ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati

Course Structure and Syllabus

ELECTRONICS AND COMMUNICATION ENGINEERING (ECE)

Semester IV / ECE / B.TECH

Sl. No.	Sub- Code	Subject	Hours/week			Credit
			L	T	P	C
	Theory					
1	MA131401	Numerical Methods and Computation	3	2	0	4
2	EC131402	Analog Electronics Circuits	3	2	0	4
3	EC131403	Digital Electronics	3	0	0	3
4	EC131404	Signals and Systems	3	0	0	3
5	EC131405	Random Variables and Stochastic process	3	0	0	3
6	HS131406	Economics and Accountancy	4	0	0	4
	Practical					
7	MA131411	Numerical Methods and Computation Lab	0	0	2	1
8	EC131412	Analog Electronics Circuits Lab	0	0	2	1
9	EC131413	Digital Electronics Lab	0	0	2	1
10	EC131414	Signals and Systems 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

ClassHours/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 : ANALOG ELECTRONICS CIRCUITS
Course Code: EC131402
L-T:: C 3-2 =4

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

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Application of pn junction diode**	(i) Voltage regulator using Zener diode, regulation. (ii) Rectifiers: Half and full wave rectifier with and without filters, calculation of ripple factor, dc and rms values, efficiency etc. (iii) Clipper and Clamper circuits.	5
2	**Bipolar Junction Transistors and Amplifier**	(i) Transistor Biasing and Stability, ac and dc load line, Q-point, Compensation techniques. (ii) h-model of transistors, expression for voltage gain, current gain, power gain, input and output impedance, Emitter follower circuits, High frequency model of transistors, Hybrid π model (iii) Multiple stage amplifiers biasing schemes, coupling schemes, Frequency response of BJT.	12
3	**Field Effect Transistors**	FET parameters, equivalent circuits, calculation of gain for CS and CD configurations, Enhancement MOSFET, Depletion-enhancement MOSFET.	5
4	**Feedback amplifiers**	Basic principle and topologies, advantages, negative & positive feedback, Barkhausen Criterion, Frequency response and stability of feedback amplifiers, Frequency compensation. **Basic idea of opamp, application**: adder, substractor, comparator, differentiator, integrator.	12
5	**Oscillators**	Colpitts, Hartley's, Phase shift, Wien bridge and crystal oscillators, Determination of frequency of oscillation and criteria for oscillations to occur.	4
6	**Compound Configurations**	(i) Study of the differential pair, current sources, voltage sources, the Darlington and Cascade connections. Current mirror.	10

		(ii) **Power amplifiers** – Class A, B, AB, C, Conversion efficiency, Tuned amplifier. (iii) **Multivibrator** – Monostable, Bistable, Astable multivibrators using BJT.	
		TOTAL	48

TEXT BOOKS:

1. Sedra & Smith-Microelectronic Circuits- Oxford UP
2. Donald A. Neamen- Electronic Circuits,
3. Boylested & Nashelsky- Electronic Devices and Circuit Theory- Pearson/PHI

REFERENCE BOOKS:

1. Millman & Halkias – Integrated El;ectronics, McGraw Hill.
2. Schilling & Belove—Electronic Circuit:Discrete & Integrated , 3/e , McGraw Hill
3. Malvino—Electronic Principles , 6/e , McGraw Hill
4. Horowitz & Hill- The Art of Electronics; Cambridge University Press.

Course Title : DIGITAL ELECTRONICS
Course Code: EC131403
L-T:: C 3-0 =3

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

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Fundamentals of digital techniques**	Review of Number systems: Positional number systems - decimal, binary, octal and hexadecimal. Number base conversion. Representation of negative binary numbers. Codes - BCD, Gray, Excess-3. Digital signal, logic gates: AND. OR, NOT. NAND. NOR- EX-OR, EX-NOR.	8
2	**Boolean algebra and its simplification**	Axioms and basic theorems of Boolean algebra. Truth table, logic functions and their realization, standard representation (canonical forms) of logic functions - SOP and POS forms. Min terms and Max terms. Simplification of logic functions: Karnaugh map of 2, 3, 4 and 5 variables. Simplification by algebra and by map method. Don't care condition. Quine Mcluskey methods of simplification. Synthesis using AND, OR and INVERT and then to convert to NAND or NOR implementation.	8
3	**Combinational logic circuit design**	Combinational logic circuits and building blocks. Binary adders and subtractors. Carry look ahead adder. Encoders, decoders, multiplexers, demultiplexers, comparators, parity generators etc. Realization of logic functions through decoders and multiplexers.	6
4	**Sequential circuits**	**Flip Flops**: truth table and state table S-R- J-K. T. D, race around condition, master-slave, conversion of flip flops Sequential shift registers, sequence generators. **Counters**: Asynchronous and Synchronous Ring counters and Johnson Counter, up/down counter, modulo – N counter. Design of Synchronous sequential circuits.	8
5	**Digital logic families and programmable logic devices**	Switching mode operation of p-n junction, bipolar and MOS-devices. Bipolar logic families: RTL, DTL, DCTL. HTL, TTL, ECL, MOS, and CMOS logic families.	6

		Tristate logic. Gate properties fan-in, fanout, propagation delay and power-delay product. RAM and ROM - their uses, SSI, MSI LSI and V LSI devices, Introduction to PLA. PAL to FPGA and CPLDs. Some commonly used digital ICs.	
		TOTAL	36

REFERENCE BOOKS:

1. Modem Digital Electronics (Edition III): R. P. Jain; TMH
2. Digital Integrated Electronics: Taub & Schilling: MGH
3. Digital Principles and Applications: Malvino & Leach: McGraw Hill.
4. Digital Design: Morris Mano: PHI,
5. Digital Electronics-Kharate, Oxford University press
6. Digital Electronics- Salivahanan
7. Fundamentals of digital circuits – Anand Kumar.
8. Digital Electronics: Principle and applications- S. Mandal: TMH

Course Title : SIGNALS AND SYSTEMS
Course Code: EC131404
L-T:: C 3-0 =3

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

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Introduction to signals and systems**	Continuous and discrete time signals, Classification of signals and systems, sum elementary signals, singularity functions: Unit step, Unit Impulse and Unit Ramp functions. Periodic and aperiodic signals, Even and odd signals, Causal and non-causal signals. Transformation of independent variable (time): Time shifting, time scaling, time reversal. Basic system properties: Linear and non-linear systems, time varying and time invariant systems, Causal and non-causal systems, Stable and unstable systems.	8
2	**Linear Time Invariant (LTI) Systems**	Continuous time LTI systems: convolution integral, properties of convolution integral. Discrete-time LTI systems: Convolution sum, Properties of Convolution sum. System described by differential and difference equations.	3
3	**Fourier Series of periodic signals**	Trigonometric and Exponential Fourier series, Evaluation of Fourier series coefficients. Relationship between trigonometric and exponential Fourier series.	3
4	**Fourier Transform of Continuous time signals (FT)**	Properties (or theorems) of Fourier Series, Fourier Transform of Discrete time signals (DTFT) and their properties, Frequency Response and System function of LTI systems.	7
5	**Correlations and Spectral Density**	Auto- correlation of a signal, cross-correlation between two signals, Energy spectral density(ESD), Power Spectral Density (PSD), Relation between correlation functions and spectral density.	3
6	**Laplace Transform**	Recapituation, Analysis and characteristics of LTI systems using Laplace Transform. Relationship between Laplace Transform and Fourier Transform.	2

7	**Sampling Theorem**	Representation of continuous time signal by its samples. Sampling theorems. Reconstruction of a signal from its samples: Aliazing and Nyquist rate of sampling.	4
8	**Z-Transform**	Definition: Relation between Z-Transform and Fourier Transform. Region of Convergence (ROC), Properties of ROC, Properties of Z-Transform : Poles and Zeros, Inverse Z-Transform using power series expansion , Partial Fraction expansion and Contour Integration.	6
		TOTAL	36

TEXT BOOKS:

1. Tarun Kumar Rawat, "Signals and Systems", (Oxford University Press).
2. A. Nagoor Kani, "Signals and Systems", (TMH).
3. P.Ramesh Babu and Anandanatarajan: "Signals and Systems", 5th Edition (Scitech)

REFERENCES:

1. J.G Proakis and D. G. Manolakis, "Digital Signal Processing", (Pearson)
2. B.P. Lathi, "Principles of Linear Systems and Signals" , 2e, (Oxford University Press)
3. M. H. Hayes, " Digital Signal Processing"(Schaum's Outline, TMH)
4. L.F. Chaparro, "Signals and Systems using MATLAB" (Elsevier)
5. Hsu, "Signals and Systems" (Schaum's Outline, TMH).

Course Title : RANDOM VARIABLES AND STOCHASTIC PROCESS
Course Code: EC131405
L-T:: C 3-0 =3

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

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Deterministic and Random signals**	Introduction to probability theory. Some definition using set theory and Venn diagram. Outcome, random experiment, sample space, sample points, null set, union of events, intersection of events, Mutually exclusive events, compliment. Axioms of probability, Conditional probability, Statistically independent events, Baye's theorem.	6
2	**Random variables**	Definition and examples, Discrete and Continuous random variables, Probability functions and their properties, Cumulative distribution function (CDF) and Probability density function (PDF).	5
3	**Joint Statistics of Multiple Random Variables**	Joint distribution function and joint density functions and their properties, Marginal distribution, Conditional distribution, Independent random variable, Functions of random variables, Transformation of distribution and density function.	5
4	**Statistical Average of Random Variables**	Mean or expectation, moment, variance and standard deviation, Joint moments and Correlation between two random variables, Statistical averages of discrete random variables, Mean and variance of some of two random variables, some important probability models: uniform distribution, Gaussian distribution, Importance of Gaussian distribution. Central limit theorem, Rayleigh distribution, Gaussian distribution and error Fa and Q function.	8
5	**Random Process or Stochastic Process**	Definition and explanation, Statistics of Stochastic process, First and second	9

		order distribution and density function of random process, Mean, Autocorrelation and auto co-variance of random processes. Cross co relation and cross co variance of two random processes. Stationary random process, Conditions of wide sense and strict sense stationarity. Auto correlation function and power spectral density of random processes and their properties. Ergodic process, Definition of random signals.	
6	**Transmission of random process**	Transmission of random process through linear systems**.**	3
		TOTAL	36

REFERENCE BOOKS:

1. P.Z. Peebles,'Probability,Random variables and Random signal principles'(TMH)
2. Maurray R. Spiegel,'Probability and statistics'(Schaums' outlin(McGraw Hill))
3. Hwei P.Hsu,'Analog and Digital communication'(Schaums' outlin(McGraw Hill))
4. P.Z. Peebles,'Problems and Solutions in Probability, Random variables and Random signal processing'(TMH)

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

ClassHours/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.

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 : ANALOG ELECTRONICS CIRCUITS LAB
Course Code: EC131412
L-T-P ::C 0-0-2 = 1

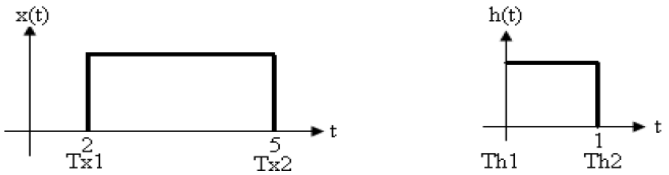
EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Study of Diode as clipper & clamper.	1
2	Study of Zener diode as a voltage regulator.	1
3	Study of ripple and regulation characteristics of full wave rectifier without and with capacitor filter.	3
4	To study the biasing techniques of single stage BJT Amplifier (Fixed Bias).	3
5	To study the biasing techniques of single stage BJT Amplifier (Voltage Divider Bias).	3
6	To study the biasing techniques of single stage BJT Amplifier (With dual supply).	3
7	To study the biasing techniques of two stage Direct coupled BJT amplifier.	3
8	To study and design a CE amplifier with voltage divider bias. Plot the gain vs frequency curve for the amplifier.	3
9	To study low and high frequency response of a two stage RC coupled amplifier and the effect of cascading on gain and frequency response.	3
10	To study the operational Amplifier circuits as inverting amplifier.	1
11	To study the operational Amplifier circuits as summing amplifier.	1
12	To study the operational Amplifier circuits integrating and differentiating amplifier.	3
13	To study and design a common source JFET circuit.	3
	TOTAL	31

Course Title : DIGITAL ELECTRONICS LAB
Course Code: EC131413
L-T-P ::C 0-0-2 = 1

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	To study the TTL and CMOS families of Digital Integrated Circuits.	3
2	To implement a simple Boolean expression on TTL/CMOS Small Scale Integrated Circuit (SSI) Devices.	3
3	To implement Half adder & Full adder by using basic and universal gates.	3
4	To study Parallel Binary adder.	3
5	To study a BCD to 7 Segment LED display decoder as an example of a multiple input and multiple output combinational digital circuit.	3
6	Study of Binary to Gray code converter.	3
7	To study the IC 74151 & implement a function using IC 74151.	3
8	To study the J-K FF and conversion of D and T flip flop to JKFF.	3
9	To study a simple two-bit ripple counter.	3
10	Design a synchronous up/ down counter.	3
	TOTAL	30

Course Title : SIGNALS AND SYSTEMS LAB
Course Code: EC131414
L-T-P ::C 0-0-2 = 1

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Define and Sketch the following discrete time signals: a) unit step function u(n) b) unit impulse signal δ(n) c) unit ramp signal r(n) d) rectangular pulse signal of width 10 Use Subplot to plot the graphs in the same window.	1
2	Sketch the following shifted unit step signals using subplot to plot on the same figure window. a) u(n+2) b) u(n-3) c) u(n+2) – u(n-3)	1
3	Generate the signal x(n)= u(n) - u(n-10). Decompose x(n) into odd and even components. Plot x(n) and the odd and even components using subplot.	1
4	Define and Sketch the following continuous time signals: a) unit step function u(t) b) unit impulse function δ(t) c) unit ramp r(t) d) rectangular pulse signal of width 2 using sign function in MATLAB. Use Subplot to plot the graphs in the same window.	1
5	WAP to generate the following a) A 50 Hz sinusoidal signal sin(2πft) samples at 600 Hz. b) A sinc function c) A square wave.	1
6	Plot signals cos (2πt), cos(2πt+ π/2) and cos(2πt-π/2) on the same figure window on the same axis. Make use of proper markers, colour and legends to distinguish between the graphs.	1
7	Consider a continuous time signal x(t)=2sin πt for an interval 0≤t≤2π. Sample the continuous time signal with a sampling period of T=0.2s. Sketch the continuous time signal and discrete time signal using subplot.	1

8	Plot the exponentially varying sinusoid $x(t)=4e^{-2t}\sin(6t-60^{\circ})$, $0<t<4$	1
9	Define the following piecewise continuous functions in MATLAB and plot them: a) $x(t)= 1, \quad -1 \le t < 0$ $-1, \quad 0 \le t < 2$ b) $x(t) = e^{t}, \quad -5 \le t \le 0$ $e^{-t}, \quad 0 < t \le 5$ c) $x(t)= \sin(t), \quad t < 0$ $t^2, \quad 0 \le t \le 1$ $1/t, \quad t>1$	1
10	Plot the signal $x(t)=\cos(\pi t)$, $-5 \le t \le 5$. On the same plot, same axis, also show x(2t) and x(t/2)	1
11	Plot signal $x(t)= e^{t/2}$, $-5 \le t \le 1$. using subplot, plot x(-t).	1
12	Plot the continuous time signals x(t) and h(t) given below using MATLAB commands. Find the convolution of the two signals and plot the convolution result. Use subplot to show all the three signals. 	1
13	Determine the convolution of two sequences x(n)={1,4,3,2} and h(n)={1,3,2,1} and then plot it.	1
14	Given unit impulse response h(n)=sin(0.5n) for $n \ge 0$ and input x(n)=sin(0.2n) for $n \ge 0$. Compute the output response y(n). Plot x(n), h(n) and y(n) using subplot.	1
15	Write a function to plot the unit step function and using that function plot a) u(n), $-7<n<7$ b) u(n-3), $-10<n<10$ c) u(n+2), $-6<n<6$	1
16	WAP to find the Laplace transform of the following signals a) t b) te^{-at} c) $t^{n-1}/(n-1)!$ d) $3\sin(2t) + 3\cos(2t)$	1

17	WAP to find the inverse Laplace transform of the following s-domain signals a) $2/s(s+1)(s+2)$ b) $1/(s^2+s+1)(s+2)$	1
18	WAP to find the convolution of signals $x(t)=t^2-3t$ and $h(t)=t$ using Laplace transform.	1
19	WAP to find the Z transform of the following signals a) n b) a^n c) e^{-anT} d) $1+n(0.4)^{n-1}$	1
20	WAP to find the inverse Z transform of the following signals a) $1/(1-1.5z^{-1} + 0.5\ z^{-2})$ b) $1/(1+z^{-1})(1-z^{-1})^2$	1
21	WAP to perform the convolution of the following signals $x(n)=(0.4)^n\ u(n)$ and $h(n)=(0.5)^n u(n)$ using z transform.	1
	TOTAL	21

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