ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati

Course Structure and Syllabus

ELECTRICAL AND ELECTRONICS ENGINEERING (EEE)

Semester IV / EEE / B.TECH

Sl. No.	Subject Code	Subject	Hours/week			Credit C
			L	T	P	
Theory						
1	MA131401	Numerical Methods and Computation	3	2	0	4
2	EC131402	Analog Electronics Circuits	3	2	0	4
3	EEE131403	Electrical Machines	3	0	0	3
4	EC131404	Signals and Systems	3	0	0	3
5	EEE131405	Microprocessors and Microcontrollers-I	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	EEE131413	Electrical Machines Lab	0	0	2	1
10	EEE131415	Microprocessors and Microcontrollers-I Lab	0	0	2	1
TOTAL			19	4	8	**25**
Total working Hours : 31						
TOTAL CREDIT : 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 : ELECTRICAL MACHINES
Course Code: EEE131403
L-T:: C 3-0 =3

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

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Electromechanical Energy Conversion**	Principle of energy conversion, Field magnets (stationary/rotating), Induced e.m.f. and torque in rotating machines.	2
2	**D.C.Machines**	Overview of constructional features and winding types. Classification of D.C. Machines on the basis of excitation (separate, shunt, series, compound) **D.C.Generator:** E.M.F. equation, Armature reaction, Inter-poles and compensation windings, Commutation, Characteristic curves of D.C. Generators **D.C.Motor:** Principle of operation, Speed and Torque characteristic curves of shunt, series and compound motors. Starting of D.C. motors – Starters and grading of starting resistance, Speed control, Choice of motors for different duties, Losses and efficiency	7
3	**Transformers**	Single Phase Transformer**:** Overview of construction and types. EMF equation and output equation, Magnetic circuit, leakage flux and leakage reactance. Phasor diagram, per unit values of resistance and reactance. Open circuit and short circuit tests, back to back test, Regulation, losses and efficiency, maximum efficiency, all-day efficiency. Overview of Auto-transformer, 3-phase transformer, Phase transformation and connections.	7
4	**Induction Motors**	**Three Phase Induction Motors:** Constructional features – slip ring and squirrel cage motors. Rotating magnetic field and operation of poly-phase induction motors, Equivalent circuit and phasor diagram. Torque and Power, Speed-torque curves – effects of rotor resistance. Performance calculation	8

		from circle diagram. Method of speed control and starting of induction motor. Losses and efficiency & Applications. **Single Phase Induction Motor: Construction**, Rotating and cross field theories, Equivalent circuit, Speed-torque characteristic, Starting methods, Slip-torque characteristics.	
5	**Synchronous Machines**	**Alternator:** Construction and principles of operation of synchronous generators. Armature windings, winding factors, emf equation. Armature reaction, leakage reactance, synchronous reactance, and impendence of non-salient pole machines. Voltage regulation and calculation of regulation by synchronous impedance method, MMF method & Zero Power Factor method. Synchronization, power angle diagram and synchronizing power. Parallel operation. **Synchronous motor:** Principle of operation. Phasor diagram, effect of varying excitation, effect of load variation, V- curve, O-curve, power angle diagram and stability, Hunting, Two-reaction theory of salient- pole motor, Starting. Use as synchronous phase modifiers.	6
6	**Special Machines**	**Stepper motor**: Construction and principle of operation, Types, Characteristics, Selection and Application. **Servomotors**: Construction and principle of operation of AC and DC servomotors. Types, Damping in AC servomotors, Application.	6
		TOTAL	36

TEXTBOOKS / REFERENCES:

1. Electrical Machines - D P Kothari, I J Nagrath – Mc Graw Hill.
2. Electrical Machinery - P S Bimbhra – Khanna Publication.
3. Electric Machinery - A Fitzgerald, Charles Kingsley Jr., Stephen D Umans - Mc Graw Hill.
4. A Textbook of Electrical Technology Volume – II – B.L.Thereja & A.K.Thereja – S.Chand.

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 : MICROPROCESSORS AND MICROCONTROLLERS –I
Course Code: EEE131405
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 Computer Architecture & Organization**	Architecture of 8-bit microprocessors, bus configurations, CPU module, introduction to assembly language and machine language programming, instruction set of a typical 8-bit microprocessor, subroutines and stacks, programming exercises.	3
2	**Memory Technology**	Timing diagrams, RAM, DRAM and ROM families, memory interfacing, programmable peripheral, interface chips, interfacing of input-output ports, programmable interval timer. Memory map, peripheral I/O and memory-mapped I/O.	14
3	**Data Transfer Schemes**	Serial and parallel data transfer schemes, interrupts and interrupt service procedure. 8085 interrupts and vector locations, SIM and RIM instructions, RST instructions.	8
4	**Introduction To Microcontrollers**	Microcontroller definition, architecture overview, advantages, industrial relevance, selection criteria	2
5	**Instruction Set & Programming**	Instruction set and programming of 8 bit micro controllers (8051).	7
6	**Development Tools**	Tool chains. Cross Compilers, Instruction Set Simulators, Debuggers (In Circuit Emulators, ROM Monitors).	2
		TOTAL	36

TEXTBOOKS / REFERENCES:

1. Microprocessor Architecture, Programming and Applications – Ramesh S.Gaonkar
2. The 8051 Microcontroller & Embedded Systems Using Assembly & C - Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay (Pearson).

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 : ELECTRICAL MACHINES LAB
Course Code: EEE131413
L-T-P ::C 0-0-2 = 1

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Introduction to GNU plot.	3
2	Design of D.C. Machine Winding (Lap & Wave Simplex).	3
3	Determination of the Open Circuit Characteristic Of a D.C. Shunt Generator.	3
4	Speed Control of D.C. Shunt Motor (Armature & Field Control Methods).	3
5	Voltage Regulation of a single phase Transformer ubroutines & Branching.	3
6	Determination of Core & Copper Losses in a single phase Transformer.	3
7	**S**tepper Motor Driving Methods using 8051 microcontrollers.	3
8	Design of Servo Motor Driver.	3
9	Introduction to Permanent Magnet D.C. Motors control using PWM (with emphasis on electric vehicles).	3
10	Induction Motor Starting Methods.	3
	TOTAL	30

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Course Title : MICROPROCESSORS AND MICROCONTROLLERS - I LAB
Course Code: EEE131415
L-T-P ::C 0-0-2 = 1

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Introduction to 8085 Microprocessor Kit	3
2	Arithmetic Operations : Addition,Subtraction of 8 and 16 bit numbers	3
3	Conversion (BCD to HEX, HEX to ASCII, vice versa)	3
4	Subroutines & Branching	3
5	Interfacing (7 Segment Display, ADC)	3
6	Introduction to 8051 Microcontroller & toolchain	3
7	Interfacing of 16 x 2 LCD and 4x4 matrix keypad	3
8	Interfacing of ADC0804 & External SRAM	3
	TOTAL	24

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