BABU BANARASI DAS UNIVERSITY, LUCKNOW

B. Sc. (Hons.) Electronics Science

COURSE STRUCTURE (Under CBCS)

(Effective 2017-18 and after)

Course Category	Course Code	Course Name	Teaching			Evaluation					Credits
						Theory		Lab/ Seminar/ Viva voce/ Dissertation		Total	
			L	T	P	CIA	ESE	CIA	ESE		
SEMESTER – I											
Core	BSE 1101	Basic Circuit Theory and Network Analysis	4	-	4	40	60	20	30	150	6
Core	BSE 1102	Mathematics Foundation for Electronics	5	1	-	40	60	-	-	100	6
GE		Generic Elective - I									6
AECC	BSAE 1101	Communicative English	2	-	-	40	60	-	-	100	2
GP	BSGP11	General Proficiency	-	-	-	-	-	100	-	100	1
											21
SEMESTER – II											
Core	BSE 1201	Semiconductor Devices	4	-	4	40	60	20	30	150	6
Core	BSE 1202	Applied Physics	5	1	-	40	60	-	-	100	6
GE		Generic Elective - II									6
AECC	BSAE1201	Environmental Studies	2	-	-	40	60	-	-	100	2
GP	BSGP12	General Proficiency	-	-	-	-	-	100	-	100	1
											21
SEMESTER – III											
Core	BSE 1301	Electronics Circuits	5	1	-	40	60	-	-	100	6
Core	BSE 1302	Digital Electronics	4	-	4	40	60	20	30	150	6
Core	BSE 1303	C Programming and Data Structures	4	-	4	40	60	20	30	150	6
GE		Generic Elective - III									6
SEC		Skill Enhancement Course - I									2
GP	BSGP13	General Proficiency	-	-	-	-	-	100	-	100	1
											27
SEMESTER – IV											
Core	BSE 1401	Operational Amplifiers and Applications	4	-	4	40	60	20	30	150	6
Core	BSE 1402	Signals & Systems	5	1	-	40	60	-	-	100	6
Core	BSE 1403	Electronic Instrumentation	4	-	4	40	60	20	30	150	6
GE		Generic Elective - IV									6
SEC		Skill Enhancement Course - II									2
GP	BSGP14	General Proficiency	-	-	-	-	-	100	-	100	1
											27
SEMESTER – V											
Core	BSE 1501	Microprocessor and Microcontrollers	4	-	4	40	60	20	30	150	6
Core	BSE 1502	Electromagnetic	5	1	-	40	60	-	-	100	6
DSE		Discipline Specific Elective - I									6
DSE		Discipline Specific Elective - II								100	6
Lab	BSE S15	Seminar	-	-	-	-	-	100	-	100	2
											26
SEMESTER – VI											
Core	BSE 1601	Communication Electronics	4	-	4	40	60	20	30	150	6
Core	BSE 1602	Photonics	5	1	-	40	60	-	-	100	6
DSE		Discipline Specific Elective - III								100	6
DSE		Discipline Specific Elective - IV								100	6
Lab	BSE V16	Viva Voce	-	-	-	-	-	-	100	100	2
											26

ELECTIVE COURSES – B. Sc. (Hons.) Electronics Science

Code	Title	Teaching			Evaluation					Credits
					Theory		Lab/Seminar/ Viva Voce/ Dissertation		Total	
		L	T	P	CIA	ESE	CIA	ESE		
Generic Elective – I										
BSM 1101	Calculus	5	1	-	40	60	-	-	100	6
BSC1102	Computer System Architecture	5	1		40	60			100	6
Generic Elective – II										
BSM 1202	Differential Equations	5	1	-	40	60	-	-	100	6
BSC1202	Discrete Structure	5	1		40	60			100	6
Generic Elective – III										
BSM 1303	PDE and System of ODE	5	1	-	40	60	-	-	100	6
BSC1302	Operating Systems	4	-	4	40	60	20	30	150	6
Generic Elective – IV										
BSM 1401	Numerical Methods	5	1	-	40	60	-	-	100	6
BSC 1403	Database Management Systems	4	-	4	40	60	20	30	150	6

Discipline Specific Elective – I										
BSE 1551	Control Systems	5	1	-	40	60	-	-	100	6
BSE 1552	Semiconductor Fabrication and Characterization	5	1	-	40	60	-	-	100	6
BSE 1553	Electrical Machines	5	1	-	40	60	-	-	100	6
Discipline Specific Elective – II										
BSE 1554	Digital Signal Processing	5	1	-	40	60	-	-	100	6
BSE 1555	Power Electronics	5	1	-	40	60	-	-	100	6
BSE 1556	Nanoelectronics	5	1	-	40	60	-	-	100	6
Discipline Specific Elective – III										
BSE 1651	Transmission Lines, Antenna and Wave Propagation	5	1	-	40	60	-	-	100	6
BSE 1652	Basic VLSI Design	5	1	-	40	60	-	-	100	6
BSE 1653	Embedded Systems	5	1	-	40	60	-	-	100	6
Discipline Specific Elective – IV										
BSE 1654	Computer Networks	5	1	-	40	60	-	-	100	6
BSE 1655	Modern Communication Systems	5	1	-	40	60	-	-	100	6
BSE 1656	Dissertation	-	-	-	-	-	50	50	100	6

Skill Enhancement Course – I										
BSSE 1301	LaTeX and HTML	1	-	2	40	60	50	-	150	2
BSSE 1311	Web Technologies	1	-	2	40	60	50	-	150	2
Skill Enhancement Course – II										
BSSE 1411	Linux / Unix Programming	1	-	2	40	60	50	-	150	2
BSSE 1421	Programming in MATLAB	1	-	2	40	60	50	-	150	2

Course Name	Basic Circuit Theory and Network Analysis		
Category: Core	Code: BSE 1101	Credits: 6	L-4 T-0 P-4
Exam: Theory 3 Hrs, Practical 2 Hrs	ESE (Theory): 60 Marks CIA (Theory): 40 Marks		
ESE (Lab): 30 Marks	CIA (Lab): 20 Marks		

SYLLABUS

Module I:

Basic Circuit Concepts: Voltage and Current Sources, Resistors: Fixed and Variable resistors, Construction and Characteristics, resistors in series and parallel. Inductors: Fixed and Variable inductors, Self and mutual inductance, Faraday's law and Lenz's law of electromagnetic induction, Energy stored in an inductor, Inductance in series and parallel, Capacitors: Principles of capacitance, Parallel plate capacitor, Permittivity, Definition of Dielectric Constant, Dielectric strength, Energy stored in a capacitor, types of capacitor and their application, capacitors in series and parallel, factors governing the value of capacitors.

Module II:

Circuit Analysis And DC Transient Analysis : Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Node Analysis, Mesh Analysis, Star-Delta Conversion. RC Circuit- Charging and discharging with initial charge, RL Circuit with Initial Current, Time Constant, RL and RC Circuits With Sources, DC Response of Series RLC Circuits.

Module III:

AC Circuit Analysis : Sinusoidal Voltage and Current, Definition of Instantaneous, Peak, Peak to Peak, Root Mean Square and Average Values. Voltage-Current relationship in Resistor, Inductor and Capacitor, Phasor, Complex Impedance, Power in AC Circuits: Instantaneous Power, Average Power, Reactive Power, Power Factor. Sinusoidal Circuit Analysis for RL, RC and RLC Circuits. Resonance in Series and Parallel RLC Circuits, Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth. Passive Filters: Low Pass, High Pass, Band Pass and Band Stop.

Module IV:

Network Theorems : Principal of Duality, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Reciprocity Theorem, Millman's Theorem, Maximum Power Transfer Theorem. AC circuit analysis using Network theorems. Two Port Networks: Impedance (Z) Parameters, Admittance (Y) Parameters, Transmission (ABCD) Parameters.

Recommended Books:

1. A.Chakrabarti, "Circuit Theory (Analysis and Synthesis)" , Dhanpat rai & Co.
2. Network Analysis And Synthesis by Franklin F .Kuo, John Wiley And Sons.
3. W. H. Hayt, J. E. Kemmerly, S. M. Durbin, Engineering Circuit Analysis, Tata McGraw Hill(2005)

4. Alexander and M. Sadiku, Fundamentals of Electric Circuits , McGraw Hill (2008)
5. S. A. Nasar, Electric Circuits, Schaum's outline series, Tata McGraw Hill (2004)
6. Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill.(2005)

Basic Circuit Theory and Network Analysis Lab

1. Familiarization with
    a. Resistance in series, parallel and series – Parallel.
    b. Capacitors in series & Parallel.
2. Study of Multimeter.
3. Study of C.R.O.
4. Verification of Kirchoff's Law.
5. Verification of Norton's theorem.
6. Verification of Thevenin's Theorem.
7. Verification of Superposition Theorem.
8. Verification of the Maximum Power Transfer Theorem.
9. RC Circuits: Time Constant, Differentiator, Integrator.
10. Designing of a Low Pass RC Filter and study of its Frequency Response.
11. Designing of a High Pass RC Filter and study of its Frequency Response.

Course Name	Mathematics Foundation for Electronics		
Category: Core	Code: BSE 1102	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Matrices: Introduction to Matrices, System of Linear Algebraic Equations, Gaussian Elimination Method, Gauss-Seidel Method, LU decomposition, Solution of Linear System by LU decomposition. Eigen Values and Eigen Vectors, Linear Transformation, Properties of Eigen Values and Eigen Vectors, Cayley-Hamilton Theorem

Module II:

Sequences and series: Sequences, Limit of a sequence, Convergence, Divergence and Oscillation of a sequence, Infinite series, Necessary condition for Convergence, Cauchy's Integral Test, D'Alembert's Ratio Test, Cauchy's nth Root Test, Alternating Series, Leibnitz's Theorem, Absolute Convergence and Conditional Convergence.

Module III:

Complex Variables and Functions: Analytic Functions, Cauchy-Riemann (C- R) Equations, Harmonic and Conjugate Harmonic Functions, Exponential Function, Trigonometric Functions, Hyperbolic Functions, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivative of Analytic Functions, Taylor's Series, Laurent Series, Zeroes and Poles.

Module IV:

Integral Transform: Fourier Integral and Fourier Transform, Fourier Integral theorem, Finite and Infinite Integral, Laplace Transform of Elementary Function (Dirac Delta & Green's Function). Solution of Simple Differential Equations.

Recommended Books:

1. E. Kreyszig, Advanced engineering mathematics, Wiley India (2008)
2. Murray Spiegel, Seymour Lipschutz, John Schiller, Outline of Complex Variables, Schaum Outline Series, Tata McGraw Hill (2007)
3. R. K. Jain, and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House (2007)
4. C .R. Wylie and L. C. Barrett, Advanced Engineering Mathematics, Tata McGraw-Hill (2004)
5. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Limited (2007)

Course Name	Semiconductor Devices		
Category: Core	Code: BSE 1201	Credits: 6	L-4 T-0 P-4
Exam: Theory 3 Hrs, Practical 2 Hrs	ESE(Theory) : 60 Marks CIA ((Theory) : 40 Marks		
ESE (Lab): 30 Marks	CIA (Lab): 20 Marks		

SYLLABUS

Module I:

Semiconductor Basics: Introduction to Semiconductor Materials, Crystal Structure, Metals, Semiconductors and Insulators, Direct and indirect semiconductors, Carrier Concentration at Normal Equilibrium in Intrinsic semiconductors, Derivation of Fermi Level for Intrinsic & Extrinsic Semiconductors, Carrier Transport Phenomena: Conductivity & Mobility, Carrier Drift, Resistivity, Hall Effect, Diffusion Process, Current Density Equation, Einstein Relation, Diffusion And Recombination Processes: Continuity Equation.

Module II:

P-N Junction Diode: Formation of Depletion Layer, Space Charge at a Junction, Derivation of Electrostatic Potential Difference at Thermal Equilibrium, Depletion Width, Derivation of Diode Equation and I-V Characteristics. Zener and Avalanche Junction Breakdown Mechanism, Rectifying Contacts , Ohmic Contacts.

Module III:

Bipolar Junction Transistors (BJT): PNP and NPN Transistors, Basic Transistor Action, Amplification With BJTS: Emitter Efficiency, Base Transport Factor, Current Gain, Base- Width Modulation, Modes of operation, Input and Output Characteristics of CB, CE and CC Configurations.

Module IV:

Field Effect Transistors: JFET, Construction, Idea of Channel Formation, Pinch-Off and Saturation Voltage, Current-Voltage Output Characteristics. MOSFET, types of MOSFETs, Circuit symbols, Working and Characteristic curves of Depletion type MOSFET (both N channel and P Channel) and Enhancement type MOSFET (both N channel and P channel). Complimentary MOS (CMOS).

Special Devices: Varactor Diode, Photodiode, solar cell: circuit symbol, characteristics, applications, Light Emitting Diodes (LED)**,** Tunnel diode, IMPATT Diode, Gunn Diode.

Recommended Books:

1. S. M. Sze, Semiconductor Devices: Physics and Technology, 2ndEdition, Wiley India edition (2002).
2. Adel S. Sedra& Kenneth C. Smith, “Microelectronic Circuits”, Oxford.
3. Ben G Streetman and S. Banerjee, Solid State Electronic Devices, Pearson Education (2006).
4. Millman&Halkias, “Electronic Devices And circuits”, TMH.
5. Jasprit Singh, Semiconductor Devices: Basic Principles, John Wiley and Sons (2001)
6. Kanaan Kano, Semiconductor Devices, Pearson Education (2004)
7. Robert F. Pierret, Semiconductor Device Fundamentals, Pearson Education (2006)

Semiconductor Devices Lab

1. Study of the I-V Characteristics of Diode – Ordinary and Zener Diode.
2. Study of the half wave rectifier and Full wave rectifier.
3. Study of clipping and clamping circuits.
4. Zener diode as voltage regulator – load regulation.
5. Study of the I-V Characteristics of the CE configuration of BJT.
6. Study of the I-V Characteristics of the Common Base Configuration of BJT.
7. Study of the I-V Characteristics of the Common Collector Configuration of BJT.
8. Study of the frequency response of Common Source FET amplifier.
9. Designing of PCB using artwork, its fabrication and testing.
10. Design, fabrication and testing of a 9 V power supply with Zener regulator.

Course Name	Applied Physics		
Category: Core	Code: BSE 1202	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Quantum Physics: Inadequacies of Classical physics. Compton's effect, Wave-particle duality, de Broglie waves. Basic postulates and formalism of quantum mechanics: probabilistic interpretation of waves, conditions for physical acceptability of wave functions. Schrodinger wave equation for a free particle and in a force field (1 dimension), Boundary and continuity conditions. Operators in Quantum Mechanics, Conservation of probability, Time-dependent form, Linearity and superposition, Operators, Timeindependent one dimensional Schrodinger wave equation, Stationary states, Eigen-values and Eigen functions. Particle in a one-dimensional box, Extension to a three dimensional box, Potential barrier problems, phenomenon of tunneling

Module II:

Mechanical Properties of Materials: Elastic and Plastic Deformations, Hooke's Law, Elastic Moduli, Brittle and Ductile Materials, Tensile Strength, Theoretical and Critical Shear Stress of Crystals. , Hardness, Creep, Fatigue, Fracture.

Module III:

Thermal Properties: Brief Introduction to Laws of Thermodynamics, Concept of Entropy, Concept of Phonons, Heat Capacity, Debye's Law, Lattice Specific Heat, Thermoelectricity, Seebeck Effect, Thomson Effect, Peltier Effect.

Module IV:

Electric and Magnetic Properties: Conductivity of metals, Ohm's Law, relaxation time, collision time and mean free path, electron scattering and resistivity of metals, heat developed in current carrying conductor. Classification of Magnetic Materials, Origin of Magnetic moment, Origin of dia, para, ferro and antiferro magnetism and their comparison, , Saturation agnetisation and Curie temperature. Magnetic domains.

Recommended Books:

1. S. Vijaya and G. Rangarajan, Material Science, Tata Mcgraw Hill (2003)
2. W. E. Callister, Material Science and Engineering: An Introduction, Wiley India (2006)
3. A. Beiser, Concepts of Modern Physics , McGraw-Hill Book Company (1987)
4. A. Ghatak & S. Lokanathan, Quantum Mechanics: Theory and Applications, Macmillan India (2004)

Course Name	Electronics Circuits		
Category: Core	Code: BSE 1301	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Diode Circuits: Ideal diode, piecewise linear equivalent circuit, dc Circuits. Rectifiers: HWR, FWR (Center tapped and bridge). Circuit diagrams, workingand waveforms ripple factor & efficiency, comparison, Clipping and clamping circuits. Filters: types, circuit diagram and explanation of Shunt capacitor filter with waveforms.Zener diode regulator circuit diagram, disadvantages of Zener diode regulator.

Module II:

Bipolar Junction Transistor: Review of CE, CB Characteristics and regions of operation. Hybrid parameters. Transistor biasing, DC load line, operating point, thermal runaway, stability and stability factor, Fixed bias without and with RE, collector to base bias, voltage divider bias and emitter bias (+VCC and –VEE bias), circuit diagrams and their working. Transistor as a switch, circuit and working**,** Darlington pair and its applications.BJT amplifier (CE), dc and ac load line analysis, hybrid model of CE configuration, Quantitative study of the frequency response of a CE amplifier, Effect on gain and bandwidth for Cascaded CE amplifiers (RC Coupled).

Module III:

MOSFET Circuits and amplifiers: Review of construction and characteristics of JFET, Review of Depletion and Enhancement MOSFET, FET Biasing, Small Signal Parameters, Common Source amplifier circuit analysis, CMOS circuits.

Module IV:

Power Amplifiers: Difference between voltage and power amplifier, classification of power amplifiers, Class A, Class B, Class C and their comparisons. Operation of a Class A single ended power amplifier. Operation of Transformer coupled Class A power amplifier, overall efficiency. Circuit operation of complementary symmetry Class B push pull power amplifier, crossover distortion, heat sinks.

Operational Amplifier: Block diagram of an operational amplifier (IC 741) Op-Amp parameters: input offset voltage, input offset current, input bias current, differential input resistance, input capacitance, offset voltage adjustment range, input voltage range, common mode rejection ratio, slew rate, supply voltage rejection ratio.

Text Book:

1. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition, 2013, PHI
2. Electronic devices, David A Bell, Reston Publishing Company.

Reference Books:

1. Donald A. Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill (2002)
2. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
3. Allen Mottershed, Electronic Devices and Circuits, Goodyear Publishing Corporation.

Course Name	Digital Electronics		
Category: Core	Code: BSE 1302	Credits: 6	L-4 T-0 P-4
Exam: Theory 3 Hrs. Practical 2 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Number System and Codes:

Decimal, Binary, Hexadecimal and Octal number systems, base conversions, Binary, octal and hexadecimal arithmetic (addition, subtraction by complement method, multiplication), representation of signed and unsigned numbers, Binary Coded Decimal code. Logic Gates and Boolean algebra: Introduction to Boolean Algebra and Boolean operators, Truth Tables of OR, AND, NOT, Basic postulates and fundamental theorems of Boolean algebra, Truth tables, construction and symbolic representation of XOR, XNOR, Universal (NOR and NAND) gates.

Module II:

Combinational Logic Analysis and Design:

Standard representation of logic functions (SOP and POS), Karnaugh map minimization, Encoder and Decoder, Multiplexers and Demultiplexers, Implementing logic functions with multiplexer, binary Adder, binary Subtractor, parallel adder/Subtractor.

Module III:

Sequential logic design:

Latches and Flip flops, S-R Flip flop, J-K Flip flop, T and D type Flip flop, Clocked and edge triggered Flip flops, master slave flip flop, Registers, counter design using excitation table and equations Counters (synchronous and asynchronous and modulo-N) State Machine, State Table, State Diagrams. Ring counter and Johnson counter.

Module IV:

Programmable Logic Devices: Basic concepts- ROM, PLA, PAL.

Digital Logic families: Fan-in, Fan out, Noise Margin, Power Dissipation, Figure of merit, Speed power product, TTL and CMOS families and their comparison.

Text Books:

1. M. Morris Mano , “Digital System Design”, Pearson Education Asia,(Fourth Edition)
2. S. Salivahanan& S. Arivazhagan, “Digital Circuits and Design”, Vikas Publishing.

Reference Books:

1. M Morris Mano, “Computer System Architecture” PHI 3rd Edition.
2. R. P. Jain, “Modern Digital Electronics” 4thEdition, 2009 Publisher: McGraw Higher Ed

Digital Electronics Lab

1. To verify truth table of AND, OR, NOT, NAND, NORand XOR gates.
2. To verify the law of Boolean algebra and De-Morgan's Theorem
3. Design and verification of Half and Full Adder.
4. Design and verification of Half and Full Subtractor.
5. Verification of a seven-segment display driver.
6. Study of Multiplexer and De-multiplexer.
7. To study a Flip- Flop Circuits using elementary gates.
8. Verification of different types of Counters
9. To Studyshift register and verifyserial shifting of data.

Course Name	C Programming and Data Structures		
Category: Core	Code: BSE 1303	Credits: 6	L-4 T-0 P-4
Exam: Theory 3 Hrs. Practical 2 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module-I:

C Programming Language: Introduction, Importance of C, Character set, Tokens, keywords, Identifier, Constants, Basic data types, Variables: Declaration & assigning values. Structure of C-program. Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment and decrement operators, Conditional operators, Bit wise operators, expressions and evaluation of expressions, Type cast operator, Implicit conversions, Precedence of operators. Array concepts: Declaration, accessing elements, Storing elements, Two-dimensional and multi-dimensional arrays. Input output statement and library functions (math and string related functions).

Module-II:

Decision making, branching & looping: Decision making, branching and looping: if, if-else, else-if, Switch statement, Break and Continue, For loop, While loop and do loop. Functions: Defining functions, Function arguments and passing, Returning values from functions.Structures:Defining and declaring Structure variables, Accessing structure members, Initializing a structure, Copying and comparing structure variables, Array of structures, Arrays within structures, Structures and Union, Understanding pointers.

Module-III:

Data Structures: Applications of Data Structure, Operations on data Structure, Definition of stack, Array implementation of stack, Conversion of infix expression to prefix and postfix expressions, Evaluation of postfix expression. Queue, Circular queue,Array implementation of queues. Linked List and its implementation, Link list implementation of stack and queue, Circular and doubly linked list.

Module-IV:

Searching and sorting: Insertion sort, Selection sort, Bubble sort, Merge sort, Linear Search, Binary search. **Trees:** Introduction to trees, Binary search tree, Insertion and searching in a BST, Preorder, Postorder and in order traversal (recursive).

Text Books:

1. Programming in ANSI C, Balagurusamy, 2nd edition, TMH.
2. Tanenbaum: “Data Structures using C”, Pearson/PHI.

Reference books:

1. Byron S Gottfried, Programming with C, Schaum Series
2. Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language, Prentice Hall

3. YashavantKanetkar, Let Us C, BPB Publications
4. S. Sahni and E. Horowitz, “Data Structures”, Galgotia Publications
5. Ellis Horowitz and SartazSahani “Fundamentals of Computer Algorithms”, Computer Science Press.

C Programming and Data Structures Lab

1. Generate the Fibonacci series up to the given limit N and also print the number of elements in the series.
2. Find minimum and maximum of N numbers.
3. Find the GCD of two integer numbers.
4. Program to find whether the number is even or odd.
5. Calculate factorial of a given number.
6. Program to find reverse of a number and palindrome number.
7. Program to swap two numbers using third variable and without using third variable.
8. Generate and print prime numbers up to an integer N.
9. Calculate the value of sin (x) and cos (x) using the series. Also print sin (x) and cos (x) value using library function.
10. Find the product of two matrices of order MxN and PxQ.
11. Find the sum & difference of two matrices of order MxN and PxQ.
12. Find the transpose of given MxN matrix.
13. Implement sparse matrices using arrays and linked lists.
14. Program to implement call by value and call by reference.
15. Calculate the subject wise and student wise totals and store them as a part of the structure.
16. Create a stack and perform Pop, Push, Traverse operations on the stack using Linear Linked list.
17. Implement linear and circular linked lists using single and double pointers.
18. Create a Linear Queue using Linked List and implement different operations such as Insert, Delete, and Display the queue elements.
19. Create circular linked list having information about a college and perform Insertion at front, Deletion at end.
20. Create a Binary Tree to perform Tree traversals (Preorder, Postorder, Inorder) using the concept of recursion.
21. Implement binary search tree using linked lists. Compare its time complexity over that of linear search.
22. Implement Insertion sort, Merge sort, Bubble sort, Selection sort.

Course Name	Operational Amplifiers and Applications		
Category: Core	Code: BSE 1401	Credits: 6	L-4 T-0 P-4
Exam: Theory 3 Hrs. Practical2 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Feedback Amplifiers: Concept of feedback, negative and positive feedback, advantages and disadvantages of negative feedback, voltage (series and shunt), current (series and shunt) feedback amplifiers, gain, input and output impedances. Barkhausen criteria for oscillations, Study of phase shift oscillator, Colpitts oscillator and Hartley oscillator.

Module II:

Op-Amp Circuits: Open and closed loop configuration, Frequency response of an op-amp in open loop and closed loop configurations, Inverting, Non-inverting, Summing and difference amplifier, Integrator, Differentiator, Voltage to current converter, Current to voltage converter. Comparators: Basic comparator, Level detector, Voltage limiters, Schmitt Trigger. Signal generators: Wein bridge oscillator, Square wave generator, triangle wave generator, saw tooth wave generator.

Module III:

Multivibrators (IC 555): Block diagram, Astable and monostablemultivibrator circuit, Applications of Monostable and Astablemultivibrators. Phase locked loops (PLL): Block diagram, phase detectors, IC565, VCO-IC566

Module IV:

Signal Conditioning circuits: Sample and hold systems, Active filters: First order low pass and high pass Butterworth filter, Second order filters, Band pass filter, Band reject filter, All pass filter, Log and antilog amplifiers, Fixed and variable IC regulators:IC 78xx and IC 79xx -concepts only, IC LM317- output voltage equation

Text Books:

1. R. A. Gayakwad, Op-Amps and LinearIC's, Pearson Education (2003).
2. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition, 2013, PHI.

Reference Books:

1. R. F. Coughlin and F. F.Driscoll, Operational amplifiers and Linear Integrated circuits, Pearson Education (2001).
2. J. Millman and C.C. Halkias, IntegratedElectronics, Tata McGraw-Hill,(2001)
3. A.P.Malvino, Electronic Principals, 6thEdition, Tata McGraw-Hill,(2003)
4. K.L.Kishore,OP-AMP and Linear Integrated Circuits, Pearson(2011)

Operational Amplifiers and Application Lab

1. Transistorized oscillators: Phase shift,Wein Bridge, Hartley's &Colpitts.
2. IC 555 Timer: Monostable&Astable operation circuit.
3. IC 565: PLL Applications.
4. IC 566: VCO Applications.
5. Study of A/D, D/A Converters.
6. To study of Op-amp as Adder, integrator & voltage comparator.
7. Study of Op-amp as Astable&Monostablemultivibrators.
8. Sampling & reconstruction using Nyquist criteria.
9. Function generator using operational amplifier (single, triangular & sq. wave)
10. FET Amplifiers.

(a) Single Stage Common source FET amplifier plot ofgain (in dB) vs. frequency.

(b) Measurement of BW, input impedance, maximum signal handlingcapacity of an amplifier.

11. Voltage to current & current to voltage converter.
12. Filter design using Op-amp

Course Name	Signals and Systems		
Category: Core	Code: BSE 1402	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Signals and Systems: Continuous and discrete time signals, Transformations of the dependent and independent variable, Exponential and sinusoidal signals, Impulse and unit step functions, Continuous-Time and Discrete-Time Systems, Basic System Properties.

Module II:

Linear Time -Invariant Systems (LTI): Discrete time LTI systems, the Convolution Sum, Continuous time LTI systems, the Convolution integral, Properties of LTI systems: Commutative, Distributive, Associative, LTI systems with and without memory, Invariability, Causality, Stability, Unit Step response, Differential and difference equation formulation, Block diagram representation of first order systems.

Module III:

Fourier Series Representation of Periodic Signals: Continuous-Time periodic signals, Fourier series representation of continuous time Periodic signal, various forms of Fourier series, Convergence of the Fourier series, Properties of continuous-Time Fourier series.

Fourier Transform: Aperiodic signals, Periodic signals, Properties of Continuous-time Fourier transform, Convolution and Multiplication Properties, Properties of discrete Fourier transform and basic Fourier transform Pairs.

Module IV:

Laplace Transform: Laplace Transform, Inverse Laplace Transform, Properties of the Laplace Transform, Laplace Transform Pairs, Laplace Transform for signals, Laplace Transform Methods in Circuit Analysis, Impulse and Step response of RL, RC and RLC circuits.

Text Books:

1. V. Oppenheim, A. S. Wilsky and S. H. Nawab, Signals and Systems, Pearson Education (2007)
2. S. Haykin and B. V. Veen, Signal and Systems, John Wiley & Sons (2004)

Reference Books:

1. B. P. Lathi, “Linear Systems & Signals” Oxford University Press, 2008.
2. I. J Nagrath, S.N. Saran, R. Ranjan and S. Kumar, “Signals and Systems”, TataMcGraw Hill, 2001.
3. H. P. Hsu, Signals and Systems, Tata McGraw Hill (2007)

Course Name	Electronic Instrumentation		
Category: Core	Code: BSE1403	Credits: 6	L-4 T-0 P-4
Exam: Theory 3 Hrs. Practical 2 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Qualities of Measurement: Specifications of instruments, their static and dynamic characteristics, Error in measurement-Limiting errors, Relative limiting errors, combination of quantities with limiting errors. Known errors, Types of errors (Gross error, systematic error) and uncertainty analysis.

Basic Measurement Instruments: PMMC instrument, galvanometer, DC measurement - ammeter,

voltmeter, ohm meter, AC measurement-Digital frequency meter, Digital voltmeter systems (ramp and integrating types).

Module II:

Measurement of Resistance and Impedance: Low Resistance: Kelvin's double bridge method, Medium Resistance by Voltmeter Ammeter method, Wheatstone bridge method. A.C. bridges, Measurement of Self Inductance, Maxwell's bridge, Hay's bridge, and Anderson's bridge, Measurement of Capacitance, Schering's bridge, De-Sauty's bridge, Measurement of frequency, Wien's bridge.

A-D and D-A Conversion: 4-bit binary weighted resistor type D-A conversion, circuit and working. Circuit of R-2R ladder. A-D conversion characteristics, successive approximation ADC, counter type, dual slope integrator A/D.

Module III:

Oscilloscopes: CRT, wave form display and electrostatic focusing, time base and sweep synchronization, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Dual trace oscilloscope, Sampling Oscilloscope, Digital storage oscilloscope (DSO) Block diagram, principle and working, Advantages and applications, CRO specifications (bandwidth, sensitivity, rise time).

Module IV:

Transducers and sensors: Classification of transducers, Basic requirement/characteristics of transducers, active & passive transducers, Resistive (Potentiometer, Strain gauge – Theory, types, temperature compensation and applications), Capacitive (Variable Area Type – Variable distance type – Variable Permittivity type), Linear variable differential transformer(LVDT-Inductive type), Rotatory variable differential transformer (RVDT) and piezoelectric transducers. Measurement of pressure (diaphragm, bellows), Measurement of temperature (RTD, thermistor, thermocouple, semiconductor IC sensors), Light transducers (photo conductive cell, photovoltaic cells, photodiodes).

Text Book:

1. A. K Sawhney, Electrical and Electronics Measurements and Instrumentation, DhanpatRai and Sons(2007).

2. H. S. Kalsi, Electronic Instrumentation, TMH(2006)

Reference Books:

1. W.D. Cooper and A. D. Halftrack, Electronic Instrumentation and Measurement Techniques, Prentice-Hall (2005).
2. C. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata McGrawHill(1998).
3. R. P. Jain, Modern Digital Electronics 4thEdition, 2009Publisher:McGrawHigher Ed

Electronic Instrumentation Lab

1. Calibration of ammeter and voltmeter
2. Design if multi-range ammeter and multi-range voltmeter using galvanometer.
3. Measurement of resistance by Wheatstone Bridge and Bridge sensitivity.
4. Measurement of low resistance by Kelvin’s double bridge.
5. Measurement of inductance by Maxwell Bridge.
6. Measurement of inductance by Hay’s Bridge.
7. Measurement of inductance by Anderson Bridge.
8. Measurement of capacitance by Schering Bridge.
9. Measurement of capacitance by DeSauty’sBridge.
10. To determine the Characteristics of resistance transducer-strain gauge (Measurement of strain using half and full bridge)

Course Name	Microprocessor and Microcontroller		
Category: Core	Code: BSE 1501	Credits: 6	L-4 T-0 P-4
Exam: Theory 3 Hrs. Practical 2 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Microprocessor Architecture and microcomputer system: Microprocessor Architecture and Its Operations, Memory, Input and Output (I/O) Devices, Example of microcomputer system, The 8085 MPU, Memory interfacing, interfacing output display, interfacing input device, Memory mapped I/O.

Module II:

Programming 8085:8085 programming model, Instruction classification: Data transfer operation, Arithmetic operation, Logic operations and Branch operations. Writing assembly language programs, Debugging a program. Programming techniques: Looping, Counting and Indexing. Time delay programs, Stack, subroutine, Conditional call, Return instruction. Code conversion: BCD to Binary conversion, Binary to BCD and BCD to seven segment LED code conversion.

Module III:

Interfacing Devices: Digital to analog converter, Analog to digital converter, 8279 programmable Keyboard/display interface, 8255 Programmable peripheral interface: Interfacing Keyboard and Seven segment display, 8254 Programmable interval timer, 8259 Programmable interrupt controller, 8237 DMA controller.

Module IV:

Introduction8051: Overview of the 8051 family, Inside the 8051, 8051 data types and directives, 8051 flag bits and PSW register, 8051 Register bank and stack, Addressing modes: Immediate and Register addressing modes, Accessing Memory using various Addressing Modes, Bit Address for I/O and RAM, Extra 128 byte on chip Ram on 8052. 8051 interrupts, Loop and jump instructions, Call instructions, Time delay for various 8051 chips. I/O port programming: 8051 I/O programming, I/O bit manipulation programming, Arithmetic and logic instructions: Arithmetic instructions, Signed number concepts and arithmetic operations, Logic and compare instructions, Rotate instruction and data serialization, BCD, ASCII and other application programs.

Text Books:

1. Microprocessor Architecture and Programming & Application with 8085,Ramesh S.Goanker,Wiley Eastern Ltd Fifth edition.
2. The 8051 Microcontroller and embedded systems-Muhammad Ali Mazidi, Janice Gillespie Mazidi, Rollin D McKinley, Pearson, Second Edition.

Reference Books:

1. Microprocessor and Microcontrollers, B. Ram, Dhanpat Rai Publications, 8th Edition.
2. Ayala Kenneth, “The 8051 Microcontroller”, Cengage Learning, 3rd Edition.
3. Microprocessors and Interfacing by Douglas V. Hall, McGraw Hill International Ed. 1992.

Microprocessor Lab

1. Program to transfer a block of data.
2. Program for addition.
3. Program for subtraction.
4. Program to multiply two 8-bit numbers.
5. Program to divide a 16-bit number by 8-bit number.
6. Binary to gray code conversion.
7. To sort a string of a 1-byte numbers in ascending order.
8. To sort a string of a 1-byte numbers in descending order.
9. To find the maximum number in a given string.
10. Program to interface ADC/DAC.

Course Name	Electromagnetic		
Category: Core	Code: BSE 1502	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Vector Algebra and Co-ordinate systems: Scalars and Vectors, Rectangular coordinate systems, cylindrical coordinate systems, Rectangular coordinate systems and Spherical coordinate systems.

Vector Calculus: Introduction, Differential Length, Area and Volume, Line Surface and Volume integrals, Del Operator, Gradient of a Scalar, Divergence of a Vector and divergence theorem, curl of a Vector and Stokes's theorem. Laplacian of scalar.

Module II:

Electrostatic Fields: Coulomb's Law and Electric Field density, Electric fields due Continuous Charge Distributions Electric Flux Density, Gauss's Law-Maxwell Equations, Applications of Gauss's Law, Electric Potential, Potential due to a Charge and Charge distribution.Electric dipole.

Electrostatic Fields in material space: Introduction, Properties of material, convection and conduction current and current densities, Electric Fields in Conductors, Polarization, Dielectric Constant and strengths. Dielectric materials-linear, isotropic and homogenous dielectrics, Continuity of Current equation and relaxation time, Metallic Conductor Properties and Boundary Conditions.

Module III:

Magneto Statics: Derivation of Poisson's and Laplace's equation, Uniqueness Theorem, BiotSavert's law and Applications, Ampere's Circuital Law, application of ampere's law, Magnetic Flux and Magnetic Flux Density-Maxwell's equation, Maxwell's equations for static EM fields, Magnetic Scalar and Vector Potentials

Magnetic forces, Materials and Devices:

Forces due to magnetic fields, Magnetic torque and moment, Magnetic dipole, magnetic materials, classification of magnetic materials, magnetic boundary conditions, Inductors and inductances, Magnetic Energy, Magnetic Circuits.

Module IV:

Time-varying Fields and Maxwell's Equations: Faraday's Law of Electromagnetic Induction, Transformer and Motional EMF, Stationary Circuit in Time-Varying Magnetic Field, Displacement Current, Maxwell's Equations in differential and integral form and Constitutive Relations. Time varying potentials, Concept of Retarded Potentials. Electromagnetic Boundary Conditions. Time-Harmonic Electromagnetic Fields and use of Phasor.

Text Books:

1. M. N. O. Sadiku, Elements of Electromagnetics, Oxford University Press (2001)
2. W. H. Hayt and J. A. Buck, Engineering Electromagnetics, Tata McGraw Hill (2006)
3. Murray. R. Spiegel, Vector Analysis, Schaum series, Tata McGraw Hill (2006)

Reference Books:

1. D. C. Cheng, Field and Wave Electromagnetics, Pearson Education (2001)
2. J. A. Edminster, Electromagnetics, Schaum Series, Tata McGraw Hill (2006)
3. N. Narayan Rao, Elements of Engineering Electromagnetics, Pearson Education (2006)
4. Introduction to Electrodynamics, D.J. Griffiths, Pearson Education (2012)
5. Electromagnetic Wave and Radiating System, Jordan and Balmain, Prentice Hall (1979)

Course Name	Communication Electronics		
Category: Core	Code: BSE1601	Credits: 6	L-4 T-0 P-4
Exam: Theory 3 Hrs. Practical 2 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Electronic Communication: Block diagram of an electronic communication system, Baseband and Passband signals, Modulation, need for modulation, Noise: External noise, Internal Noise, Noise Figure, Noise Temperature.

Module II:

Amplitude Modulation: Amplitude Modulation, modulation index and frequency spectrum. Generation of AM(non-linear modulator), Amplitude Demodulation (diode detector), Concept of Double side band suppressed carrier, Single side band suppressed carrier, Vestigial Side Band modulation. Block diagram of super-heterodyne Receiver.

Angle Modulation: Frequency and Phase modulation, modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM (indirect method), FM detector (PLL), Comparison between AM, FM and PM.

Module III:

Pulse Analog Modulation: Channel capacity, Sampling theorem, PAM, PDM, PPM modulation and detection techniques, Multiplexing, TDM and FDM. Pulse Code Modulation: Need for digital transmission, Quantizing, Uniform and Non-uniform Quantization, Quantization Noise, Companding, Coding, Decoding, Regeneration.

Module IV:

Digital Carrier Modulation Techniques: Block diagram of digital transmission and reception, Information, Channel capacity, Bit Rate, Baud Rate and M-ary coding. Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK).

Text Books:

1. Electronic communication systems- Kennedy, 3rd edition, McGraw international publications
2. Simon Haykin,"Communication Systems" John Wiley & Sons 4thEdition.
3. B.P. Lathi, "Modern Digital and Analog Communication Systems", OUP.

Reference Books:

1. Taub& Schilling, "Principles of Communication Systems", TMH.
2. Sklar "Digital Communications: Fundamental and Applications", Pearson
3. Prokias "Digital Communications", MGH
4. R Singh,S. Sapre, "Communication Systems: Analog and Digital", McGraw Hill.

Communication Electronics Lab

1. Study of Amplitude Modulation
2. Study of Amplitude Demodulation
3. Study of Frequency Modulation
3. Study of Frequency Demodulation
4. Study of Pulse Amplitude Modulation
5. Study of TDM.
6. Study of FDM.
7. Study of Pulse Width Modulation
8. Study of Pulse Position Modulation
9. Study of Amplitude Shift Keying
10. Study of Phase Shift Keying,
11. Study of Frequency Shift Keying.
12. Study of Pulse Code Modulation.

Course Name	Photonics			
Category: Core		Code: BSE 1602	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.		ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Light as an Electromagnetic Wave: Plane waves in homogeneous media, concept of spherical waves. Reflection and transmission at an interface, total internal reflection, Brewster's Law. Interaction of electromagnetic waves with dielectrics: origin of refractive index, dispersion.

Interference: Superposition of waves of same frequency, Concept of coherence, Interference by division of wave front, Young's double slit, Division of Amplitude, thin film interference, anti-reflecting films, Newton's rings; Michelson interferometer. Holography.

Diffraction: Huygen Fresnel Principle, Diffraction Integral, Fresnel and Fraunhoffer approximations. Fraunhoffer Diffraction by a single slit, rectangular aperture, double slit, Resolving power of microscopes and telescopes; Diffraction grating: Resolving power and Dispersive power

Module II:

Polarization: Linear, circular and elliptical polarization, polarizer-analyzer and Malus' law; Double refraction by crystals, Interference of polarized light, Wave propagation in uniaxial media. Half wave and quarter wave plates. Faraday rotation and electro-optic effect.

Module III:

Light Emitting Diodes: Construction, materials and operation.

Lasers: Interaction of radiation and matter, Einstein coefficients, Condition for amplification, laser cavity, threshold for laser oscillation, line shape function. Examples of common lasers. semiconductor injection laser diode.

Photo detectors: Bolometer, Photomultiplier tube, Charge Coupled Device. Photo transistors and Photodiodes (p-i-n, avalanche), quantum efficiency and responsivity.

LCD Displays: Types of liquid crystals, Principle of Liquid Crystal Displays, applications, advantages over LED displays. Photodiode, solar cell: circuit symbol, characteristics, applications, Light Emitting Diodes (LED)

Module IV:

Guided Waves and the Optical Fiber: TE and TM modes in symmetric slab waveguides, effective index, field distributions, Dispersion relation and Group Velocity. Step index optical fiber, total internal reflection, concept of linearly polarized waves in the step index circular dielectric waveguides, single mode and multimode fibers, attenuation and dispersion in optical fiber.

Text Book:

1. AjoyGhatak, Optics, Tata McGraw Hill, New Delhi (2005).

2. S. O. Kasap, Optoelectronics and Photonics: Principles and Practices, Pearson Education (2009).

Reference Book:

1. E. Hecht, Optics, Pearson Education Ltd. (2002)

2. J. Wilson and J. F. B. Hawkes, Optoelectronics: An Introduction, Prentice Hall India (1996).

3. Ghatak A.K. and Thyagarajan K., “Introduction to fiber optics,” Cambridge Univ. Press. (1998).

Course Name	Control Systems		
Category: DSE	Code: BSE 1551	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Introduction to Control Systems: Introduction to open loop and closed loop control system, Transfer Function, Mathematical representation of Physical Systems, Modeling of control systems: Electrical systems, Mechanical systems, Block diagram and its reduction techniques.

Module II:

Time Domain Analysis: Poles, zeros and System response**,** Time domain performance criteria, transient response of first, second & higher order systems, steady state error for unity feedback systems, static error constants and system types.

Module III:

Concept of Stability: Asymptotic stability and conditional stability, Routh – Hurwitz criterion, relative stability analysis, Root Locus plots and their applications.

Frequency Domain Analysis: Correlation between time and frequency response, Polar and inverse polar plots, frequency domain specifications, Logarithmic plots (Bode Plots), gain and phase margins, Nyquist stability criterion

Module IV:

Controllers and Compensation Techniques: Proportional, Integral and Derivative control, PI, PID control, Compensation technique: Concept of Lag, Lead, Lag and Lead Networks, Design of closed loop systems using compensation technique.

Text Books:

1. B.S.Manke, “Linear Control Systems” Khanna Publishers, 9th Edition.
2. Norman S. Nise, Control System Engineering 4th edition, Wiley Publishing Co., 2004.

Reference Books:

1. J. Nagrath& M. Gopal, Control System Engineering, New Age International, 2000
2. K. Ogata, Modern Control Engineering, PHI 2002
3. B. C. Kuo, “Automatic control system”, Prentice Hall of India, 2000.

Course Name	Semiconductor Fabrication and Characterization		
Category: DSE	Code: BSE 1552	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Introduction of Semiconductor Process Technology: Introduction to IC technology,Electronic Grade Silicon, Crystal structure, Crystal growing Practice: Czochralski technique, Si Wafer preparation.

Epitaxy Deposition: Epitaxial growth by Vapor Phase Epitaxy (VPE), Epitaxial Reactors,Molecular Beam Epitaxy (MBE).

Module II:

Oxidation: Thermal Oxidation Process: Utility of Thermal Oxidation, Growth Mechanism and Kinetics,Effect of Impurities and Damage on the oxidation rate, Thin Oxide, Dry and Wet oxidation.

Lithographic Processes: Photolithography Photo resists, Photo mask Fabrication, Various Printing Techniques.

Module III:

Etching: Wet Chemical Etching, Dry etching using plasma etching technique.

Diffusion: Basic Diffusion Process, Fick's Law for Diffusion Equation, Diffusion Profiles, Diffusion Systems, Diffusion of P type and N type impurity, Ion Implantation and its advantages.

Module IV:

Metallization: Metallization and its application, Uses of Physical Vapor Deposition and Chemical Vapor Deposition technique for Metallization

Process Integration:MOSFET Technology: Basic fabrication process of NMOS and CMOS technology, Bipolar IC-Technology: Basic fabrication process.

Text Books:

1. S.M.Sze, VLSI Technology, Second Edition, TMH Publishing Company.
2. K.R.Botkar, Integrated Circuits, Khanna Publishers

Reference Books:

1. Gary S.May and S.M.Sze, Fundamentals of Semiconductor Fabrication, John Wiley & Sons(2004).

2.LudmilaEckertova, Physics of Thin films, 2nd Edition, Plenum Press (1986).

Course Name	Electrical Machines		
Category: DSE	Code: BSE 1553	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Transformers:

Types of transformers, transformer construction, EMF equation, no load operation, operation under load, phasor diagram, equivalent circuit of transformer, transformer losses, voltage regulation, condition of maximum efficiency, all day efficiency, short circuit and open circuit test

Auto-Transformers. Construction, VA relationship between auto transformer and two winding transformer, saving of copper

Three phase transformers:Three phase bank of single phase transformer, various three phase transformer connection.

Module II:

Poly phase induction motors: General constructional features, types of rotors, Principle of operation, concept of rotating magnetic field (Ferrari's Principle), induction motor as a generalized transformer, equivalent circuit, production of torque, slip, torque equation, torque-slip characteristics, power in induction motor, speed control of induction motors

Single phase motors: Single phase induction motors, construction, Principle of Operation based on starting methods, Split phase Motors, Capacitor Start Motors, Capacitor Start and Run Motors, Reluctance Motor, Stepper Motor,Universal Motor.

Module III:

Synchronous Machines: Brief Construction Details of Three Phase Synchronous Generators,EMF Equation, Principle of Operation of Synchronous Motor, Methods of Starting, Factors for Failure to Start, Applications, Comparison of Synchronous and Induction Motor.

Module IV:

DC Machines: Basic constructional features, armature winding (ac and dc), lap and wave connections, different type of pitches,

D.C. Generator: Construction and principle of operation, brief idea about armature reaction and commutation, E.M.F equation, methods of excitation and characteristics of self-excited and separately (shunt components and series) excited generators, losses and efficiency, applications.

D.C. Motors: principle of operation, significance of back E.M.F, maximum power, torque and speed relation, characteristics of series, shunt and compound excited motors & applications, losses and efficiency, necessity of motor starters, three-point starter, speed control of DC motors in brief, electric braking, applications of DC motor

Text Books:

1. I.J. Nagrath and D.P. Kothari, Electrical Machines, Tata McGraw Hill
2. B.L. Thareja, A.K. Thareja, A Textbook of Electrical Technology-Volume-II, S. Chand

Reference Books:

1. J.B. Gupta, Electrical Technology(Electrical Machines), Katsons.
2. H. Cotton, Advanced Electrical Technology, CBS Publishers and Distributors, New Delhi.

Course Name	Digital Signal Processing		
Category: DSE	Code: 1554	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Discrete Time systems: Discrete sequences, linear coefficient difference equation, Representation of DTS, LTI Systems. Stability and causality, frequency domain representations and Fourier transform of DT sequences.

Module II:

Z-Transform: Definition and properties, Inverse Z Transform and stability. Parsevals theorem and applications,

Sampling: Introduction to sampling process, Sampling theorem, types of sampling: Ideal, Natural and Flat-top sampling.

Module III:

Discrete Fourier Transform: DFT assumptions and Inverse DFT. Matrix relations, relationship with FT and its inverse, circular convolution, DFT theorems, DCT, Computation of DFT. FFT Algorithms and processing gain, Discrimination, interpolation and extrapolation, Gibbs phenomena, FFT of real functions interleaving and resolution improvement, Word length effects.

Module IV:

Realization of Filter Structures: FIR Filter Structures: Direct form structure, frequency sampling structure, lattice structure and Cascade form structure.IIR Filter Structure: Direct forms structure, Cascade form structure, Parallel form structure and signal flow graph, lattice and Lattice ladder structures for IIR Filter

Recommended Books:

Text Book:

1. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall, 1997.
2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.

Reference Books:

1. Johnny R. Johnson, Digital Signal Processing, PHI Learning Pvt Ltd., 2009.
2. S. Salivahanan, Digital Signal Processing 2/e, Tata Mcgraw Hill Education Private Limited
3. Rao D. Ganesh, Digital Signal Processing, 2/E, Pearson Education India

Course Name	Power Electronics		
Category: DSE	Code: BSE 1555	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Introduction to Power Electronics: Application of power electronics, introduction to various Semiconductor Power Device,

Power Diodes: Diode characteristics, power diode types, effects of forward and reverse recovery time.

Power BJT: Steady state characteristics, switching characteristics and base drive control.

Power MOSFETs: Steady state characteristics, switching characteristics and gate drive control.

Module II:

Introduction to family of Thyristors:

Silicon Controlled Rectifier (SCR): Structure, I-V Characteristics, Turn-On and Turn-Off Characteristics, Ratings, Factors affecting the characteristics/ratings of SCR, Gate triggering circuits, Control circuit design and protection circuit, snubber circuit.

Diac And Triac: Basic structure, Working and V-I Characteristics, Application of a diac as a triggering device for a triac.

Application of SCR: SCR as a static switch, Phase controlled rectification, Single Phase half wave, full wave and Bridge rectifiers with inductive and non-inductive loads

AC voltage control using SCR and Triac as a switch.

Module III:

Power Inverters: Need for Commutating Circuits and their various types, DC link inverters, parallel capacitor commutated inverters with and without reactive feedback and its analysis, Series inverter, Limitations and its improved version, Bridge Inverters.

Choppers: Basic Chopper Circuit, Types of Choppers (type A-D), Step-Down Chopper, Step-Up Chopper, Operation of DC Chopper Circuits using self-commutation (A & B- Type Commutating circuits), Cathode Pulse Turn-off Chopper (using class D commutation), Load sensitive cathode pulse turn-off chopper (Jones Chopper), Morgan's Chopper.

Module IV:

Electromechanical Machines

DC Motors, Basic understanding of field and armature, Principle of Operation, EMF Equation, Back EMF, Factors controlling motor speed, Thyristor based speed control of DC motors

AC Motors (Induction Motor only), Rotor and Stator, Torque and speed of Induction Motor, Thyristor control of AC motors (Block Diagrams only).

Text Books:

1. Power Electronics Circuits, Devices and Applications, 3rd Edition, M.H. Rashid, Pearson education
2. Power Electronics, M.D. Singh and K.B. Khanchandani, TMH.

Reference Books:

1. Power Electronics, P.S Bimbhra, Khanna Publishers.
2. Power electronics, P.C. Sen, TMH.
3. Power Electronics and Controls, S.K. Dutta.

Course Name	Nano Electronics		
Category: DSE	Code: BSE 1556	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Introduction: Definition of Nano-Science and Nano Technology, Applications of Nanotechnology

Introduction to Physics of Solid State: Size dependence of properties, bonding in atoms and giant molecular solids, Electronic conduction, System confined to one, two or three dimension and their effect on property.

Quantum Theory for Nano Science: Time dependent and time independent Schrodinger wave equations. Particle in a box, Potential step: Reflection and tunneling (Quantum leak). Penetration of Barrier, Electron trapped in 2D plane (Nano sheet), Quantum confinement effect in nano materials.

Quantum Wells, Wires and Dots: Preparation of Quantum Nanostructure; Size and Dimensionality effect, Fermi gas; Potential wells; Partial confinement; Excitons; Single electron Tunneling, Infrared detectors; Quantum dot laser Superconductivity.

Module II:

Growth Techniques of Nanomaterials: Synthetic aspects: bottom up and top down approaches, Lithographic and Nonlithographic techniques, Sputtering and film deposition in glow discharge, DC sputtering technique (p-CuAlO2 deposition). Thermal evaporation technique-beam evaporation, Chemical Vapour deposition (CVD), Synthesis of carbon nano-fibres and multi-walled carbon nanotubes, Pulsed Laser Deposition, Molecular beam Epitaxy, Sol-Gel Technique, Synthesis of nanowires/rods, Electrodeposition, Chemical bath deposition, Ion beam deposition system, Vapor-Liquid-Solid (VLS) method of nanowire.

Module III:

Methods of Measuring Properties and Characterization techniques:

Microscopy: Scanning Probe Microscopy (SPM), Atomic Force Microscopy(AFM),Field Ion Microscopy,Scanning Electron Microscopy(SEM),Transmission Electron Microscopy(TEM) including energy dispersive X-ray (EDX) analysis, low energy electron diffraction (LEED),reflection high energy

electron diffraction(RHEED)

Spectroscopy: Infra-red and Raman Spectroscopy, X-ray Spectroscopy, Magnetic resonance, Optical and Vibrational Spectroscopy. Characterization and application like biopolymer tagging and light emitting semiconductor quantum dots.

Module IV:

Carbon nanotubes, nano cuboids, graphene, carbon quantum dots: Fabrication, structure. Electrical, mechanical and vibrational properties and applications.Use of nano particles for biological application, drug delivery and bio-imaging, Impact of Nano technology on environment.

Text Book:

1. Nanoscale Science and Technology, Robert W. Kelsall, Ian W. Hamley and MarkGeoghegan, John Wiley & Sons, Ltd., UK, 2005.
2. Introduction to Nanotechnology, Charles P. Poole Jr and Frank J. Owens, Wiley Inter science, 2003.

Reference Books:

1. Nano: The Essentials: Understanding Nanoscience and Nanotechnology, T.Pradeep,Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.
2. Electron Microscopy and analysis, 2nd ed. Taylor and Francis, 2000.
3. Bio-Inspired Nanomaterials and Nanotechnology, Edited by Yong Zhou, Nova Publishers.
4. Modern magnetic materials: principles and applications, John Wiley & Sons, 2000.
5. Nanobiotechnology, concepts, applications and perspectives, Wiley-VCH, 2004.

Course Name	Transmission Lines, Antenna and Wave Propagation		
Category: DSE	Code: BSE 1651	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Electromagnetic Wave Propagation: Propagation in Good Conductors, Skin Effect, Reflection of uniform Plane Waves at normal incidence, Plane Wave Reflection at Oblique Incidence, Wave propagation in dispersive media, Concept of phase velocity and group velocity.

Module II:

Transmission Lines: Typical Transmission lines- Co-axial, Two Wire, Microstrip, Coplanar and Slot Lines, Transmission Line Parameters, Transmission Line Equations, Wave propagation in Transmission lines, lossless line, Distortion less line, Input Impedance, Standing Wave Ratio,Power. and lossy lines, Shorted Line, Open-Circuited Line, Matched Line, Smith Chart, Transmission Line Applications.

Module III:

Waveguides and Waveguide Devices: Wave propagation in waveguides, Parallel plate waveguides, TEM, TM and TE modes, Rectangular waveguides, circular waveguides, Power transmission and attenuation, Rectangular cavity resonators, directional couplers, isolator, circulator.

Module IV:

Radiation of Electromagnetic Waves: Concept of retarded potentials, Antenna Parameters: Radiation Mechanism, Current Distribution on a Thin Wire Antenna, Radiation Pattern, Radiation Power Density, Radiation Intensity, Beam width, Directivity, Antenna Efficiency, Gain, Beam Efficiency, Bandwidth, Polarization, Input Impedance Antenna Radiation Efficiency, Effective Length and Equivalent Areas, Maximum Directivity and Maximum Effective Area, Friis Transmission Equation and Radar Range Equation

Types of Antenna: Hertzian dipole, Half wave dipole, Quarter-wave dipole, Yagi-Uda, microstrip, Parabolic antenna, Helical antenna, Antenna array.

Text Book:

1. M. N. O. Sadiku, Principles of Electromagnetics, Oxford University Press (2001)
2. K.D. Prasad, Antenna and Wave Propagation, SatyaPrakashan(2006)

Reference Books:

1. W. H. Hayt and J.A. Buck, Engineering Electromagnetics, Tata McGraw Hill (2006)
2. G. S. N. Raju, Antennas and Propagation, Pearson Education (2001)
3. J. A. Edminster, Electromagnetics, Schaum Series, Tata McGraw Hill (2006)

Course Name	Basic VLSI Design		
Category: DSE	Code: BSE 1652	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Metal Oxide Semiconductor (MOS) Transistor: Introduction to IC Technology, Fabrication of MOSFETs: Introduction, Fabrication process flow: Basic steps, The C-MOS n-Well process, Layout Design Rule, Full Custom Mask Layout Design. The MOS structure, The MOS system under external bias, Structure and operation of MOS transistor (MOSFET), MOSFET Current voltage characteristics, Scaling and small geometry effects, Capacitances.

Module II:

MOS Inverters: Static Characteristic: Introduction, Resistive-Load Inverter, Inverter with n-Type MOSFET Load, CMOS Inverter. Switching Characteristics and Interconnect Effects: Introduction, Delay Time definitions, Calculation of Delay Times, Inverter Design with delay Constraints, Estimation of Interconnect Parasitic, Calculation of Interconnect delay, Switching Power Dissipation of CMOS Inverters.

Module III:

MOS Logic Design: Combinational MOS logic circuits: Introduction, MOS logic circuits with depletion nMOS loads, CMOS logic circuits. Sequential MOS logic circuits: Introduction, Behavior of Bistable elements, The SR latch circuits, Clocked latch and Flip-Flop Circuits, CMOS D-Latch and Edge triggered Flip-Flop.

Module IV:

Semiconductor Memories and Dynamic Logic Circuits: Memories: Introduction, ROM circuits, SRAM circuits, DRAM circuits. Dynamic logic circuits: Introduction, Basic principles of Pass transistor circuits, Voltage boot strapping synchronous dynamic circuit techniques, High performance Dynamic CMOS circuits.

Text Books:

1. Kang &Leblebigi “CMOS Digital IC Circuit Analysis & Design”- McGraw Hill, 2003.
2. Basic VLSI design: Douglas A Pucknell, Kamran Eshraghian, PHI, 3rd edition

Reference Books:

1. Rabey, “Digital Integrated Circuits Design”, Pearson Education, Second Edition, 2003.
2. Weste and Eshraghian, “Principles of CMOS VLSI design” Addison-Wesley, 2002.

Course Name	Embedded Systems		
Category: DSE	Code: BSE 1653	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Introduction to Embedded Systems: Overview of Embedded Systems, Features,Requirements and Applications, Recent Trends in the Embedded System Design, Common architectures for the Embedded System Design, Embedded Software design issues.Introduction to microcontrollers, Overview of Harvard architecture and Von Neumann architecture, RISC and CISC microcontrollers

Module II:

AVR RISC Microcontrollers: Introduction to AVR RISC Microcontrollers, Architecture overview, status register, general purpose register file, memories, Instruction set, Data Transfer Instructions, Arithmetic and Logic Instructions, Branch Instructions, Bit and Bit-test Instructions, MCU Control Instructions. Simple programs in Assembly Language / CLanguage

Module III:

Interrupts and Timer: Introduction to System Clock, Reset sources, Introduction to interrupts, External interrupts, IO Ports, 8-bit and 16-bit Timers, introduction to different modes, Input Capture and Compare Match.

Module IV:

Peripherals: Analog Comparator, Analog-to-Digital Converter, Serial Peripheral Interface(SPI), The Universal Synchronous and Asynchronous serial Receiver and Transmitter(USART), Two Wire Interface (TWI) / I2C bus.

Text Book:

1. Embedded system Design - Frank Vahid and Tony Givargis, John Wiley, 2002
2. AVR Microcontroller and Embedded Systems: Using Assembly and C by Muhammad Ali Mazidi, SarmadNaimi, SepehrNaimi, PHI

Reference Books:

1. Programming and Customizing the AVR Microcontroller by D V Gadre, McGraw- Hill.
2. Atmel AVR Microcontroller Primer: Programming and Interfacing by Steven F. Barrett, Daniel J. Pack, Morgan & Claypool Publishers.

Course Name	Computer Networks		
Category: DSE	Code: BSE 1654	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Data Communications: Components, protocols and standards, Network and Protocol Architecture, Reference Model ISO-OSI, TCP/IP-Overview, topology, transmission mode.

Switching: Circuit switching (space-division, time division and space-time division), packet switching (virtual circuit and Datagram approach), message switching.

Module II:

Data Link Layer: Design issues, Data Link Control and Protocols: Flow and Error Control, Stop-and-wait ARQ. Sliding window protocol, Go-Back-N ARQ, Selective Repeat ARQ, HDLC, Point-to –Point Access: PPP Point –to- Point Protocol, PPP Stack,

Medium Access Sub layer: Channel allocation problem, Controlled Access, Channelization, multiple access protocols, IEEE standard 802.3 & 802.11 for LANS and WLAN, high-speedLANs, Token ring, Token Bus, FDDI based LAN, Network Devices-repeaters, hubs, switches bridges.

Module III:

Network Layer: Design issues, Routing algorithms, Congestion control algorithms, Host to Host Delivery: Internetworking, addressing and routing, IP addressing (class full &Classless), Subnet, Network Layer Protocols: ARP, IPV4, ICMP, IPV6, ICMPV6.

Module IV:

Transport Layer: Process to Process Delivery: UDP; TCP, congestion control and Qualityof service.

Application Layer: Client Server Model, Socket Interface, Domain Name System (DNS):Electronic Mail (SMTP), file transfer (FTP), HTTP and WWW.

Text Books:

1. B.A. Forouzan, “Data Communication and Networking”, Tata McGraw Hill.
2. Andrew S. Tanenbaum: Computer Networks, PHI India.

Reference Books:

1. Leon-Garcia,Widjaja: Communication Networks, TMH.
2. William Stallings,“Data& Computer Communication”, Prentice Hall.

Course Name	Modern Communication Systems		
Category: DSE	Code: BSE 1655	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I:

Optical Communication: Introduction of Optical Fiber, Types of Fiber, Guidance in Optical Fiber, Attenuation and Dispersion in Fiber, Optical Sources and Detectors, Block Diagram of optical communication system, optical power budgeting.

Module II:

Cellular Communication: Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, frequency reuse, roaming and hand off, cellular network capacity, network capacity improvement, Co-channel and adjacent channel interference

Module III:

Mobile Communication and Network

FDMA, TDMA,CDMA technology overview, simplified block diagram of cellular phone handset, Comparative study of GSM and CDMA, 2G, 3G and 4G concepts. OSI model, wireless LAN requirements-concept of Bluetooth, Wi-Fi and WiMAX.

Module IV:

Satellite communication: Introduction, need, satellite orbits, advantages and disadvantages of geostationary satellites. Satellite visibility, satellite system – space segment, block diagrams of satellite sub systems, up link, down link, cross link, transponders (C- Band), effect of solar eclipse.

Text Books:

1. W. Tomasi, Electronic Communication Systems: Fundamentals through Advanced, Pearson Education, 3rd Edition.
2. Martin S. Roden, Analog & Digital Communication Systems, Prentice Hall, Englewood Cliffs, 3rd Edition

Reference Books:

1. Forouzan B. A, Data Communications and Networking, McGraw-Hill, 2nd Ed., 2000
2. Modern digital and analog Communication systems- B. P. Lathi, 4rd Edition 2009 Oxford University press.
3. ThiagarajanVishwanathan, Telecommunication Switching Systems and Networks, Prentice Hall of India.
4. Theodore S. Rappaport, Wireless Communications Principles and Practice, 2nd Edition, Pearson Education Asia.

Course Name	Programming in MATLAB		
Category: SEC	Code: BSSE 1421	Credits: 2	L-1 T-0 P-2
Exam: Theory 3 Hrs. Practical 2 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

SYLLABUS

Module I

Introduction to MATLAB: Basic introduction, Starting and Quitting, Desktop overview.

Matrices and Arrays: Matrices and Magic Squares, Expressions, Working with Matrices, Controlling Command Window Input and Output.

Graphics: MATLAB Plotting, Editing Plots using Functions and plotting tools, Modify the Graphs. Basic Plotting functions, Mesh and Surface plots, Printing Graphics.

Module II

MATLAB Programming Techniques: Flow controls, Cell Arrays, Structures, Scripts and Functions.

Creating Graphical User Interfaces. Basics, Laying out a GUI, programming a GUI.

Desktop Tools and Development Environment: Command window and command History, Current Directory, search path, Work Space browser and Array Editor, Debugger.

Introduction to Signal Processing, Image Processing toolbox in MATLAB Environment.

Text Book:

1. Getting Started With MATLAB: A Quick Introduction For Scientists And Engineers, by Rudra Pratap
2. MATLAB Programming for Engineers by Stephen J. Chapman

LAB Session: Programming in MATLAB

Module I

The MATLAB Environment

1. Learn how to use the MATLAB desktop, workspace and command window, command history.
2. Using the documentation system and other online resources.
3. Creating MATLAB variables, Overwriting variable.
4. Error messages, Making corrections.
5. Miscellaneous commands, Getting help.
6. Matrix generation, Colon operator, Linear spacing, Colon operator in a matrix.
7. Creating a sub-matrix, deleting row or column, Dimension, Continuation, Transposing a matrix, concatenating matrices, Special matrices.
8. Plotting/Graphics Overview, creating simple plots.
9. Adding titles, axis labels, and annotations.
10. Multiple data sets in one plot, Specifying line styles and colors.

Module II

Array operations and Linear equations

1. Array operations, **Matrix arithmetic** operations, **Array arithmetic** operations.
2. Solving **linear equations**, Matrix inverse, Matrix functions.
3. Introduction, M-File Scripts, Script side-effects, M-File functions, Anatomy of a M-File function.
4. Input and output arguments, Input to a script file, Output commands.
5. **Control flow and operators**:
   a) Control flow, The ‘‘if...end’’ structure
   b) Relational and logical operators
   c) The ‘‘for...end’’ loop
   d) The ‘‘while...end’’ loop
   e) Operator precedence
   f) Saving output to a file.