1996
2. Mazidi & McKinlay, "The 8051 Microcontroller and Embedded Systems using Assembly and C", PHI.
3. D A Patterson and J H Hennessy, "Computer Organization and Design The hardware and software interface. Morgan Kaufman Publishers.
4. Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill, 1991.

Course Code	Course Title	Hours per week L-T-P	Credit C
ECE181502	Data Structure and Algorithm	3-0-0	3

**Course Outcome:** At the end of this course students will be able to

**CO1:** Design algorithms and apply asymptotic notations to analyze the performance of algorithms.

**CO2:** Apply linear data structures like arrays, linked list, stacks and queues to solve problems.

**CO3:** Illustrate and compare various techniques for sorting and searching.

**CO4:** Apply nonlinear data structures like trees and graphs to solve problems.

**CO5:** Apply various hashing techniques to solve problems and describe file-organization and indexing.

**MODULE 1: Introduction to Algorithms (5 Lectures)**

Introduction to Algorithms, Time and Space Complexity, Asymptotic Notations, Asymptotic analysis of simple algorithms, Recursive and Iterative algorithms, Types of Recursion, Order Statistics

**MODULE 2: Linear Data Structure (10 Lectures)**

Data Structures, Types of Data structures, 1-D Arrays and multi-dimensional arrays, Strings, Pointers and Arrays. Stacks and Applications of Stacks, Queues and its Applications, Dequeues, Link List, Circular Link List and Double Link Lists, Applications of Linked lists

**MODULE 3: Sorting and Searching (7 Lectures)**

Sorting, Internal and external sorting, Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort, Heap Sort, Radix Sort, Bucket Sort, Searching, Linear Search, Binary Search

**MODULE 4: Non-Linear Data Structure (10 Lectures)**

Trees, Different types and Applications of trees, Tree Traversals, Binary trees, threaded trees, Binary Search Trees, Height balanced and weight balanced trees, AVL trees, Huffman tree, B-trees, B+ trees. Graphs and Representations, BFS, DFS, Minimum Spanning Trees, Prim's and Kruskal's Algorithms, Applications of graphs

**MODULE 5: Hashing and File Organization (8 Lectures)**

Hashing and Hash Tables, Hash functions, properties and types of hash functions, collision and collision resolution techniques, Applications of hashing, File Organization, Sequential, relative and indexed sequential organization, different types of indexes

**Textbooks/Reference Books:**

1. Richard F. Gilberg, Behrouz A. Forouzan, Data Structures: A Pseudocode Approach with C, Cengage Learning.
2. Horwitz E., S. Sahni and S. Anderson, Fundamentals of Data Structures in C, University Press (India).
3. Aho A. V., J. E. Hopcroft and J. D. Ullman, Data Structures and Algorithms, Pearson Publication.
4. Tremblay J. P. and P. G. Sorenson, Introduction to Data Structures with Applications, Tata McGraw Hill.
5. Peter Brass, Advanced Data Structures, Cambridge University Press.
6. Lipschuts S., Theory and Problems of Data Structures, Schaum's Series.
7. Wirth N., Algorithms + Data Structures = Programs, Prentice Hall.
8. Hugges J. K. and J. I. Michtm, A Structured Approach to Programming, PHI.
9. Martin Barrett, Clifford Wagner, And Unix: Tools for Software Design, John Wiley.
10. Samanta D., Classic Data Structures, Prentice Hall India.
11. CLR must be the text book of this course

Course Code	Course Title	Hours per week L-T-P	Credit C
PI181503	Industrial Process Control	3-0-0	3

### Course Outcomes (COs):

On Completion of this course the students should be able to

**CO1:** Develop Mathematical modeling of various physical systems.

**CO2:** Analyse response of different control systems.

**CO3:** Apply control actions e.g. P, PI, PD and PID in process control.

**CO4:** Illustrate different controller tuning methods.

### MODULE 1: Introduction

(6 Lectures)

Definition of process & process control systems; Objectives & requirements; Classification & selection of process variables; Sources & nature of disturbances; hardware elements of process control systems.

### MODULE 2: Physical Systems

(7 Lectures)

Mathematical model of physical systems-liquid level system, thermal system, mixing process, CSTR etc. RLC elements in process.

### MODULE 3: Response Analysis

(8 Lectures)

Response of first and second systems with P, I, P-I and P-I-D controllers; transient response specifications, effect of time delay and measurement lag on system response.

### MODULE 4: Control Action and Controllers

(5 Lectures)

On-Off, P, I, D, PI, PD and PID control actions, Electronic controllers

### MODULE 5: Design of Feed Back Controllers

(8 Lectures)

Selection criterion for type of controllers, controller tuning-process reaction curve, Zeigler-Nichol's method, Cohen and Coon method and frequency domain method.

### MODULE 6: Control valve and PLC

(6 Lectures)

Final control elements-its characteristics and various selection criteria to be used in real processes. PLC -Operation cycle, Application etc. Applications of process control using MATLAB TOOLBOX.

### Textbooks/Reference Books/Resources:

1. Process Control –Surekha Bhanot (OXFORD)
2. Stephanopoulos G- Chemical process control (PHI).
3. Pollard A –Process control.
4. Coughanowr – Process System Analysis and Control (MH).
5. Hariot P-Process Control (TMH).
6. Johnson-Process Control Instrumentation Technology (JW).

Course Code	Course Title	Hours per week L-T-P	Credit
ECE181504	Control Systems	3-0-2	4

**Course Outcome:** At the end of this course students will be able to

**CO1:** Formulate mathematical model for physical systems.

**CO2:** Analyse a system in time domain and frequency domain.

**CO3:** Determine the stability of a system using time and frequency domain analysis.

**CO4:** Develop and analyse state space models.

**CO5:** Design and analyse various controllers.

**MODULE 1: Introduction to Control System**

**(2 Lectures)**

Introduction to control problem- Industrial Control examples.

**MODULE 2: Mathematical Modelling of Physical Systems**

**(8 Lectures)**

Transfer function. System with dead-time System response. Control hardware and their models: potentiometers, synchro's, LVDT, dc and ac servomotors, tacho-generators, electro hydraulic valves, hydraulic servomotors, electro pneumatic valves, pneumatic actuators. Closed-loop systems. Block diagram and signal flow graph analysis.

**MODULE 3: Time Domain Analysis**

**(8 Lectures)**

Time response of second-order systems, steady-state errors and error constants.

Performance specifications in time-domain. Routh stability criterion, Root locus method of design.

**MODULE 4: State Variable Analysis**

**(6 Lectures)**

Concepts of state, state variable, state model, state models for linear continuous time functions, diagonalization of transfer function, solution of state equations, concept of controllability & observability

**MODULE 5: Feedback Control Systems**

**(6 Lectures)**

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness. Proportional, integral and derivative systems, Lead & lag compensators, Feed- forward and multi-loop control configurations, stability concept, and relative stability

**MODULE 6: Frequency Domain Analysis**

**(10 Lectures)**

Polar plots, Bode plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency domain. Frequency domain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation. Op-amp based and digital implementation of compensators. Tuning of process controllers. State variable formulation and solution.

**Textbooks/Reference Books:**

1. Gopal. M., "Control Systems: Principles and Design", Tata McGraw-Hill, 1997.
2. Kuo, B.C., "Automatic Control System", Prentice Hall, sixth edition, 1993.
3. Ogata, K., "Modern Control Engineering", Prentice Hall, second edition, 1991.
4. Nagrath & Gopal, "Modern Control Engineering", New Age International, New Delhi

Course Code	Course Title	Hours per week L-T-P	Credit C
PI181505	Electrical and Electronic Measurements	3-0-0	3

**Course Outcome:** At the end of this course students will be able to

**CO 1:** To understand concepts of various electrical and electronic measuring instruments.

**CO 2:** To familiarize with different electromechanical and electronic instruments.

**CO 3:** To introduce instruments for power, energy measurements and special type meters.

**CO4:** To explain instrument transformers and magnetic measurements.

**CO5:** To be able to measure different physical parameters with the help of AC bridges.

**CO6:** To understand construction and working principle of electronic instruments.

**MODULE 1: Electrical Standards (2 lectures)**

Standards of e.m.f. and resistance, frequency dependence of resistance, Inductance and Capacitance, Time and frequency standards, Qualities of Measurements.

**MODULE 2: Electromechanical Indicating Instruments (7 lectures)**

PMMC galvanometer, Ohmmeter, Electrodynamometer, Moving iron meter, Rectifier and thermo-instruments, Comparison of various types of indicating instruments.

**MODULE 3: Power and Energy Measurement (6 lectures)**

Electrodynamometer type of wattmeter and power factor meter, Power in poly phase system: two wattmeter method, Single-phase induction and Electronic energy meters.

**Special Type meters:** Construction and working principle of frequency meter, synchroscope, power factor meter, flux meter, maximum demand meter.

**MODULE 4: Instrument Transformers (6 lectures)**

Current & Voltage transformers, Constructional features, Ratio & Phase angle errors, errors compensation, testing of CT and PT

**Magnetic Measurements:** Determination of BH curve and Hysterisis loop, Measurement of iron losses with Llyod Fisher Square

**MODULE 5: Bridge Measurements (9 lectures)**

AC bridges: Applications and conditions for balance, Maxwell's bridge, Hay's bridge, Schering bridge, Wien's bridge, De Sauty's bridge, Insulation testing, Ground resistance measurement, Varley and Murray loop test.

**MODULE 6: Electronic Instruments (10 lectures)**

Electronic Voltmeters, Digital voltmeters , Electronic multimeter , general characteristics ramp type voltmeter, quantization error, digital frequency meter/timer, Q meter and its applications, distortion meter, wavemeter and spectrum Analyzer, block diagram and applications of oscilloscopes, vertical and horizontal deflection systems, delay line,multiple trace, CRO probe & transducers, measurement of voltage, current , phase and frequency by CRO, storage oscilloscopes , working principle and circuit diagram of strip-chart and X-Y recorders

**Textbooks/Reference Books:**

1. Golding, E.W., and Widdis, F.C., Electrical Measurements and Measuring Instruments, Pitman (2003).
2. Helfrick, A.D., and Cooper, W.D., Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India (2007).
3. D.V.S. Murthy, “Transducers and Instrumentation”, Prentice Hall of India, 2<sup>nd</sup> edition, 2009
4. A. K. Sawhney, “A course in Electrical and Electronic Measurement and Instrumentation’, Dhanpatrai & Co., 12<sup>th</sup> edition, 2010.
5. Kalsi, H.S., Electronic Instrumentation, TMH 2007.
6. D O Doebelin, “Measurements Systems, Applications and Design”, TMH Publications, 5<sup>th</sup> edition, 2003.

Course Code	Course Title	Hours per week L-T-P	Credit C
HS181506	Engineering Economics	3-0-0	3

### Course Outcomes (COs):

The students will be able to

1. Acquire knowledge about economics its nature, scope and importance.
2. Understand the economic laws, principles, and theories and their relevance in present day situation.
3. Develop the ability of critical thinking to meet the challenges at the national and global problems.
4. Apply knowledge in finding out socio-economic problems and appropriate measures to deal with them.
5. Equip students with vital knowledge to run government and non-government institutions and bodies.
6. Assemble knowledge which is vital for industry and research and evolve proper policy for economic development.

#### **MODULE 1: Introduction to Economics (3 Lectures)**

Meaning and Definition of Economics, Nature and Scope of Economics, Concept of Micro and Macro Economics.

#### **MODULE 2: Utility Analysis (3 Lectures)**

Meaning of Utility, Utility Function, Consumers Equilibrium, Concept of Indifference Curve, properties of Indifference Curve, Equilibrium under Indifference Curve.

#### **MODULE 3 : Demand and Supply Analysis (4 Lectures)**

Law of Demand, Demand Function, Elasticity of Demand, Types of Elasticity of Demand, Measurement of Elasticity of Demand, Demand Forecasting, , Law of Supply, Supply Function.

#### **MODULE 4: Revenue, Production & Cost Analysis (4 Lectures)**

Average, Marginal and Total Revenue, Revenue Function, Average, Marginal and Total Cost, Cost Function, Short and Long Run Cost Curves. Break Even Point, Managerial Uses of Cost Function, Cobb Douglas Production Function.

#### **MODULE 5: Market Structure (4 Lectures)**

Concept of Market, Price-Output Determination under Perfect Competition, Monopoly Market and Monopolistic Competition.

#### **MODULE 6 : Money, Banking and National Income (8 Lectures)**

Definition of Money, Function of Money, Index Numbers, Construction of Index Numbers, value of Money, Causes of Inflation, Functions of Commercial and central bank, Central bank and its monetary policy, Money Market and Capital Market, Functions of Stock exchange, Concept of National Income, Measurement of National Income, Concept of Investment.

**MODULE 7: Introduction to Environmental Economics****(5 Lectures)**

Concept of Environmental Economics, Cost -Benefit Analysis, Social Cost, Externalities, Concept of Pareto Equilibrium, Externality, Market Failure.

**MODULE 8: Public Finance****(3 Lectures)**

Introduction to Public Finance, Concept of Budget, Types of Budget, Budget Receipts, Concept of Goods and services Tax (GST)

**Textbooks/Reference Books:**

1. Managerial Economics by V. Agarwal: Pearson Pvt. Limited, New Delhi.
2. Engineering Economics by Dr. A. Ahmed & G. Begum: Chandra prakash, Guwahati
3. Principles of Engineering Economics with Application by Dr. Z. A. Khan, A. N. Siddiquee, B. Kumar, M. H. Abidi: Cambridge University Press.
4. Public Finance and Public Policy by Dr. R. K Choudhury: Kalayani publishers
5. Quantitative Methods for Economics by R. Veerachamy: New Age International Publication Ltd.
6. Micro and Macro Economics by Dr. M. L. Seth: Educational Publishers, Agra
7. A Koutsoyiannis: Modern Microeconomics
8. Environmental Economics by R. N. Bhattacharya: Oxford Publication.

Course Code	Course Title	Hours per week L-T-P	Credit C
ECE181511	Microprocessor and Embedded System Lab	0-0-2	1

**Course outcomes:** On the completion of this laboratory course, the students will be able to:

**CO1:** Apply the fundamentals of assembly level / high level language programming of 8085 Microprocessor and 8051 Microcontroller to perform arithmetic, logical, data transfer applications and branch/loop instructions.

**CO2:** Interface a microprocessor and microcontroller with peripherals for various applications.

**List of Experiments:**

1. Programs involving:  
Data transfer instructions like: i) Byte and word data transfer in different addressing Modes ii) Block move (with and without overlap) iii) Block interchange
2. Programs involving: Arithmetic & logical operations like: i) Addition and Subtraction of multi precision nos. ii) Multiplication and Division of signed and unsigned Hexadecimal nos. iii) ASCII adjustment instructions iv) Code conversions
3. Programs involving: Bit manipulation instructions like checking: i) Whether given data is positive or negative ii) Whether given data is odd or even iii) Logical 1's and 0's in a given data iv) 2 out 5 code v) Bit wise and nibble wise palindrome
4. Programs involving: Branch/ Loop instructions like i) Arrays: addition/subtraction of N nos., Finding largest and smallest nos., Ascending and descending order ii) Two application programs using Procedures and Macros.
5. Programs involving String manipulation like string transfer, string reversing, searching for a string.
6. Programs for reading a Character from keyboard, Buffered Keyboard input, Display of character/ String on console
7. Interfacing Experiments: Experiments on interfacing 8085/86 with the following interfacing modules  
1. Matrix keyboard interfacing  
2. Seven segment display interface  
3. Logical controller interface  
4. Stepper motor interface  
5. Analog to Digital Converter Interface (8 bit)  
6. Light dependent resistor ( LDR ), Relay and Buzzer Interface to make light operated switches

\*\*\*\*\* *Repeat the above listed programs for both 8085 microprocessor and 8051 microcontroller*

Course Code	Course Title	Hours per week L-T-P	Credit C
ECE181512	Data Structure and Algorithm Lab	0-0-2	1

**Course Outcomes:** On completion of this lab course the students will be able to

**CO1:** Implement linear and non-linear data structure in C programs

**CO2:** Implement different sorting, searching and hashing techniques.

**List of Experiments:**

1. Write a program to implement stack using array.
2. Write a program to implement Stack using linked list.
3. Write a program to implement a circular linked list.
4. Write a program to implement a Doubly Linked List.
5. Write a program to implement queue using array.
6. Write a program to implement queue using linked list.
7. Write a program to implement circular queue using linked list.
8. Write a program to implement a deque.
9. Write a program to implement priority queue using array.
10. Write a program to implement a linked list in descending order.
11. Write a program to insert an element in a sorted linked list.
12. Write a program to sort any six integers using linked list.
13. There are two linked lists A and B containing the following data:  
A: 7, 5, 3, 1, 20  
B: 6, 25, 32, 11, 9  
Write a function to combine the two lists such that the resulting list contains nodes in the following elements:  
7, 6, 5, 25, 3, 32, 1, 11, 20, 9
14. Write a program to add two polynomial using linked list. You are not allowed to create any additional node while writing the addition function.
15. Write a program to merge two sorted linked list, restricting common elements to occur only once only.
16. Write a program to delete the minimum value from a linked list.
17. Write a program to remove a specified node from a given Doubly Linked List and insert it at the end of the list.
18. Write a program to split a linked list in such a way that one list will have odd position elements and other will have even position elements. Starting position is *one*.
19. Write a program to reverse a string using stack and implement the stack using linked list.
20. Write a program to generate a random matrix of 0's and 1's of order 4×4 and run the program for four times and draw all the four graphs.
21. Write a program to sort some words using linked list.
22. Write a program to sort some *three* digits number by comparing the leftmost to rightmost digit.  
Example: 358 264 187 (compare 8 of 358 with 4 of 264)  
Step1 264 358 187  
Similarly you compare all the digits and exchange the numbers.
23. Write a program to implement merge sort algorithm.
24. Write a program to implement insertion sort algorithm.
25. Write a program to implement bubble sort algorithm.
26. Write a program to implement selection sort algorithm.
27. Write a program to implement the Radix sort algorithm.

28. Write a program to implement the quick sort algorithm.
29. Write a program to implement linear search and binary search.
30. Write a program to find the inorder, preorder, and postorder traversal in a binary tree.
31. Write a program to implement a binary search tree.
32. Write a program to convert an infix expression to postfix expression.
33. Write a program to convert an infix expression to prefix expression.
34. Write a program to convert to evaluate a postfix expression.
35. Write a program using stack to convert decimal to binary, octal, and hexadecimal number system.
36. Write a program to check a given expression containing balanced parentheses or not.
37. Write a program to implement Breadth First Search (BFS) in a graph.
38. Write a program to implement Depth First Search (DFS) in a graph.
39. Write a program to implement linear probing to insert a set of integers using the hash function  $k \bmod m$  in a hash table, where  $k$  is the key value and  $m$  is the size of hash table. (hash table size should be at least the size of the array)
40. Write a program to implement quadratic probing to insert a set of integers using the hash function  $k \bmod m$  in a hash table, where  $k$  is the key value and  $m$  is the size of hash table. (hash table size should be at least the size of the array)

## **Control Systems Lab:**

**Course Outcomes:** On completion of this lab course the students will be able to

**CO1:** Execute and analyze the time domain response of first and second order system.

**CO2:** Analyze the stability of a system through Root Locus, Bode plot and Nyquist plot.

**CO3:** Design compensators (Lag, Lead and Lead-Lag) and verify experimental results in MATLAB/LabVIEW

**CO4:** Design and tuning of P, PI and PID controllers for close loop control system.

### **List of Experiments:**

1. Simulation of a first order and second order system time domain response for different inputs like Impulse, Step, Ramp and Parabolic inputs using MATLAB.
2. Evaluation of steady state error, settling time, percentage peak overshoot, gain margin, phase margin of a given Transfer function using MATLAB.
3. a) Evaluation of the effect of additional poles and zeroes on time response of a given second order system using MATLAB.  
b) Simulation of Step response & impulse response for type-0, type-1 & type-2 system with unity feedback.
4. a) Stability analysis of a second order system through
  - i. Root locus
  - ii. Bode plot
  - iii. Nyquist plotb) Comparative study of Bode, Nyquist and Root locus with respect to Stability using MATLAB.
5. a) Design of following compensating network for the given specifications using RC passive network.
  - i. lead
  - ii. lag
  - iii. lead-lagb) Obtain the Transfer function and frequency response of a given compensator using MATLAB.
6. a) Design and implementation of PID controller for DC motor speed controlling. The gain of the controller to be computed by using Z-N method.  
b) Comparison of P, PI, PID control action with respective to step input using LabView.
7. Design of close loop temperature controller system using a temperature sensor as feedback element using LabView.
8. Obtain transfer function of a given system from state variable model and vice versa using LabView.

Course Code	Course Title	Hours per week L-T-P	Credit C
PI181515	Electrical and Electronic Measurements Lab	0-0-2	1

**Course Outcomes:** On completion of this lab course the students will be able to

**CO1:** Measure low resistance, self-inductance and capacitance using different bridges.

**CO2:** Learn calibration and testing of different types of meters.

**CO3:** Learn about measurement of power and power factor in single and multi-phase system.

### List of Experiments

1. Measurement of Low Resistance by Kelvin's Double Bridge Method.
2. Measurement of Self Inductance and Capacitance using Bridges.
3. Study of Galvanometer and Determination of Sensitivity and Galvanometer Constants.
4. Calibration of Voltmeters and Ammeters using Potentiometers.
5. Testing of Energy meters (Single phase type).
6. Measurement of Iron Loss from B-H Curve by using CRO.
7. Measurement of R, L, and C using Q-meter.
8. Measurement of Power in a single phase circuit by using CTs and PTs.
9. Measurement of Power and Power Factor in a three phase AC circuit by two-wattmeter method.
10. Study of Spectrum Analyzers.

\*\*\*\*\*