ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati
Course Structure and Syllabus

ELECTRICAL ENGINEERING (EE)

Semester IV / EE / 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	EE131402	Electrical Machines II	3	0	0	3
3	EE131403	Measurements And Instrumentation	3	0	0	3
4	EE131404	Signals and Systems Analysis	3	0	0	3
5	HS131406	Economics and Accountancy	4	0	0	4
6	EC131407	Introduction to Digital Electronics	4	0	0	4
	Practical					
7	MA131411	Numerical Methods and Computation Lab	0	0	2	1
8	EE131412	Electrical Machines II Lab	0	0	2	1
9	EE131413	Measurements And Instrumentation Lab	0	0	2	1
10	EC131417	Introduction to Digital Electronics Lab	0	0	2	1
TOTAL			20	2	8	**25**
Total Contact Hours : 30						
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 MACHINES - II
Course Code: EE131402
L-T:: C 3-0 =3

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

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Synchronous Machines**	(i) Construction of synchronous generator and motors. Principles of operation of synchronous generators. Ventilation and cooling, Armature windings, winding factors, emf equation. (ii) Armature reaction, leakage reactance, synchronous reactance, and impendence of non-salient pole machines. Short circuit and open circuit tests, short circuit ratio, M M F in salient and non-salient pole machines. (iii) Calculation of regulation by synchronous impedance method, MMF method, Potier triangle method and ASA method. (iv) Phasor diagram, effect of varying excitation, effect of load variation, V-curve Introduction of two-reactance theory, slip test, damper winding and oscillation of synchronous machines, Synchronization, power angle diagram and synchronizing power. (v) Determination of sub-transient and transient reactances and time constants of synchronous machine by different methods. Determination of sequence impedances of synchronous machine. Parallel operation.	16
2	**Synchronous Motor**	(i) Working principle, Phasor diagram, effect of varying excitation, effect of load variation, V and Inverted V-curve. (ii) Power angle diagram and stability, Hunting, Two-reaction theory of salient-pole motor, Starting. Use as synchronous phase modifiers.	3
3	**A.C. commutator motors**	(i) Construction and functions of the commutator. 3-phase commutator motor: Effects of voltage injection into the rotor circuit of a polyphase induction motor. Construction and operation of the Schrage motor. Effects of brush movement. (ii) 1-phase commutator motors: Repulsion motors:	3

		Construction and principle of operation, Starting methods, Speed control, Improvement of commutation and power-factor by compensation.	
4	**Poly-phase Induction Motors**	(i) Constructional features – slip ring and squirrel cage motors. Rotating magnetic field and operation of poly-phase induction motors, Equivalent circuit and phasor diagram. (ii) Torque and Power, Speed-torque curves – effects of rotor resistance, Deep-bar and double cage rotors, Performance calculation from circle diagram. (iii) Method of speed control, Losses and efficiency, Applications, Induction generator and induction regulator, Starting of induction motor.	6
5	**Fractional Kilowatt Motors**	(i) Single phase induction motors: Construction, Rotating and cross field theories, Equivalent circuit, Speed-torque characteristic, Starting methods, Slip-torque characteristics. (ii) Reluctance motors: Construction and principle of operation, Synchronous and sub-synchronous operation, Effects of frequency and rotor resistance, Types of reluctance motor, Speed-torque characteristic. (iii) Universal Motor: Construction, Principle of operation, and Application.	6
6	**An introduction to unified theory of electrical machines**	Introduction to unified theory of electrical machines.	2
		TOTAL	36

REFERENCE BOOKS:

1. Electrical Machines - D P Kothari, I J Nagrath – Mc Graw Hill.
2. Electrical Machines - Deepa el.al – SCITECH.
3. Electric Machinery - A Fitzgerald, Charles Kingsley Jr., Stephen D Umans - Mc Graw Hill.
4. Advanced Electrical Technology - H Cotton - CBS Publication.
5. Electrical Machinery - P S Bimbhra – Khanna Publication.
6. Electrical Machines - R K Rajput – Laxmi Publication.
7. Generalized Theory of Electrical Machinery - P S Bimbhra – Khanna Publication.

Course Title : MEASUREMENTS AND INSTRUMENTATION
Course Code: EE131403
L-T:: C 3-0 =3

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

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Characteristic of instruments and measuring systems**	Static characteristic – accuracy, sensitivity, reproducibility, drift, static error and dead zone, Dynamic characteristics, Errors occurring in measurement, Types of errors.	3
2	**Measuring Instruments**	Electro-dynamic, rectifier and induction type ammeters and voltmeters – construction, operation, errors and compensation, Electro-dynamic and induction type watt meters, Single phase induction type energy meter. MC and MI type power factor meters. Electrodynamometer type frequency meter, Synchroscope.	5
3	**Measurement of resistance**	**Wheatstone bridge method** – sensitivity of the Wheatstone Bridge – precautions to be taken while making precision measurements, Limitations, Carey-Foster slid WireBridge. **Measurement of low resistance** – Kelvin's DoubleBridge. **Measurement of high resistance** – direct deflection method. Measurement of volume and surface receptivity. Loss of charge method. Measurement of insulation resistance with power on.	6

4	**Potentiometers**	D. C. potentiometer – basic principle. Laboratory type potentiometer. Methods of standardization. Applications- calibration of ammeters and voltmeters, measurement of resistance and power - calibration of watt meters. Volt ratio box, A. C. potentiometers – difference between A. C. and D. C. potentiometers. Types - polar and co-ordinate type. Application of A. C. potentiometer.	4
5	**A.C. Bridges**	General principle, Balance equation. Sources and Detectors used in A. C. Bridges. Balance condition and Phasor diagrams of Maxwell's bridge, Anderson's bridge, Owen's bridge, De Sauty's bridge, Low voltage Schering Bridge, Heavy-side mutual inductance Bridge.	6
6	**Transducers**	Introduction to sensors, transducers, types of transducers- strain gauges, LVDT, capacitive transducers, piezoelectric transducers, Hall effect transducers	4
7	**Instrument Transformer**	Use of instrument transformers – ratio, burden. Theory and operation of CTs and PTs – errors and compensation – CT testing – mutual inductance method, Silbee's method. PT testing – comparison method. Power and energy measurement using CTs and PTs.	4
8	**C.R.O.**	Basic construction, main parts, principle of operation, Applications.	2
9	**Galvanometers**	Ballastic, D'Arsonval, Vibration galvanometers construction and working principle.	2
		TOTAL	36

TEXTBOOKS / REFERENCES:

1. J.B. Gupta- A Course in Electronics and Electrical Measurements and Instrumentation.

2. A.K. Sawhney – Electrical and Electronic Measurements and Instrumentation.

3. K. Krishna Reddy- Electrical Measurements.

Course Title : SIGNALS AND SYSTEMS ANALYSIS
Course Code: EE131404
L-T:: C 3-0 =3

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

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Introduction**	Definitions. Continuous and Discrete-time signals. Systems and their classification.	6
2	**LTI Systems**	Continuous-time LTI systems: The Convolution integral. Discrete-time LTI systems: the Convolution sum. Properties of LTI systems. Systems described by differential and difference equations.	6
3	**Fourier analysis for continuous-time**	Response of LTI systems to complex exponential. Representation of periodic signals: the Fourier series. Representation of a-periodic signals: the Fourier Transform and its properties. System analysis by Fourier Transforms.	5
4	**Fourier analysis for Discrete-time case**	Response of LTI systems to complex exponential. Discrete-time Fourier series. Discrete-time Fourier Transform and its properties. System analysis.	6
5	**Sampling**	The sampling theorem. Effect of under-sampling. Reconstruction of a signal from its samples using interpolation. Spectrum of sampled signal.	4
6	**Z-transform**	Definitions. The region of convergence. Properties of Z-transform. Inversion of Z-transforms. Application to system analysis.	5
7	**Digital Filters**	Frequency selective filters. FIR and IIR filters	4
		TOTAL	36

REFERENCES:

1. Oppenheim, Schafer: Digital Signal Processing, PHI (India).
2. Signals and Systems: A Nagoor Kani.
3. Signals and Systems: Sanjay Sharma.
4. Digital Signal Processing: Sanjay Sharma.
5. Signals and Systems: Ramesh Babu.

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.

Course Title : INTRODUCTION TO DIGITAL ELECTRONICS
Course Code: EC131407
L-T:: C 4-0 =4

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

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Number System and Codes**	Positional number systems - decimal, binary, octal and hexadecimal. Number base conversion. Representation of negative binary numbers. Codes - BCD, Gray.	6
2	**Boolean algebra and logic gates**	Basic theorems of Boolean algebra, Truth table, logic functions and their realization. Logic gates, standard representation (canonical forms) of logic functions - SOP and POS forms. Min terms and max terms.	7
3	**Simplification of Boolean functions**	Karnaugh map of 2, 3 and 4 variables, minimal SOP & POS, Don't care conditions, realization using only one type of gate (NAND or NOR), Quine-Mcclusky method, determination and selection of prime implicants.	10
4	**Combinational logic circuit design**	Adders & substractors, parallel binary adders, magnitude comparator, decoders & encoders, Multiplexer & demultiplexers, parity generators, Read only memories PLA & PAL.	10
5	**Introduction to sequential circuits**	Flip-flops - truth table, The S-R, J-K, T and D flip-flop, Race condition, Sequential circuits, Registers: Shift – Registers, Counters: Ripple counter, synchronous counters, up/down counters, ring counter.	10
6	**Digital integrated Circuit**	Introduction, special characteristics (Fan-Out, Power dissipation, Propagation delay, figure of merit, noise level) Introduction to TTL, ECL, MOS, and CMOS circuit.	5
		TOTAL	48

REFERENCES:

1. Digital Electronics- G. K. Kharate
2. Modern Digital Electronics- R.P.Jain
3. Digital Electronics- A.Kumar
4. Digital Electronics- B. R. Gupta & V. Singhal
5. Digital Fundamental – TL Floyd

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.	AIM 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 MACHINES - II LAB
Course Code: EE131412
L-T-P:: C 0-0-2 =1

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Block rotor test of 3-phase induction motor.	3
2	V-Curves of a Synchronous Motor.	3
3	Hopkinson test (Back-to-Back test) on two similar D.C. machines.	3
4	Voltage regulation of a three phase alternator using synchronous impedance method.	3
5	Sumpner's test or Back to Back test on two similar transformers.	3
6	Parallel operation of 3-phase alternators.	3
7	Speed-Torque characteristics of three-phase slip-ring induction motor.	3
8	Load test on compound generator.	3
9	Load test on three-phase alternator.	3
	TOTAL	27

Course Title : MEASUREMENTS AND INSTRUMENTATION LAB
Course Code: EE131413
L-T-P:: C 0-0-2 =1

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Measurement of medium resistance using Wheatstone's Bridge.	3
2	Measurement of very low resistance using Kelvin's double Bridge.	3
3	Measurement of unknown capacitance using Schering Bridge.	3
4	To measure the inductance of given coil by Anderson Bridge method.	3
5	Measurement of resultant frequency by Wien Bridge oscillator.	3
6	Testing of energy meter.	3
7	Calibration of wattmeter.	3
	TOTAL	21

Course Title : INTRODUCTION TO DIGITAL ELECTRONICS LAB
Course Code: EC131417
L-T-P:: C 0-0-2 =1

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Implement a Boolean expression on TTL/CMOS Small Scale Integrated Circuit (SSI) devices $F = \bar{A}\bar{B}D + AB\bar{C}\bar{D} + \bar{A}BD + ABC\bar{D}$ a) Implement using all possible logic gates b) Implement using only NAND gates.	3
2	To implement half adder and full adder.	3
3	To study parallel adder and implement function using IC7483.	3
4	To study a BCD to 7 segment LED display decoder.	3
5	To study IC74151(8:1 MUX) and implement the following function using IC74151 F= m(0,2,5,7)	3
6	To study the J/K , D and T flipflops.	3
	TOTAL	18

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