ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

COURSE STRUCTURE

Semester – III / Electronics and Communication Engineering/ B.Tech

Sl. No.	Sub Code	Subject	L	T	P	Credit
	Theory					
1	MA131301	Mathematics-III	3	2	0	4
2	EC131302	Network Analysis	3	2	0	4
3	CS131303	Oriented Programming in c++	3	2	0	4
4	EC131304	Semiconductor and Electronic Devices	3	2	0	4
5	EC131305	Electronic Measurement and Instrumentation	3	0	0	3
6	HS131306	Sociology	2	0	0	2
	Practical					
7	EC131312	Network Analysis Lab	0	0	2	1
8	CS131313	Object Oriented Programming in C++Lab	0	0	2	1
9	EC131314	Semiconductor and Electronic Devices Lab	0	0	2	1
10	EC131316	Electronics Measurement and Instrumentation Lab	0	0	2	1
Total			17	8	8	25
Total Contact Hours = 33						
Total Credits = 25						

Course Title: Mathematics III
Course Code: MA131301
L-T-: C **3-2-=4**
Abstract:

This course of Mathematics is important for almost all the engineering disciplines. It deals with the partial differential equations of first order and 2nd order.

Prerequisites: Concept of solution of ODE, Elementary complex numbers and properties, Elementary probability and statistics – measures of central tendency, dispersions. Basic differentiation and integration [HS / diploma level]

Course Outcomes:

The students will

- Be able to apply the fundamental concepts of Partial differential Equations.
- Get familiarised with the applications of Ordinary Differential Equations and Partial Differential Equations.
- Be able to apply different techniques of integration, including partial fractions, integration by parts and recurrence formulae, to solve problems.

Module	Topic	No of hours	Marks
1	**First order Partial differential equation:** Partial differential equation of first order, Linear partial differential equation, Non-linear partial differential equation, Homogenous and non-homogeneous partial differential equation with constant co- efficient, Cauchy type, Monge's method. **Second order Partial differential equation:** Second order partial differential equation The vibrating string, the wave equation and its solution, the heat equation and its solution, Two dimensional wave equation and its solution, Laplace equation in polar, cylindrical and spherical coordinates, potential.	15	30
2	**Complex Analysis:** Analytic function, Cauchy-Riemann equations, Laplace equation, Conformal mapping, Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions. **Mathematical Series**: Power Series, Taylor's series, Laurent's series, Singularities and zeros, Residue integration method.	15	30

3	**Probability and statistics:** (i)Definition of probability, Laws of probability, Bays theorem, random variables, probability distributions and characteristics, binomial distribution, poisson's distributions and Normal distribution. (ii) elementary sampling theory, tests of hypothesis (statistical inference), Standard error, Fudicial (Confidence) limits, Tests of significance- Students' T-tests, Chi square tests and Z –tests.	10	25
4	**Laplace Transform** Definition of Laplace transform, Laplace transform of elementary functions, inverse of Laplace transforms. Properties of Laplace Transform- Linearity, multiplication by t^n and division by t. Laplace Transform of derivatives and integrals. Shifting theorems, Laplace transform of (i) periodic function (ii) unit step function, (iii) Dirac-delta function. Covolution theorem, Application of Laplace transform to initial value problems.	8	15

Reference books:

1. E. Kreyszig," Advanced Engineering Mathematics:, Eighth Edition, Wiley India.
2. B.V. Ramana, "Higher Engineering Mathematics", McGraw Hil Education.
3. N.P.Bali and Manish Goel, " A text book of Engineering mathematics", Laxmi Publication.
4. B. S. Grewal , "Higher Engineering Mathematics", Khanna Publication, Delhi.
5. Babu Ram, "Engineering Mathematics", Pearson.

NETWORK ANALYSIS (EC131302)

Credit: 4
L-T-: 3-2
Total no. of lecture hours: 45

Module 1: DC Circuit analysis **[12L]**

Sources-Transformation, Star Delta Conversion, Mesh and Nodal Analysis, Network theorems – Superposition theorem,Thevenin's theorem, Norton's theorem, Reciprocity theorem, Millman's theorem, Compensation theorem, Maximum power transfer theorem and Tellegen's theorem – Application to DC circuit analysis including circuits with dependent sources.

Module 2: AC Circuit Analysis **[10L]**

Phasor concept, Complex impedance, admittance and their phasor diagram. Series circuits -RC, RL and RLC circuits and parallel circuits – RLC circuits – sinusoidal steady state response – Mesh and Nodal analysis – analysis of circuits using Superposition, Thevenin's. Norton's and Maximum power transfer theorems. Resonance – Series resonance – Parallel resonance – Variation of impedance with frequency – Variation in current through and voltage across L and C with frequency – Bandwidth – Q factor – selectivity.

Module 2: Magnetically Coupled Circuits **[3L]**

Self inductance – Mutual inductance – Dot rule –Co-efficient of coupling, series, Parallel connection of coupled inductors – single tuned coupled circuits.

Module 4: Transients **[4L]**

Forcing Functions; Impulse, Step and Ramp Functions, Solution of simple circuits using Laplace transform.

Module 5:Network topology **[5L]**

Network Terminology, Graph of a network, Incident matrix, Tie Set Matrix and Cut set Matrix, Formulation of Network Equilibrium equations.

Module 6: **[4L]**

Foster and Cauer form of realization of one port network with two kinds of elements – LC, RC or RL.

Module 7: Two port networks **[7L]**

General principle, Open circuit Impedance parameter (Z), Short Circuit Admittance parameter (Y), Hybrid parameter (h) and Transmission Parameter (ABCD), Inter-relationship between parameters, Interconnection of two port networks. Network functions for two port networks; Driving point and Transfer Function.

Text Books / reference

1. William H. Hayt, Jr. Jack E, Kemmerly and Steven M. Durbin, ''Engineering Circuits Analysis'', MCGrwa Hill Science Engineering, seventh Edition, 2006.
2. M. E. Valkenburg, ''Network analysis'', PHI.
3. A. sudhakar, Shymmohan Palli, ''Circuits and Network'', 3rd edition, McGraw Hill.
4. Ravish R singh, ''Network Analysis and synthesis'' McGraw Hill.
5. David a. Bell, ''Electronic Circuits'', 7th edition Oxford University Press.

SEMICONDUCTOR AND ELECTRONIC DEVICES (EC131303)

Credit: 4

L-T-: 3-2-
Total no. of lecture hours: 40

Module - 1

Energy Bands and Charge Carriers in Semiconductors:

Energy-band (E-k diagram) and the bond model, metal, insulator, semiconductor; Effective mass, Concept of hole, Direct & indirect band-gap semiconductors; Carrier distribution. (4L)

Semiconductor in equilibrium : Charge carriers in semiconductor, equilibrium distribution of electrons and holes, effective density of states function, intrinsic carrier concentration, FD distribution function, intrinsic Fermi-level, Extrinsic semiconductors and energy levels, distribution, Mass action law, Degenerate and nondegenerate semiconductor, mathematical derivation of position of Fermi Energy Level, Effect of temperature and doping on Fermi level. (6L)

Carrier Transport phenomena: Carrier drift, mobility, phonon and impurity scattering, conductivity, carrier diffusion, Graded impurity distribution, Einstein Relation, Hall effect. (4L)

Semiconductor in non-equilibrium: Carrier generation and recombination, excess carrier, Continuity equation, quasi-fermi level, excess carrier life time, surface states. (4L)

Module - 2

pn junction:

Concept of homo and hetero junctions, Basic structure of pn junction, unbiased and biased pn junction, built in potential, electric field, space charge width, junction capacitance, concept of one-sided junction, non-uniformly doped junction. (4L)

pn junction diode:

pn junction current under zero, forward and reverse biased conditions, characteristics, static and dynamic resistance, piecewise linear model, Diode switching, Breakdown mechanism, Zener diode, Varactor, Tunnel, Schottky, PIN, Optical devices and Solar cells. (6L)

Module- 3

Bipolar Junction Transistors*:*

BJT as a current controlled device, Physical mechanism, current gain, minority current distribution; Punch-through and avalanche effect, amplification property of BJT, input & output characteristics for CB. CE & CC mode, transistor as a switch, Eber's Moll model, Charge controlled model,Basic idea about Photo-transistors & Power transistors, PNPN transistors - simple working principle, I-V characteristics, triggering, mention of Triacs, Diacs & Thyristors, UJT. (8L)

Module – 4

Field Effect Transistors

Basic MOS capacitor, energy band diagram, flat band and threshold voltages, Basic structure, working, characteristics of JFET and MOSFET, CMOS. (4L)

Text Books :

Neamen- Semiconductor Physics and Devices TMH
Ben Streetman and Banerjee- Solid State Electronic Devices, Prentice Hall.
Bhattacharya & Sharma- Solid State Electronic Devices- Oxford
Maini & Agrawal- Electronics Devices and Circuits- Wiley
David A. Bell: Electronic Devices and Circuits- Oxford University Press.

Reference Books :

Milman, Halkias & Jit- Electronics Devices and Circuits- TMH
Bell-Electronics Devices and Circuits-Oxford
Bhattacharya & Sharma- Solid State Electronic Devices- Oxford
Singh & Singh- Electronics Devices and Integrated Circuits –PHI
Bogart, Bisley & Rice- Electronics Devices and Circuits- Pearson

Kasap-Principles of Electronic Materials and Devices- TMH
Boylestad & Nashelsky- Electronics Devices and Circuit Theory- Pearson
Salivahanan, Kumar & Vallavaraj- Electronics Devices and Circuits- TMH

SUBJECT: Object Oriented Computer Programming in C++
CODE: CS131303
L-T-C: 3-2-4
CLASS HOURS: 4 hrs./ Week
EXPECTED NO OF WEEKS: 13 (APPROX)
TOTAL NO OF CLASSES: 39 (APPROX)
L-Lectures, T-Tutorials, C-Credits

OBJECTIVES:

1. Acquire an understanding of basic object-oriented concepts and the issues involved in effective class design.
2. Write C++ programs that use: object-oriented concepts such as information hiding, constructors, destructors, inheritance

PREREQUISITE:

1. Introduction to Computer Programming (CS131105)

FOR TEACHERS:	**Hours**	
COURSE CONTENTS:		
1. MODULE I : INTRODUCTION		
(a) What is Object Oriented Programming? Why we need Object Oriented Programming? Programming characteristics of OOP. Difference between OOP and procedure oriented programming;	**2**	
(b) Basic Concepts of OOPs, feature of OOPs, Application of OOPs, and .Review of Data Types (user define and derived data types), Keywords, Tokens, Identifies, Constants, Reference variables, different Operators and	**5**	

Control statements		
2. MODULE II: CLASSES AND OBJECTS		
(a) Introduction to Objects and classes, Difference between Class and Structure, Class definition and syntax, Defining member functions, Access control to other functions(Private, Public, Protected)	**2**	
(b) Objects-Dynamic Creation and initialization, Passing and Returning objects, Object assignment and array of objects,;	**2**	
(c) Constructors-Types, Destructors, Nesting member function, Private member function , Inline functions,	**2**	
(d) Static class members, Function prototyping, Call by reference, Return by reference, Default Argument, Friend functions, this pointer.	**2**	
3. MODULE III : INHERITANCE		
(a) Types of Inheritance; Base and Derived classes – Syntax of derived classes, access to the base class; Types of Inheritance,	**2**	
(b) Multiple inheritance – Virtual Base classes, Constructors and Destructors in Inheritance,	**3**	
(c) Container classes, Abstract Classes.	**1**	
4. MODULE IV : POLYMORPHISM		
a) Compile time(Early/Static binding)-Overloading functions and operators, Overloading new and delete operators;	**2**	
b) Run time polymorphism(Late/Dynamic Binding) – Virtual functions, Pure Virtual functions, Virtual Destructors,	**3**	
c) Review of Virtual base classes,	**1**	
5. MODULE V : TEMPLATES		
Templates – Uses, Generic classes, Class templates, Function templates, Advance templates. Examples	**2**	
6. MODULE VI : EXCEPTION HANDLING AND MANIPULATORS		
(a) Exception handling – Advantages, Try catch and throw clauses, Examples,	**2**	
(b) Manipulators, different examples of manipulators;	**2**	
7. MODULE VII: POINTERS AND FILES		
a) Pointer types- uses; Dynamic memory allocation techniques - garbage collection, Linked list, generic pointers;	**3**	
b) Files- Open, Close, Read and Write; File attributes, File management	**3**	

TEXT/ REFERENCE BOOKS:

1. E. BALAGURUSWAMY**: OBJECT ORIENTED PROGRAMMING WITH C++** , Tata McGraw Hill.
2. HERBERT SCHILDT: "**C++, THE COMPLETE REFERENCE"**
3. BARKATAKI : "**OBJECT ORIENTED PROGRAMMING"**, PHI

REFERENCES:

1. DEITAL AND DEITAL **: "C++ HOW TO PROGRAM"**
2. O'REILY: **"Head First C#:"**
3. R. LAFORE : "**OBJECT ORIENTED PROGRAMMING IN TURBO C++",** GALGOTIA, NEW DELHI
4. P.B. MAHAPATRA : "**THINKING IN C- INCLUDING OBJECT ORIENTED PROGRAMMING WITH C++"** , WHEELER PUBLISHING

ELECTRONIC MEASUREMENT AND INSTRUMENTATION (EC131305)

Credit: 3

L-T-: 3-0-

Total no. of lecture hours: 44

Module:1

Review: [8L]

Review of electromagnetic indicating instruments and potentiometers: Moving coil instrument,PMMC, torque equation,Merits ans demerits. Dynamometer type instruments. Damping and coupling torque, galvanometer, D'arsonval galvanometer, working principle of ohmmeter, Q_meter: working principle, applications, limitations of such instruments.

Module:2

Bridges: [9L]

The principle of bridges, the basic wheastone bridge , Kelvin double bridge, Anderson's bridge, Hay's bridge, schering bridge, Owen's bridge, Maxwell's bridge.

Module:3

Operational Amplifiers: [5L]

Basic circuits. Enhancing the performance of traditional measuring instruments with the help of Op-Amps. Increasing input resistance, range and accuracy. High frequency instruments build around precision rectifiers. Measurements of important electrical parameters.

Module:4
Digital Instrument Basic [8L]
Introduction to digital representation of Analog Quantity,Digital displays,digital counting. Effect of resolution and non-linear behaviour on accuracy of measurement. Working of principle of R-2R ladder DA converter, Binary weighted resistor DA converter. AD conversion - successive approximation type, dual slope integrating type and flash converter.

Module:5
Analog Multiplexing [2L]

Analog multiplexers, characteristics and applications, Analog switches, sample and hold circuit. Multiplexing of multiple signals.

Module:6
The Oscilloscope: [7L]
The principle and the important components of an analogue scope. Time base and deflection fundamentals. Delayed time base. Multiple channels and the various mode of display. Concepts of digital scopes. The use of the oscilloscope for: measuring voltage and current waveforms, frequency and phase measurements, displaying electrical and magnetic characteristics of materials, Lissajous figure.

Module:7
Digital Voltmeter, Multimeter and Frequency meter [5L]
Digital multimeter, Basic handheld digital multimeter, Comparision between analog and digital multimeter, Brief idea about frequency meter, counter/timer frequency meter.

Text Books:

1. Electronic Instrumentation and Measurement, third Edition by David A Bell.
2. Electrical and electronics measurement by Sawhany.

References:

1. William David Cooper- Electrical Instrumentation and Measurement Techniques. Prentice Hall of India Private Limited.
2. Golding and widdis- electrical Measuring Instrument and Measurement. ELBS
3. E.O.Doeblin- Measurement systems
4. Ralph Morison-Instrumentation fundamentals and applications, John Wiley & sons.
5. D. Patronobis- Sensors and Transducers, Wheeler Publications.

HS131306	SOCIOLOGY	L = 2 T = 0 C = 2
Module-I	Sociology in the Industrial Perspective: Concept of sociology/ Sociology as a science?/ Sociology of work and industry/ Perspectives for sociological analysis of work/ Class conflict in industry/ Social impact of industrialization	12 Hours
Module-II	Work and Social Change: Nature of modern societies/ Emergence of industrial capitalism/ Technology and social change/ The information society after the industrial society/ Postmodernity/ Globalization and convergence/ Significance of the service sector today/ Work restructuring and corporate management	12 Hours
Module-III	Work Experiences in Industry: The concept of alienation/ Work satisfaction/ Technology and work experience/ Social background of workers/ Work orientations/ Stress and anxiety of the worker/ Work and leisure/ Unemployment/ Conflicts in the workplace	12 Hours
	Total	36 Hours

Reference Books

1. Miller and Form, Industrial Sociology (London: Harper & Row, 1968)
2. N. R. Sheth, Social Framework of Indian Factory (Bombay: Oxford University Press, 1968)
3. Gisbert, Fundamentals of Industrial Sociology (New Delhi: Oxford University Press, 1971)
4. P. Gisbert, Fundamentals of Industrial Sociology (New Delhi: Oxford University Press, 1971)
5. Tony J. Watson, Sociology, Work and Industry (New York: Routledge, 2004 reprint)

Network Analysis Laboratory (EC 131312)

Credit:1

L-T-P: 0-0-2

Introduction: Study of Passive Circuit components: Resistor, capacitors, magnetic core materials.

Experiment 1: Verification of Superposition Theorem. Measure the branch currents and verify with theoretically calculated values.

Experiment 2: Verification of Thevenin's Theorem for a simple DC Circuit. To measure the value of $V^{th}$and R^{th} and compare with theoretically calculated values.

Experiment 3: Verification of Maximum Power Transfer Theorem for a simple dc circuit. Draw the Power Vs load resistance curve and hence find the resistance corresponding to maximum power from the curve.

Experiment 4: To construct a RC low pass filter and observe output for a sinusoidal input over a range of frequencies. To measure the amplitude and phase shift at various frequencies and plot Bode plot and hence find the 3dB bandwidth.

Experiment 5: To construct a RC high pass filter and observe output for a sinusoidal input over a range of frequencies. To measure the amplitude and phase shift at various frequencies and plot Bode plot and hence find the 3dB bandwidth

Experiment 6 : To plot the frequency response of series RLC circuit and find the resonant frequency and 3dB points on the graph and hence calculate the bandwidth and Q factor.

Experiment 7: To plot the frequency response of parallel RLC circuit and find the resonant frequency and 3dB points on the graph and hence calculate the bandwidth and Q factor.

SUBJECT: Object Oriented Computer Programming in C++ Lab
CODE: CS131313
L-T-P-C: 0-0-2-1
CLASS HOURS: 2 hrs./ Week
EXPECTED NO OF WEEKS: 12 (APPROX)
TOTAL NO OF CLASSES: 9 (APPROX)
L-Lectures, T-Tutorials, P-Practicals, C-Credits

OBJECTIVES:

1. To make the student to learn C++ programming language.

2. To teach the student the implementation of object oriented programming features.
3. To teach the student to write programs in C++ to solve the problems

PREREQUISITE:

1. Introduction to Computer Programming (CS131105)
2. Object Oriented computer Programming in C++ (CS131303)

LIST OF PROGRAMS:

Topics should include but not limited to:

8. MODULE I : INTRODUCTION	
[1] Write a C++ program to display "HELLO WORLD". [2] Write a C++ program that will ask the temperature in Fahrenheit and display in Celsius [3] Write a C++ program to print the following output using *for* loop. 1 2 2 3 3 3 4 4 4 4 [4] Write a C++ program to reverse a number using *do-while* loop [5] Write a C++ program to find out the factorial of a number using *while* loop [6] Write a C++ program to read an integer array and display it. [7] Write a C++ program to read a character array and display it. [8] Write a C++ program to find out the maximum of three number using *if-else* statement	**[8 programs form this module]**
9. MODULE II: CLASSES AND OBJECTS	
(e) Write a C++ program to implement the concept of static data member in class. **(f)** Write a C++ program to implement the concept of static function in class. **(g)** Write a C++ program using function with default argument. **(h)** Write a C++ program to illustrate the use of objects as function arguments (which performs the addition of time in the hour and minutes format)	**[8 programs form this module]**

(i) Write a C++ program to illustrate the use of friend function. **(j)** Write a C++ program to illustrate how an object can be created (within a function) and returned to another function **(k)** Write a C++ program to illustrate the use of constructors and destructors. **(l)** Write a C++ program to illustrate the use of copy constructor.	
10. MODULE III : INHERITANCE	
[1] Write a C++ program to implement single inheritance (private/public) [2] Write a C++ program to implement multilevel inheritance [3] Write a C++ program to implement multiple inheritances. [4] Write a C++ program to illustrate the use of virtual base class.	**[4 programs form this module]**
11. MODULE IV : POLYMORPHISM	
[1] Write a C++ program to overload unary minus operator [2] Write a C++ program to overload binary '+' operator [3] Write a C++ program to illustrate how an operator can be overloaded using friend function. [4] Write a C++ program to illustrate the use of run time polymorphism.	**[4 programs form this module]**
12. MODULE V : TEMPLATES	
[1] Write a C++ program to swap two variable using *function template*	**[1 programs form this module]**
13. MODULE VI : EXCEPTION HANDLING AND MANIPULATORS	
[1] Write a C++ program to implement *try(), catch(), throw()* function.	**[1 programs form this module]**
14. MODULE VII: POINTERS AND FILES	
[2] Write a C++ program to implement this pointer [3] Write a C++ program to illustrate the use of pointers to derived objects [4] Write a C++ program to illustrate the use of virtual function [5] Write a C++ program to open and close a file using *open(), close()* function [6] Write a C++ program to illustrate the use of *read(), write()* function	**[6 programs form this module]**

TEXT/ REFERENCE BOOKS:

4. E. BALAGURUSWAMY**: OBJECT ORIENTED PROGRAMMING WITH C++** , Tata McGraw Hill.
5. HERBERT SCHILDT: "**C++, THE COMPLETE REFERENCE"**
6. BARKATAKI : "**OBJECT ORIENTED PROGRAMMING"**, PHI

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5. DEITAL AND DEITAL **: "C++ HOW TO PROGRAM"**
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7. P.B. MAHAPATRA : "**THINKING IN C- INCLUDING OBJECT ORIENTED PROGRAMMING WITH C++"** , WHEELER PUBLISHING

SEMICONDUCTOR PHYSICS AND ELECTRONIC DEVICES LAB (EC131314)
Credit:1

L-T-P: 0-0-2

Experiment No. 1 : To study the Forward characteristic of the p-n junction diodes.

Experiment No. 2 : To study the Forward characteristic of the ZenerDiodes.

Experiment No. 3 : To plot the static collector characteristics of a BJT in the common emitter configuration.

Experiment No. 4: To plot the static collector characteristics of a BJT in the common base configuration.

Experiment No. 5 : To plot the static collector characteristics of a BJT in the common collector configuration.

Experiment No. 6 : i) To plot the static drain characteristics of a n-channel Junction Field Effect Transistor in the common source configuration.

ii) To plot the transfer Characteristic of the given JFET.

Electronic Measurement and Instrumentation Lab **(EC131315)**

Credit:1
L-T-P: 0-0-2

List of experiments:

1. Measurement of medium resistance using Wheatstone Bridge.
2. Measurement of very low resistance using Kelvin's Double Bridge.
3. Measurement of capacitance using Schering Bridge.
4. Measurement of frequency by using Wein Bridge.
5. Calibration of Wattmeter.
6. Testing using Energy Meter.
7. Study of CRO.
    i. Calibration
    ii. Voltage
    iii. Current
    iv. Frequency
    v. Phase (Using Lissajous Figure)
8. Study of Data Acquisition System.

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