ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati

Course Structure and Syllabus

APPLIED ELECTRONICS AND INSTRUMENTATION (AEI)
Semester IV / AEI / B.TECH

Sl. no.	Subject code	Subject	Hrs/week			Credit
			L	T	P	C
Theory						
1	MA131401	Numerical Methods and Computation	3	2	0	4
2	AI131402	Electrical and Electronic Measurements	3	2	0	4
3	AI131403	Transducers and Sensors	3	0	0	3
4	AI131404	Introduction to Signals and Systems	3	0	0	3
5	HS131406	Economics and Accountancy	4	0	0	4
6	CS131407	Object Oriented Programming and Data structure	3	0	0	3
Practical						
7	MA131411	Numerical Methods and Computation Lab	0	0	2	1
8	AI131412	Electrical and Electronic Measurements Lab	0	0	2	1
9	AI131413	Transducers and Sensors Lab	0	0	2	1
10	CS131417	Object Oriented Programming and Data structure Lab	0	0	2	1
TOTAL			19	4	8	**25**
Total Contact Hours : 31						
Total Credits : **25**						

Course Title: NUMERICAL METHODS AND COMPUTATION
Course Code: MA131401
L-T-::C 3-2 = 4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 =48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Approximation in numerical computation**	Truncation and rounding errors, fixed and floating point arithmetic, Propagation of errors.	4
2	**Interpolation**	Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation	12
3	**Numerical Integration**	Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule. Expression for corresponding error terms.	8
4	**Numerical solution of linear equations**	Gauss elimination method, matrix inversion, LU factorization method, Gauss-Seidel iterative method.	7
5	**Numerical solution of Algebraic and transcendental equation**	Bisection method, Regula-Falsi method, Newton-Raphson method.	7
6	**Numerical solution of Ordinary differential equation**	Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method.	10
		TOTAL	48

REFERENCE BOOKS:

1. Numerical Methods, SukhenduDey, Shishir Gupta, McGraw Hill Education (India) private Limited
2. Numerical Algorithms. E. V. Krishnamurthy, S. K. Sen. Affilated East-West Press
3. Computer Programming & Numerical Analysis by N Dutta, University Press.
4. Numerical Methods. E. Balagurusamy, Tata McGraw - Hill Education (1999)
5. Numerical & Statistical Methods With Programming in c by SujathaSinha
6. Numerical Methods In Eng. & Science, Dr. B. S. Grewal, Khpub publication
7. Numerical Methods for Scientific and Engineering Computation by R. K. Iyengar, New Age International
8. Numerical Mathematical Analysis by J. B. Scarborough, Oxford

Course Title: ELECTRICAL AND ELECTRONIC MEASUREMENTS
Course Code: AI131402
L-T-::C 3-2= 4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 =48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Basics of Electrical instruments**	Brief review of PMMC, MI and rectifier type instruments (Questions not to be asked in examination); CT and PT-Theory, operation, application and error.	4
2	**Measurement of Resistance, Inductance, Capacitance and Frequency**	Measurement of Resistance-medium resistance using wheatstone bridge, ammeter-voltmeter method, ohmmeter-series and shunt type; Measurement of low resistance- Kelvin double bridge; high resistance measurement- insulation measurement, Megger, loss of charge method; A.C bridge- principle, Maxwell, Schering, Anderson, Wien Bridges.	8
3	**Measurement of Potential**	DC and AC potentiometers-Principle and standardisation, Laboratory type (Crompton's), AC potentiometer-Drysdale (polar type) and Gall-Tinslay (Co-ordinate type)-brief description of principle and operation-Applications and limitations of DC and AC potentiometers.	7
4	**Measurement of Power, power factor, frequency and Energy**	Electrodynamometer type wattmeter-principle and application, measurement of single phase and three phase power; measurement of power factor; measurement of frequency-electrical resonance type, mechanical resonance type, Weston type; measurement of Energy using induction type energy meter	10
5	**Digital Indicating instruments**	Digital Voltmeter (DVM)-Dual slope integrating type DVM, Integrating type DVM; Concept of A/D and D/A converter, types of DVM, Resolution and sensitivity of DVM; Digital multimeter-description of block diagram; digital frequency meter-basic circuit and	10

		operation; Digital Tachometer- basic block diagram and operation; Digital phase meter-block diagram and operation; digital capacitance meter-block diagram and operation; IEEE-488 bus.	
6	**Digital display devices and Recorders**	CRO: Basic principle of CRT, waveform display, dual trace oscilloscope, measurement of voltage, current, phase and frequency, Oscilloscope probe, sampling oscilloscope, DSO; AF sine wave generator-block diagram and operation; Function generator-block diagram and operation; square and pulse generator (laboratory type)-block diagram and operation; basics of strip chart recorder and X-Y recorder.	9
		TOTAL	48

RECOMMENDED BOOKS:

1. Elecrical and electronic measurements and instrumentation-A.K. Swahney-Dhanpat Rai & Co.
2. A Course in Electronic and Electrical Measurements and Instrumentation-J B Gupta S.K. Kataria & Sons, Delhi.
3. Electronic measurement and Instrumentation- David A Bell-Prentice Hall of India
4. Electrical Measurement by reddy
5. Electronic Instrumentation- H S Kalsi-Tata McGraw Hill
6. Industrial Instrumentation & control- S K Singh- Tata McGraw Hill
7. Digital Electronics- Jain- Tata McGraw Hill

Course Title: TRANSDUCERS AND SENSORS
Course Code: AI131403
L-T::C 3-0 = 3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Introduction**	Basic definition and classifications of transducers. Primary sensing element.	2
2	**Resistive Transducers**	Resistance potentiometers, RTD, thermistors, strain-gauge and anemometers.	6
3	**Inductive Transducers**	Types of inductive transducers. Principles of operation. LVDT, phase sensitive detectors, reluctance type transducers- push-pull arrangement and reduction of non-linearity. Eddy current type transducers.	7
4	**Capacitive Transducers**	Air gap and dielectric type. Capacitance bridge. Capacitive microphone. Electrets.	3
5	**Elastic Transducers**	Spring, bellows, diaphragm and Bourdon tube. Combination of elastic and electric transducers.	4
6	**Thermo-couples**	Characteristics of thermo-couples. Installation and compensation.	2
7	**Piezo-electric Transducers**	Principle of operation. Equivalent Circuit and frequency response.	2
8	**Smart sensors**	Introduction, converters, recent trends in sensor technology – film sensors, nano sensors.	3
9	**Miscellaneous Transducers**	Photo Transducers - LDR, Photo-diode, photo-transistor and IR detectors. Tacho-generator, G-M counter and other radiation detectors. Principle of operation and description of magnetostrictive transducers.	7
		TOTAL	36

RECOMMENDED BOOKS:

1. Measurement System, Application and Design: E. O. Doebelin. Tata-McGraw-Hill.
2. Transducers and Instrumentation: D. V. S. Murthy. Prentice Hall of Indial
3. Sensors and Transducers: D. Patranobis. A. H. Wheeler.
4. Instrumentation, Measurement and Feedback: B. E. Jones. Tata-McGraw-Hill

Course Title: INTRODUCTION TO SIGNALS AND SYSTEMS
Course Code: AI131404
L-T= :: C 3-0 = 3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Introduction to signals and systems**	Definition and Classification of different "signal": continuous and discrete type, power and energy, aperiodic and periodic, linear and nonlinear. Standard test signals: unit step, ramp, impulse, parabolic, exponential, sinusoidal. Classification of discrete and continuous systems. Need for signal processing.	3
2	**Linear Time-invariant Systems**	Continuous-time LTI systems, concept of convolution integral. Discrete time LTI systems, the convolution sum. Properties of LTI systems.	5
3	**Fourier Analysis of signals**	Fourier series analysis of signals. Representation of periodic signals in exponential and trigonometric form. The Fourier transforms: continuous time and discrete time. Properties of Fourier Transform. Representation of aperiodic signals by Fourier transforms.	9
4	**The Lapalce Transform**	Definition of Laplace transform of continuous time signal. Properties. Initial value and final value theorem. Inversion of Laplace's transforms. Application of transforms in LTI systems.	4
5	**The Z-transform**	Definition of Z-transform of discrete time signals. Region of convergence (ROC): definition and properties. Inversion methods of Z-transforms: Residue theorem, power series expansion method and partial fraction method.	5
6	**Sampling**	The sampling theorem. Reconstruction of signals from its samples. Aliasing effect. Spectrum of sampled signal.	3

7	**Random signals**	Basics of Probability theory. Random variables. Distribution and density functions- The Gaussian and uniform distribution. Determination of standard statistical parameters (mean, mean square, median, standard deviation and variance). Stochastic processes - stationary and ergodic processes. Spectral density and correlation functions.	7
		TOTAL	36

RECOMMENDED BOOKS:

1. S Haykin and B.V.Been, “Signals and Systems”, John Wiley
2. A Nagoorkani,”Signals and Systems”, McGraw Hill
3. P. Ramesh Babu and R. Anandanatarajan,”Signals and Systems”, Scitech Publications.
4. S Ghosh,”Signals and Systems”, Pearson Education
5. A.V. Oppenheim, A.S. Willskey and S.H. Nawab,” Signal & System”, Pearson Education.
6. Sanjay Sharma,“Signal & Systems (with Matlab Programming)”, S. K. Kataria & Sons.

Course Title : ECONOMICS AND ACCOUNTANCY
Course Code: HS131406
L-T ::C 4-0 = 4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Introduction to Economics**	i) Nature and Scope of Economics ii) Concepts of micro and macro economics, economic good and free good.	4
2	**Demand and Supply Analysis**	i) Law of Demand and determinants of demand. ii) Categories and Types of Elasticity of Demand- price elasticity, income elasticity, cross elasticity. iii) The determinants of elasticity, Demand elasticity and Revenue. iv)Law of Supply and Elasticity of Supply.	8
3	**The Theory of Production and Cost**	i) Iso-quant and Iso-cost line. ii) Law of Return to Scale and Law of Variable Proportion iii) Types of Cost – total, average and marginal cost, fixed cost & variable cost, long run and short run cost, private & social cost, economist's cost & accountant's cost , opportunity cost .	8
4	**Market**	i) Features of perfect competition and monopoly. ii)Price-Output determination under--perfect competition, simple problems of perfect competition.	5
5	**Concepts of Accountancy**	Various concepts like Journal, ledger and preparation of trial balance.	8
6	**Preparation of Final Account**	Trading Account, Profit and Loss account, Balance Sheet.	8
7	**Depreciation**	Depreciation Policy, Causes of Depreciation, straight line method	4
8	**Cash Book**	Single, Double and Triple Column.	3
		TOTAL	48

REFERENCE BOOKS:

1. Managerial Economics by Yogesh Maheswary, PHI Learning
2. Mankiw Gregory N.(2002), *Principles of Economics*, Thompson Asia
3. Misra, S.K. and Puri (2009), *Indian Economy*, Himalaya
4. Engineering Economics by Dr. Afajuddin Ahmed, G Begum, Chandra Prakash
5. Book Keeping and Accountancy, K.R. Das, Lawyer's Books Stall

Course Title: OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURE
Course Code: CS131407
L-T-::C 3-0=3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Introduction**	Introduction To Oops, Difference between OOP and procedure oriented programming, Basic concept of OOPS, features of oops, and application of OOPS.	2
2	**Array, Structure and pointer**	1-D array, 2-D array, Concept of structure, pointer and types of pointer.	4
3	**Class and Object concept**	Introduction to object and class, class syntax, defining member function, Access specifiers (Public, Private, Protected), nesting member function, Private member function, Inline function, static data member, static member function, array of class, array within the objects, object pointer, this pointer, friend function and friend class.	4
4	**Constructors and Destructors**	Introduction to constructors and destructors and their properties, types of constructors, example of parameterized constructors, example of multiple constructors, example of copy constructors, example of destructor.	3
5	**Inheritance**	Define derived and base class, Types of Inheritance; Base and Derived classes, Syntax of derived classes, access to the base class; virtual function, virtual Base classes, Constructors and Destructors in Inheritance, abstract class.	4
6	**Polymorphism**	Compile time(Early/Static binding)- Overloading functions and operators, Overloading new and delete operators; Run time polymorphism(Late/Dynamic Binding) – Pure Virtual functions, Virtual Destructors, Review of Virtual base classes,	4
7	**Working with File**	File handling	3
8	**Complexity Analysis**	Time and Space analysis of Algorithms – Order Notations.	1

9	**Sorting of Array**	Bubble, selection, insertion, quick and merge sort technique.	3
10	**Searching**	Linear and binary search technique.	1
11	**Linked List**	Operation on singly and doubly.	3
12	**Stack**	Push operation, pop operation, conversion from infix to postfix, conversion from infix to prefix, evaluate postfix expression.	4
		TOTAL	36

RECOMMENDED BOOKS:

1. Introduction to Object oriented programming and C++ by Yaswant Kanetkar (B.P.B Publication)
2. Object Oriented Programming with C++ by Balaguruswamy (Tata Mcgraw Hill)
3. Data Structure by Lipschutz (PHI publication)
4. Data Structure through C++ by Yaswant Kanetkar

PRACTICALS

NUMERICAL METHODS AND COMPUTATION LAB

SUBJECT	NUMERICAL METHODS AND COMPUTATION LAB
CODE	MA131411
L-T-P-C	0-0-2-1
CLASS HOUR	3hrs/week
TOTAL NO. OF CLASS	5 (APPROX)
EXPECTED NO. OF WEEKS	5 (APPROX)

EXPERIMENT NO.	TITLE OF THE EXPERIMENT	HOURS
1	Write a C program to solve algebraic equations by using Method of Bisection.	3
2	Write a C program to solve algebraic equations by using Method of False position.	3
3	Write a C program to solve algebraic equations by using Newton Raphson Method.	3
4	Write a C program to solve linear system of equations by using Gauss Jordan Method.	3
5	Write a C program to solve linear system of equations by using Gauss Seidal Method.	3
	TOTAL	15

Course Title: **ELECTRICAL AND ELECTRONIC MEASUREMENTS LAB**
Course Code: **AI131412**
L-T-P:: C **0-0-2:: 1**

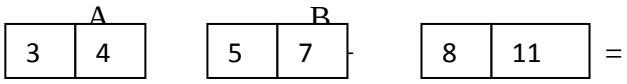
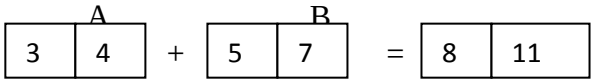
EXPERIMENT NO.	TITLE OF THE EXPERIMENT	HOURS
1	Measurement of medium resistance using Wheatstone bridge method	3
2	Measurement of low resistance using Kelvin bridge method	3
3	Measurement of unknown Capacitance i) De Sauty's bridge method and ii) Schearing bridge method	3
4	Measurement of unknown inductance with the help of Anderson's bridge	3
5	Testing of an Energy meter	3
6	Measurement of earth resistance using digital earth tester	3
7	Measurement of Power factor for different types of loads	3
8	Measurement of Phase and Frequency using Lissajous Pattern in an Oscilloscope	3
	TOTAL	24

Course Title: **TRANSDUCERS AND SENSORS LAB**
Course Code: **AI131413**
L-T-P:: C **0-0-2::1**

EXPERIMENT NO.	TITLE OF THE EXPERIMENT	HOURS
1	To study the characteristics of LVDT	3
2	Measurement of temperature using RTD	3
3	To study the characteristics of thermistor and to calculate the material constant, negative thermal coefficients of resistance and the time constant	3
4	To study the characteristics of thermocouple	3
5	To study the characteristics of strain gauge and to find the Young's modulus	3
6	Measurement of Angular displacement using Light activated Transducer	3
7	To study the characteristic of operational amplifier and its use as instrumentation amplifier	3
	TOTAL	21

Course Title: OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURE LAB
Course Code: CS131417
L-T-P::C 0-0-2::1

EXPERIMENT NO.	TITLE OF THE EXPERIMENT	HOURS
1	(a) Write a program to read and display the contents of an array and find the maximum and minimum from the array. (b) Design a structure "STUDENT " having the following elements "Roll", "Name", "Sem". Write different functions to read and display the structure elements. (c) Write a program to read and display records of 5 students using array of structure. (d) Write a program to read and display the content of an array in reverse order using pointer. (e) Design a structure "Book" having the following elements "Bookid", "Name", "Price". Write a menu base program to do the following operations. 1. Read the records 2. Display the records 3. Find the book with highest price 4. Compare the price of two books using a function which accept two structure variables as argument. (f) Write a program to swap the content of two structure using structure pointer. (g) Write a program to perform the addition and multiplication of two matrices. (h)Write a program to display the Pascal triangle	3
2	(a) Design a class "STUDENT " having the following data members "Roll", "Name", "Sem". Write different member functions 1.Read the details of a student 2. Display the details (b) Design a class to read three integers. Write different member functions to 1. Find the sum of two numbers and display the result 2. Find the maximum of three numbers (c) Write a program to read and display the records of 5 employees using array of objects. (d) Write a program to count the no of objects created of a particular class. [Use static data member and static member function]	3

	(e) Write a program to perform the following operations  Where A and B are the objects of two different class. [Use friend function]. (f) Write a program to perform the following operations  Using a function which accept two objects as parameters. (g) Design a class to read the details of employees. Use object pointer to display the details of the employee.	
3.	(a) Write a program to evaluate the following series $X= 2^2/2! +3^2/3!+ 4^2/4! +------- n^2/n!$ Use constructor to initialize the value of X to 0. (b) Design a class having two integers as private data member. Use different constructors to initialize the data members. (c) Write a program to copy the content the one object into other using copy constructor. (d) Design a menu based program to implement banking system. Use constructor and destructor.	3
4.	(a) Define a class "STUDENT" having the following data members "Roll","name", "branch" . Define functions to read the data members. Define another class "EXAM" having data members marks [3], percent and also inherited the properties of class "STUDENT", Define member function to read the data members and display the values. (b)Create a base class Shapes, Use this class to store two float type values that will be used to calculate the area of figures. Derive two classes called Rectangle and Circle. Add to the base class a member function init() to initialize the data members to 0, and member function read() to read the values . Redefine the read function in derived classes. Use different functions in derive class to display the area.	3
5.	(a) Design a class having two integers as private data member. Overload binary + operator two add two objects. (b) Design a class having a float variable as a private data member. Overload > operator to compare two objects. (c) Define a class having a float data member age. Define a function which accept an object pointer as argument, Compare the age of both the objects i.e the object calling the function and the object passed as argument, and return the object having maximum age. **[Use this pointer]** (d) Write a program to demonstrate the use of Virtual Base class. (e) Create a base class Book, Use this class to store book id, name and price. Derive two classes called Reference and	3

	Journal. Add to the base class a member function read () to read the values. Make the read ( ) function **virtual** and redefine this function in derived class. Use different functions in derive class to display the values. [Use base class and derive class pointer to call the member function].	
6	(a) Write a program to insert an element in a particular position in an array. (b) Write a program to delete an element from a particular position from an array and delete a particular element. (c) Write a program to perform bubble sort in an array. (d) Write a program to perform selection sort in an array. (e) Write a program to perform insertion sort in an array. (f) Write a program to search a particular element from an array. (use linear and binary search technique)	3
7	(a) Write a program to implement the following for a singly, doubly linked list (i) create a list (ii) insert a node at the beginning (iii) insert a node at the end (iv) insert a node at any specified position (v) display the list (vi) delete a node from the beginning (vii) delete a node from the end (viii) delete a node from a specified position (ix) searching a node (x) delete a node with a key value.	3
8	(a) Write a program to push and pop an element from a stack. (b) Write a program to convert an infix expression to postfix and prefix. (c) Write a program to evaluate a postfix expression	3
	TOTAL	24

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