K.L.E Society's
R.L. Science Institute, Belagavi
Department of ELECTRONICS
CBCS Structure

SEM	TYPE	Code	Course	Credits	Total Credits
I	DSC	ELE101	Network Theorems and Analog Electronics	4	**6**
	DSC	ELE102	Practical	2	
II	DSC	ELE201	Amplifiers, FET, Filters , Power Control and Optoelectronic Devices	4	**6**
	DSC	ELE202	Practical	2	
III	DSC	ELE301	Linear Integrated Circuits &C - Programming	4	**8**
	DSC	ELE302	Practical	2	
	SEC	ELE303	Electrical Circuits and Network Skills	2	
IV	DSC	ELE401	Digital Electronics & Verilog	4	**8**
	DSC	ELE402	Practical	2	
	SEC	ELE403	Signals and Systems	2	
V	DSE	ELE501A	Analog & Digital Communication	4	**10**
		ELE501B	Microprocessor -8085 & Electronic Instrumentation		
	DSE	ELE502A	Practical - 1	2	
		ELE502B	Practical– 2(Project)	2	
	SEC	ELE503A	PCB - Fundamentals	2	
VI	DSE	ELE601A	Microcontroller - 8051	4	**10**
		ELE601B	Python programming, Arduino and IoT		
	DSE	ELE602A	Practical -1	2	
		ELE602B	Practical -2 (Project)	2	
	SEC	ELE603A	Nanoelectronics	2	
Total Credits					**48**

KLE Society's
R.L.Science Institute (Autonomous), Belagavi
Department of Electronics
B.Sc. - V Semester
DSE1: ANALOG & DIGITAL COMMUNICATION

Course Duration : 16 Weeks **Total Credits : 04** **Total Teaching Hours : 60**

UNIT1: Transmission lines& Antennas: 15 Hours

Transmission lines - Types and equivalent circuit of T-lines, primary and secondary constants. reflection co-efficient, VSWR and CSWR,standing wave ratio in terms of reflection coefficient and vice versa, impedance matching – single stub and double stub.

Antennas -Radiation mechanism, radiation pattern and current distribution for different lengths, non - resonant antenna, antenna parameters-gain, directive gain, power gain, bandwidth, beam width, polarization, efficiency, radiation resistance, total effective resistance, derivation for the power radiated by antenna and expression for radiation resistance. Qualitative study of dipole antenna, Yagi Uda antenna, helical antenna, and loopantenna, Problems

UNIT2: Analog Modulation Techniques &**Radio Receivers** : **16 Hours**

Block diagram of electronic communication system. modulation-needand types of modulation. Amplitude modulation –modulation index, expression for instantaneous voltage, power relations, frequency spectrum, AM collector modulator. Limitations of AM. Frequency Modulation -modulation index, FM frequency spectrum diagram, bandwidth requirements, frequency deviation. Block diagram of AM transmitter and FM transmitter. **Radio Receivers**: Characteristics of radio receivers-qualitative study of sensitivity, selectivity, signal to noise ratio, fidelity, stability, image frequency and itsrejection. AM superheterodyne receiver– principle, block diagram, FM receiver, Problems.

UNIT3:Digital communication: 16 Hours

Block diagram of digital communication system.Comparison of analog and digital communications. Characteristics of data transmission circuits -information capacity, entropy, bit-rate, baud rate, bandwidth,data transmission speed, noise, cross talk, echo suppressors, distortion and equalizer of digital data. Shannon's theorem, Shannon-Hartley theorem. Sampling process, types of sampling. Sampling theoremNyquist criterion and aliasing effect. Analog pulse modulation techniques - PAM, PWM, PPM, PCM. Quantization, advantages and applications, digital modulation techniques – ASK,FSKandPSK Problems

UNIT4 : Optical Fiber Communication: 13 Hours

Introduction, Block diagram of basic fiber optic communication system. Optical fiber-principle of operation, numerical aperture, angle of acceptance, configurations, losses,couplers Optical emitters-LED and semiconductor LASERS, Optical detectors-APD and PIN diode advantages. Advantages and disadvantages of OFC over metallic cables.

Reference Books:

1. Electronic Communication Systems, George Kennedy, 5th edition, TMHill.

2. Electronic Communication, Roddy and Coolen, 4th edition, PHI.
3. Electronic Communications Systems, Wayne Thomasi, 5th edition.
4. Communication By Gupta and Kumar.
5. Radio Engineering by G.K.Mittal, 20th Edition 2010, Khanna publication
6. Antennas and Micro Wave Propogation by K.D.Prasad 1999, Satyaprakashan publ.
7. Analog and Digital Communication by Simon Haykin
8. Digital Communication by J.S. Chitode
9. Fibre Optic Communication by D C Agarwal, 2nd Edition, 1998 – Wheeler publ.
10. Optical fiber Communication by Keiser. G , 5th Edition 2017 –TMHill

Couse Outcomes:

CO1: Students are able to analyze analog communications in time and frequency domain

CO2: Students understand the importance of noise considerations in communication systems.
CO3: Students can compare and contrast various analog and digital modulation and demodulation techniques

CO4: Students learn the basic elements of optical fiber transmission link, fiber modes, configurations, structures and understand the different types of lisses

Semester V - Practical -1

Credits :02

COMMUNICATION LAB

1. Amplitude Modulation Using Transistor
2. Study of Frequency Modulation
3. Class C tunedamplifier
4. Frequency mixer.
5. IFamplifier
6. Study of PWM.
7. Study of PPM.
8. Study of ASK.
9. Study of FSK.
10. Determination of numerical aperture of OFC.
11. Study of losses (bending, scattering) in OFC
12. Characteristics of OFC.

Note: Minimum of 8 experiments to be performed.

CO1 : Verify and analyze the working of different modulation techniques.

CO2 : Learn the basic elements of optical fiber transmission link and understand the different kind of losses.

Semester V - Practical 2
EL-602P ROJECTWORK

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B.Sc. Electronics Syllabus

Semester V

DSE2: MICROPROSSESOR- 8085 and ELECTRONIC INSTRUMENTATION

Course Duration : 16 Weeks Total Credits : 04 Total Teaching Hours : 60

UNIT1:Introduction to Microprocessor: 15 Hours

Introduction, applications, basic block diagram, speed, word size, memory capacity, classification of microprocessors (mention different microprocessors being used) **Microprocessor 8085:** Features, architecture -block diagram, internal registers, register pairs, flags, stack pointer, program counter, types of buses. Multiplexed address and data bus, generation of control signals, pin description of microprocessor8085.

8085 Instructions-Operation code, Operand &Mnemonics.Instruction set of 8085, instruction classification, addressing modes, instruction format. Data transfer instructions, arithmetic instructions, increment & decrement instructions, logical instructions, branch instructions and machine controlinstructions.

UNIT2:**Stack operations and Microprocessor Programming: 15Hours**

Stack operations, subroutine calls and return operations. Timing diagrams-instruction cycle, machine cycle, T- states, time delay. Programs for data transfer and memory operations (direct & indirect addressing), addition and subtraction of two 8-bit & 16- bit numbers, multiplication, display of smallest / largest of two numbers, display of smallest / largest number in a given array of numbers, sum of a series of 8-bit numbers; sum 8-bit, sorting of numbers in descending / ascending order. 1's and 2's complement of 8-bit and 16-bit numbers. to find square from LOOK-UP table, program to find square-root of a number.

UNIT3:I/O instructions and Interfacing: 15 Hours

I/O instructions and, interrupts in 8085. Basic interfacing concepts, compatible ICs of μP8085, data transfer, synchronous I/O data transfer using interrupts.Memory interfacing – address decoding, interfacing RAM and ROM.Interfacings I/O devices– input port, output port, IN & OUT instructions, interfacing input and output devices (LED display interfacing-block diagram).PPI IC 8255– features, pin diagram, functional block diagram, ports & their modes.

UNIT4:Electronic Instrumentationand Bio Medical Instruments 15 Hours

Introduction to general measurement system – characteristics - definition –static & dynamic. Transducers, types – resistive, capacitive and inductive transducers, strain gauge, LVDT, photoelectric transducers, pressure transducers-MIC and loud speaker, signal conditioning (concept only), Origin of bio-electric signals, resting & action potential – propagation, physiological transducers – active & passive transducer for

medical application – diagnostic & analytical equipments -electrodes for ECG, EEG, block diagram of ECG and EEG systems.

Text Books:

1. Microprocessor Architecture, Programming and Applications with 8085, Ramesh S.Gaonkar - Wiley Eastern Limited- IVEdition.
2. Fundamentals of Microprocessor & Microcomputer: B.Ram—DanpatRaiPublications.
3. Instrumentation devices and systems: Rangan, Sarma, Mani,TMH
4. Handbook of biomedical instrumentation: Khandpur R S,TMH
5. Electronic Instrumentation- H. S. Kalsi, TMH,2004

Reference Books:

1. Microprocessor and Interfacing- Programming & Hardware, Douglas Hall, TMH, 2nd edition,1991
2. Modern Digital Electronics, R.P. Jain–TMH–2ndEdition.
3. Microprocessor and its Applications- R.Theagarajan, S. Dhanasekaran and S. Dhanapal–NewAgeInternationalPublishers.
4. Microprocessors and Microcontrollers-B.P singh, Galgotiapublications.
5. The Intel Microprocessors 8086/8088,80186,386,486, architecture, Programming and interfacing – Barry. B. Bray, PHI, New Delhi.
6. Microprocessor Lab Manual- G.T Swamy- Lakshmi Publications 2006.
7. Instrumentation Measurement and analysis: Nakra B C, Chaudry K K,TMH
8. Measurement systems applications and design: Doeblin E O, McGraw Hill,1990.
9. Electron measurements and instrumentation techniques: Cooper W D and Helfric A D, PHI,1989.
10. Biomedical instrumentation and measurements: Leslie-Cromwell, Fred J Weibell, Erich A Pfeiffer, PHI,1994.
11. Instrumentation, Measurement& Feedback by Barry Jones,PHI
12. Electronic Instrumentation and Measurements, David A Bell, PHI /Pearson Education,2006.
13. Electronics & electrical measurements, A K Sawhney, DhanpatRai& sons, 9th edition.
14. Biomedical Instrumentation - M.Arumugham, AnuraçlhaAgencies
15. Bio Medical Instrumentation Engineering – LesleeandChronewell.

Couse Outcomes:

CO1: Students are able to describe the architecture and organization of microprocessor along with instruction set format.

CO2:They are able to list, describe and use of different types of instructions and interrupts.

CO3: Students can develop assembly language programmes using various programming tools and learn interfacing techniques.

CO4: They will have a deep understanding about instrumentation concepts which can be applied to Control systems.

Semester V - Practical 1
MICROPROSSESOR and ELECTRONICINSTRUMENTATION

1. Program to add (with carry) 8 bit numbers
2. Program to subtract two 8 bit numbers
3. Program to add & subtract two 16-bit numbers
4. Program to multiply two 8-bitnumbers.
5. Program to sort the given array of numbers (ascending/descending order).
6. Program to find the largest/smallest number in the given array of numbers.
7. Program to find the ratio (division) of two 8-bitnumbers.
8. Program to find the 1's & 2's complement of given 8-bit number
9. Program to find the 1's & 2's complement of given 16-bit number
10. Interfacing seven-segmentdisplay
11. Interfacing DAC card to convert digital input to equivalent analog output (preferably using IC DAC 08 and IC741)
12. Interfacing a steppermotor.
    Note: Minimum of 8 experiments to be performed.

CO1 : Students will learn to write and execute assembly language programmes in 8085.

CO2 : Students learn the different types of interfacing concepts.

Semester V - Practical 2

EL-602PPROJECTWORK

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B.Sc. Electronics Syllabus

Semester VI

DSE1:MICROCONTROLLER - 8051

Course Duration : 16 Weeks **Total Credits : 04** **Total Teaching Hours : 60**

UNIT1:Introduction to Microcontrollers : 16Hours

Basic block diagram, comparison of microcontroller with microprocessors, comparison of 8 bit, 16 bit and 32 bit microcontrollers. Comparison of 8051, 8031. **Microcontroller8051-** architecture **-**internal block diagram, key features of 8051, pin diagram, memory organization, Internal RAM memory, Internal ROM. General purpose memory, special purpose/function registers, externalmemory. Counters and timers – 8051 oscillator and clock, program counter, TCON, TMOD, timer counter interrupts, timer modes of operation. Input / output ports and circuits/ configurations, serial data input / output – SCON, PCON, serial data transmission modes.

UNIT2: 8051- Interrupts, Addressing modes and Instruction set: 14 Hours

Interrupts – IE, IP. Addressing modes–immediate addressing, register addressing, direct and indirect addressing, Data transfer instructions – internal data move, external data move, Push and Pop and data exchange instructions. Logical Instructions – byte level logical operations, bit level logical operations. Arithmetic Instructions – flags, incrementing and decrementing, addition, subtraction, multiplication and division, decimal arithmetic, Jump and call instructions – jump and call program range, jumps, calls and subroutines, interrupts and returns, simple programs in assembly language.

Unit 3: 8051 programmingin C: 15Hours

Data types and time delays in 8051C, I/O programming, logic operations, data conversion programs, accessing code ROM space, data serialization.
Programming 8051 Timers, Counter Programming, programming timers 0 and 1 in 8051C Interrupts Programming: 8051 Interrupts, Programming Timer Interrupts, External Hardware Interrupts.
Programming serial data transfer, Programming the Serial Communication Interrupts, Interrupt Priority in the 8051/52, Interrupt programming in C.

Unit 4:IntroductiontoEmbeddedSystems: 15 Hours

OverviewofEmbeddedSystems,Features,Requirements and Applications, Recent Trends in the Embedded System Design, CommonarchitecturesfortheEmbeddedSystemDesign,EmbeddedSoftwaredesignissues.Introduction to microcontrollers, Overview of Harvard architecture and Von Neumannarchitecture,RISCandCISCmicrocontrollers

Reference Books:

1. 8051 Microcontroller and Embedded systems – M AMazidi and J G Mazidi, Pearson Education Asia, 2002.

2. The 8051 Microcontroller Architecture, Programming and applications – K A Ayala, PENRAMPublication, 1996.

3. Programming and customizing the 8051 microcontroller – MykePredko, TMH, 2002.

Couse Outcomes:

CO1: Students gain comprehensive knowledge about architecture and addressing modes of 8051.

CO2:They are able to list, describe and use of different types of instructions and interrupts.

CO3: Students learn about timer and counter programing using C

CO4: They understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.

Semester VI - Practical -1

Experiments on MicrocontrollerProgramming:

01. Program to add and subtract two 8-bitnumbers.
02. Program to multiply and divide two 8-bitnumbers
03. Program to find largest of Nnumbers.
04. Program to find smallest of Nnumbers
05. Program to arrange the numbers in ascendingorder.
06. Program to arrange the numbers in descending order.
07. Program to interface 7- segment display.
08. Program to interface Stepper Motor.
09. Program to find 2's complement of a 16-bitnumber.
10. Program to find the sum of N 8-bitnumbers.

Note: Minimum of 8 experiments to be performed.

CO1 : Students will learn to write and execute assembly language programmes in 8051 microcontroller

CO2 : Students learn the different types of interfacing techniques using C programming.

Semester VI - Practical 2

EL-602PPROJECTWORK

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B.Sc. Electronics Syllabus

VI – SEMESTER

DSE2: PYTHON PROGRAMMING, ARDUINO AND IOT

Course Duration: 16 weeks Total Credits : 04 Total teaching Hours : 60

UNIT1: Python Programming 15 Hours

Introduction: The python programming language, history, features, installing python, running python program, comments in python, data types, variable and keywords, type conversion, operators in python.

File handling: working with open, read, write,append modes of file

Conditional statements: Indentation in pythonif,if-else,nested if-else statements

Looping Statements: for loop, while loop, nested loops

Control statements: break, continue and pass

UNIT 2: Arduino 15 Hours

Introduction: Arduino, types of Arduino, Arduino UNO, Arduino IDE, Arduino data types, function library, operators, control statement, loop statement, arrays, strings, interrupts. Arduino interfacing: Temperature and gas Sensor interfacing with Arduino, actuator interfacing (Preferably Step Motor) with an Arduino.

UNIT3: IoT - I 15 Hours

IntroductiontoIoT: Introduction,Originofterminology,Characteristics,Evolutionofconnected devices, Modern Day IoT applications, Baseline Technologies (Machine to machine(M2M) communications, cyber physical systems, Web of Things(WoT))

Computer communication concepts: OSI layers, components, packet communication, Networks,TCP-IP,subnetting,IPv4addressingandchallenges.IPv6addressing.IoTarchitecture referencelayer.

UNIT4: IoT – II 15 Hours

IoT protocols: MQTT, UDP, HTTP, COAP, XMPP and gateway protocols (All the protocols in brief)

Network Connectivity: IEEE 802.15.4: Feature, variants, types, Frames, Beacon of Enabled Networks and Non-Beacon Enabled Networks.

Zigbee: Features, Components, Topologies, Types, Zigbee Network layer, Applications.

6LoWPAN protocol: Introduction, Features, Addressing, LOADing Routing, RPL Routing.

RFID: Introduction, Working Principle, Applications.

BLUETOOTH: Introduction, Working Principle, Applications.

Sensor Networks: Target tracking, Wireless Multimedia Sensor Networks (WMSNs),Stationary Wireless Sensor Networks (SWSN), Mobile Wireless Sensor Networks (MWSN), UAV Networks.

Industrial IoT: Industrial IoT Case Study: Agriculture, Healthcare, Activity Monitoring.

Text Books:

1. Gowrishankar S, Veena A – 'Introduction to Python programming" 1st edition, crcpress/taylor and francis 2018.
2. Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, SebastianLange,StefanMeissner,"Enablingthingstotalk–Designing IoTsolutionswith the IoT Architecture Reference Model",Springer Open,2016.
3. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, StamatisKarnouskos, Stefan Avesand,David Boyle, "From Machine to Machine to Internet of Things",Elsevier Publications, 2014.

Reference Books:

1- T. Budd, exploring python, tmh,1st edition - 2011

2- LuYan, Yan Zhang, Laurence T. Yang, HuanshengNing, **The Internet of Things: From RFID to the Next-Generation Pervasive Network**, Aurbach publications,March,2008.

3- Vijay Madisetti ,ArshdeepBahga, Adrian McEwen (Author), HakimCassimally **"Internet of Things A Hands-on-Approach"**ArshdeepBahga& Vijay Madisetti, 2014.

Couse Outcomes:

CO1: Students are able to explain basic principles of Python programming language

CO2:They are able to build a prototype using Arduino Uno.

CO3: Students understand the concept of internet of things and implement interfacing of various sensors with arduino.

CO4: Students study different IoT protocols, working principle and applications of RFID & BLUE TOOTH and do the industrial IoT case study

Semester VI - Practical 2

1. Write a Python program to generate the Fibonacci series
2. Write a Python program to check whether the given number is palindrome or not.
3. Write a Python program to find GCD of twonumbers.
4. Write a Python Program to check the given number is even or odd.
5. Write a Python program to convert decimal to binary, octal and hexadecimal.
6. Write a Python Program to find the largest from a list ofnumbers.
7. Write a Python Program to find the smallest from a list of numbers
8. Write a Python Program to sum all the items in a list.
9. Write a Python Program to multiply all the items in a list.
10. Write a Python Program to interchange first and last element in a list.
11. Write a Python Program to swap two elements in a list
12. Write a Python program to count occurrences of an element in a list.

Note: Minimum of 8 experiments to be performed

CO1 : Students will learn to prepare small projects using Arduino Uno

CO2 : Students will interact with hardware, sensors, and actuators and control IoT projects
through Python

Semester VI - Practical 2

EL-602PPROJECTWORK

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Skill Enhancement Course (SEC)-V SEM

PCB FUNDAMENTALS

Course Duration: 16 weeks **Total Credits: 02** **Total Teaching Hours : 30**

UNIT1: Types of PCB & Layout and Artwork: 15 Hours

Types of PCB: Single sided board, double sided, Multilayer boards, Plated through holes technology, Benefits of Surface Mount Technology (SMT), Limitation of SMT, Surface mount components: Resistors, Capacitor, Inductor, Diode and IC's.

Layout and Artwork: Layout Planning: General rules of Layout, Resistance, Capacitance and Inductance, Conductor Spacing, Supply and Ground Conductors, Component Placing and mounting, Cooling requirement and package density, Layout check. Basic artwork approaches, Artwork taping guidelines, General artwork rules: Artwork check and Inspection

UNIT2: Laminates and Photo printing, etching & Soldering Technology of PCB: 15 Hours

Laminates and Photo printing: Properties of laminates, Types of Laminates, Manual cleaning process, Basic printing process for double sided PCB's, Photo resists, wet film resists, Coating process for wet film resists, Exposure and further process for wet film resists, Dry film resists. **Etching & Soldering:** Introduction, Etching machine, Etchant system. Principles of Solder connection, Solder joints, Solder alloys, Soldering fluxes. Soldering, Desoldering tools and Techniques. **Technology OF PCB:** Design automation, Design Rule Checking; Exporting Drill and Gerber Files; Drills; Footprints and Libraries Adding and Editing Pins, copper clad laminates

Reference Books:

1. "PCB DESIGN AND TECHNOLOGY" by Walter C.BosshartTata McGraw Hill Publications, Delhi. 1983
2. "Printed circuits Handbook" byClydeF.CoombsIII Edition, McGraw Hill.
3. "Fabricating Printed Circuit Boards " byJonVarteresian

Couse Outcomes:

CO1: Students can explore different aspect of Printed Circuit Board Design and fabrication.
CO2: Students can learn various types of PCBs. Schematic Design. entry Rules for Schematic Entry, Component Layout methods
CO3: Placement Rules, Routing Techniques for Single Sided Board.
CO4: Students can design and fabricate their own PCB for their Project and can also work in PCB Designing and Fabrication area.

Skill Enhancement Course (SEC)-VI SEM

Nanoelectronics

Course Duration: 16 weeks **Total Credits : 02** **Total Teaching Hours : 30**

Unit-1:Introduction to Nanoelectronics: 15Hours

Introduction: Definition of Nano-Science and Nano Technology, Applications of Nano-Technology.**Introduction to Physics of Solid State:** Size dependence of properties, bonding in atoms andgiantmolecularsolids,Electronicconduction,Systemsconfinedtoone,twoorthreedimensionandtheireffectonproperty**Quantum Theory for Nano Science:** Time dependent and time independent Schrodingerwave equations. Particle in a box, Potential step: Reflection and tunneling (Quantum leak).Penetration of Barrier, Electron trapped in 2D plane (Nano sheet), Quantum confinementeffectinnanomaterials.**QuantumWells,WiresandDots:**PreparationofQuantumNanostructure;SizeandDimensionality effect, Fermi gas; Potential wells; Partial confinement; Excitons; SingleelectronTunneling,Infraredetectors;QuantumdotlaserSuperconductivity.

Unit-2:GrowthTechniquesofNanomaterials: 15Hours

GrowthTechniquesofNanomaterials:Syntheticaspects:bottomupandtopdownapproaches , Lithograpahic and Nonlithograpahic techniques, Sputtering and film depositionin glow discharge, DC sputtering technique (p-CuAlO2 deposition). Thermal evaporationtechnique, E-beam evaporation, Chemical Vapour deposition(CVD), Synthesis of carbonnano-fibres and multi-walled carbon nanotubes, Pulsed Laser Deposition, Molecular beamEpitaxy, Sol-Gel Technique (No chemistry required), Synthesis of nanowires/rods, Electrodeposition, Chemical bath deposition, Ion beam deposition system, Vapor-Liquid –Solid(VLS)methodofnanowire

ReferenceBooks:

1. NanoscaleScienceandTechnology,RobertW.Kelsall,IanW.HamleyandMark Geoghegan,JohnWiley&Sons,Ltd.,UK,2005.
2. Nanomaterials:synthesis,propertiesandapplications,InstituteofPhysics,1998.
3. IntroductiontoNanotechnology,CharlesP.PooleJrandFrankJ.Owens,WileyInterscience,2003.
4. ElectronMicroscopyandanalysis,2nded.TaylorandFrancis,2000.
5. Bio-InspiredNanomaterialsandNanotechnology,EditedbyYongZhou,NovaPublishers.
6. Modernmagneticmaterials:principlesandapplications,JohnWiley&Sons,2000.
7. Nano:TheEssentials:UnderstandingNanoscienceandNanotechnology,T.Pradeep,TataMcGraw-HillPublishingCompanyLimited,NewDelhi,2008.
8. Nanobiotechnology,concepts,applicationsandperspectives,Wiley-VCH,2004.

Couse Outcomes:

CO1: Explain the fundamental of quantum mechanics behind Nano electronics, concepts of nanoscale MOSFET, CMOS scaling with its limits.
CO2: Explore various application areas of Nano electronics.
CO3: Ability to perform simple analysis of nanoelectronic devices
CO4: Ability to calculate the density of states in nonelectronic devices.