K.L.E. Society's

R. L. Science Institute (Autonomous), Belagavi

DEPARTMENT OF ELECTRONICS

B.Sc. (Basic/Honors) ELECTRONICS

DSCC & OEC Syllabus

(NEP)

of

Undergraduate Programme

B.Sc. III & IV Semester

w.e.f Academic year 2022-23

Semester- III

CourseObjectives: After thesuccessful completionofthecourse, thestudentwill beable to:

- Theabilityto codeand simulateanydigital functionin VerilogHDL.
- Knowthedifferencebetweensynthesizableandnon-synthesizablecode.
- Understandlibrarymodelling,behaviouralcodeandthedifferencesbetweensimulatoralgorithmsandlogic verification usingVerilog simulation.
- Learngood codingtechniquesrequired forcurrent industrialpractices.
- Gaintheknowledgeofprogrammingthesystemusing Cprogramminglanguage.

ELECT3.1 : ProgramminginCandDigitalDesign usingVerilog(Theory)

(Credits: Theory – 04, Practical– 02) Total Teaching Hours:56

UNIT-1 14 Hrs

C Programming: Introduction, Importance of C, Character set, Tokens, keywords, identifier, constants,basicdata types, input output statement – sprintf(), scanf() and getch().**variables:** declaration& assigning values. Structureof C program.

Operators & Expressions: Arithmeticoperators,relationaloperators,logicaloperators,assignmentoperators,incrementanddecrement operators, conditional operators, bitwise operators, expressions and evaluation of expressions,typecast operator, implicit conversions, precedenceof operators.

Decisionmaking,branching,andlooping:if,if-else,else-if,switchstatement,break,forloop,whileloopand doloop.

UNIT-2 14 Hrs

Arrays: Basics of arrays, declaration, accessing elements, storing elements, two-dimensional and multi-dimensional arrays. and library functions (math andstringrelated functions).

Functions: Defining functions, function arguments and passing, returning values from functions, exampleprograms.

Pointers: Pointerdeclaration,assigningvaluestopointers,pointerarithmetic,arraynamesusedaspointers,pointers used as arrays,pointers and text strings,pointers as functionparameters.

Structures: Structuretypedeclarations,structuredeclarations,referencingstructuremembers,referencingwholestructures, initialization ofstructures, structurebit fields

UNIT-3 14 Hrs

Overviewof VerilogHDL: EvolutionofCAD,emergenceof HDLs,typicalHDLflow,TrendsinHDLs.

Hierarchical Modelling Concepts: Top-down and bottom-up design methodology, differences betweenmodules and module instances, parts of a simulation, design block, stimulus block, Lexical conventions.Datatypes, system tasks,compilerdirectives.

ModulesandPorts: Moduledefinition,portdeclaration,connectingports,hierarchicalnamereferencing.

Gate-Level Modelling: Modelling using basic Verilog gate primitives, Description of and/or and buf/nottype gates, Rise, fall and turn-off delays, min, max, and typical delays. Combinational logic circuit designusingGate level modeling

UNIT-4 **14 Hrs**

DataflowModelling: Continuousassignments,delayspecification,expressions,operators,operands,operatorty pes.

Behavioral Modelling: Structured procedures, initial and always, blocking and non-blocking statements.Delay control, generate statement, event control, conditional statements, Multiway branching, loops,sequentialand parallel blocks.

Tasks and functions: Differences between tasks and functions, declaration, invocation, automatic tasksandfunctions. Combinationaland sequentiallogiccircuit designusing allthreemodeling

Reference Books:

1. SamirPalnitkar,"VerilogHDL:AGuidetoDigitalDesignandSynthesis,"2nd Edition,PrenticeHallPTR, 2006.
2. E.Balagurusamy,"ProgramminginANSIC",4th Edition, TataMcGraw-Hill,2008.
3. DonaldE.Thomas,PhilipR.Moorby,"TheVerilogHardwareDescriptionLanguage",5th Edition,Springer, 2002.
4. MichaelD.Ciletti,"AdvancedDigitalDesignwiththeVerilogHDL",2nd Edition,PearsonEducation,2010.
5. Padmanabhan,TripuraSundari,"DesignthroughVerilogHDL", WileyEastern,2016.
6. NazeihM.Botors,"HDLProgrammingVHDLandVerilog",1st Edition,DreamtechPublication,NewDelhi , 2006.
7. YashavantP.Kanetkar,"LetusC",18th Edition,BPBPublications,2021.
8. TJeyapoovan,"AFirstCourseinProgrammingwithC,"VikasPublishingPvtLTD,2004.
9. KevinSkahill,"VHDLforProgrammableLogic,"PearsonEducation,2006.
10. CyrilPR,"FundamentalsofHDLDesign,"Pearson,2010.

Course Outcomes (COs):After the successful completion of the course, the student will be able to:

CO1: Apply the acquired knowledge of digital circuits in different levels of modeling using Verilog HDL.

CO2: Develop the programs more effectively using directives, Verilog tasks and constructs.

CO3: CO5.Design and analyse algorithms for solving simple problems using C.

CO4: Write and execute and debug C codes for solving problems.

ELECP3.1 Programming inC and Digital Design usingVerilog(Practical)
Part-A:Programming in C Laboratory

Write and execute C Program to

1. Find the area of triangle for given three sides
2. Find the fibonacci series up to the given limit N
3. Findthefactorialof agiven number
4. Check the prime number in a series
5. Find the roots of quadratic equation
6. Find the gross salary of an employee
7. Remove all vowels from a string
8. Upper case and lower-case conversion and vice-versa
9. Arrange the array in ascending and descending order
10. Check whether the string is palindrome or not
11. To perform arithmetic operations for a matrix.
12. Display prime numbers between intervals 0 to100
13. Find GCD of two numbers.
14. Write a C-program to find the transpose of given MxN matrix

Part–B:VerilogHDLLaboratory

Writeand executeVerilogcodetorealize

1. Realization of logic gates.
2. Encoder without priority and with priority.
3. Multiplexer,De-multiplexer.
4. Comparator,Code converters –Binary to Gray and viceversa.
5. Adder/Subtractor (Half and Full) using different modeling styles.
6. 4-bit parallel adder and 4-bit ALU/8-bitALU.
7. To realize counters:Up/Down(BCDandBinary).
8. 4-bit Binary counter, BCDcounters (Synchronous reset) and any arbitrary sequence counters.

Note: Minimum 5 programs from Part - A & Part – B has to be performed.

Course Outcomes (COs):After studying this course, students will be able to:

CO1: Develop a C program & control the sequence of the program and give logical outputs
CO2: Construct the combinational circuits, using discrete gates and programmable logic devices.

ELE OEC3.1 : Fundamentals of Electronics.(Theory)

(Credits: Theory – 03) Total Teaching Hours:45

UNIT – 1 14 Hrs

PassiveComponents: Overviewofpassivecomponents-Fabrication,Types,colourcoding,andapplications.

Transformer:Principle,constructionandworking,turnratio,Typesoftransformers(StepupandStepdown).

Semiconductors:Intrinsicandextrinsicsemiconductors.

Diodes:P-NJunctiontheory,V-I Characteristics,Rectifiers,Clippers,andClampers(Qualitativeanalysisonly).

Specialdiodes: Zenerdiode,LEDandLDR;Construction,workingandapplications.

UNIT – 2 14 Hrs

Bipolar Junction Transistor (BJT): Physical structures, modes of operations, characteristics. Transistorasan amplifier, RC-Coupled amplifier, Darlingtonpairs, Transistor asaswitch.

FieldEffectTransistor(FET): Physicalstructuresandmodesofoperations,Characteristics.

ElectronicInstruments:Ammeter,Voltmeter-designandconstruction,analogmillimeter,Digitalmillimeter,functiongenerator(Qualitativeanalysisonly).CathodeRayTube(CRT),CathodeRayOscilloscope(CRO)-Block diagram.

Digital fundamentals: Binary numbers, signed binary numbers, binary to decimal and Decimal to Binaryconversion,Binary additions,and Subtractions,

Logicgates:AND,ORandNOTgates.

UNIT – 3 14 Hrs

Component and Device Applications :To designand Constructatleast Tenof thefollowing circuits.

1. V – I characteristics of a semiconductor diode.
2. V–IcharacteristicsofZenerdiode.Determinationofbreakdownvoltage.
3. V–Icharacteristicsof LED.Determination ofCut-in voltage.
4. CharacteristicsofLDR.
5. Halfwaverectifier;with andwithoutfilter.Determinationofripplefactor.
6. Fullwave rectifier(Centretap/Bridge);Withand withoutfilter,determinationofripplefactor.
7. Zenerdiodevoltageregulator;determinationoflineand loadregulation.
8. Clippingcircuits;Positiveclipper,NegativeClipper,Biasedpositiveandnegativeclippers.Tracetheinputa nd output waveforms.
9. Clampercircuits:Positiveclamper, NegativeClamper.Tracetheinputandoutputwaveforms.
10. Inputandoutputcharacteristicsofa transistorinCommonEmitterconfiguration,determineofcurrentgain β.
11. Inputandoutputcharacteristicsofatransistorincommonbaseconfiguration,determinethecurrentgain α.

12. Transistorasaswitch.
13. ConstructRCcoupledamplifier.Plotthefrequencyresponse curveanddeterminethebandwidth.
14. V-ICharacteristicsofCommonSource(CS)configurationofFET. Determinethecurrentgain.
15. Constructanammetertoread(0-1ma)of current.
16. Constructavoltmetertoread(0-1volt).
17. MeasureVp, Vppand Timeperiod ofSineand Squarewaves using CRO.
18. ConstructOR,ANDandNOTgatesusingdiodesandtransistors.Verifythetruthtables.
19. Verifythetruthtables OR,ANDandNOTgates usingIntegratedChips(ICs).
20. Constructfour-bitbinary adder.

References:

1. ATextbook ofElectronics"R. S.Sedha; SChandand Co, 3rd edition.
2. ATextbook ofElectronics"R. S.Sedha; SChandand Co, 3rd edition.
3. BasicElectronics",B L Theraja,SChandand Co,3rd edition 2012
4. ElectronicDevices",DevidBell,RestonPublishingCompany.
5. ElectronicDevices and CircuitTheory",Pearsonedition.
6. DigitalPrinciplesandApplications",MalvinoandLeach
7. Electronicstextlabmanual",PaulBZabar

Course Outcomes (COs) : After successful completion of the course student will be able to:

CO1: Know the characteristics of diodes and transistors and basic number system

CO2: Design simple circuits and mini projects.

ELE OEC3.2ApplicationofElectronics-1 (Theory)

(Credits: Theory – 03) **Total Teaching Hours:45**

Unit–1:BasicElectronics **12Hrs**

Introductiontocircuitcomponents-
Resistors,capacitors,inductor,transformer,diodeandtransistor.Symbols,pimples. LEDandLCDdisplay,relay, fuse,switches,wires.AC andDCapplications.

Unit-2:AppliedElectronics **13Hrs**

Electronicinstruments:DMM,CRO,Biomedicalinstruments-ECG,EEG,EMG,pHmeter,X-ray,sphygmomanometer,Glucometer,Digitalthermometer.Sensor-OMR,MICR,Scanner,Barcodereader.

Unit-3:PowerSupplies **10Hrs**

Dcpowersupply,Rectifiers-principle,Types
InverterandUPS.AdopterandSMPS.InverterandUPS.Mobilechargers.

Unit-4:Electroniccalculators **10Hrs**

Types,Functionsof Basiccalculators-blockdiagram, Keypadusing,useof calculator.

References:

1. BasicElectronics-SolidState–BLTheraja-SChandAndCompanyLtd

2. ElectronicDevicesAnd CircuitTheory –Robert LBoylestadAndLouisNashelsky(PHI)

Course Outcomes (COs) : After successful completion of the course student will be able to:

CO1 : Do AC and DC analysis of Semiconductor Devices.& Design and simulation of electronics power supply

CO2 : Measure biomedical and physiological information

ELE OEC3.3 Robotics.(Theory)

(Credits: Theory – 03) Total Teaching Hours:45

Unit–1:

DefinitionsofRobots,Robotics,Motivation,ABriefHistoryofRobotics,ARobotSystem,InterdisciplinaryAreasin Robots,ClassificationofRobots,Introductiontoembeddedsystem,Understanding Embedded System, Overview of basic electronics and digital electronics. Microcontrollervs. Microprocessor, Common features of Microcontroller. Comparison between the two Different types ofmicrocontrollers. Sensors, Classification of sensors (contact & non-contact), characteristics of sensors,Touchsensor,Positionsensor,opticalsensor, IR,PIR,Ultrasonic,temperature,displacementsensor.

Unit-2:

GettingStartedwithProgrammingplatformofRobots:InstallationofIDE,Pinconfigurationandarchitecture of Microcontroller (Atmel series/arduino), Device and platform features.Concept of digitaland analog ports.Familiarizing with Interfacing Board, Introduction to Embedded C platform, Review ofBasic Concepts, Arduino data types, Variables and constants, Operators, Control Statements, ArraysFunctions,I/oFunctions,PinsConfiguredasINPUT,PinsConfiguredasOUTPUT,Incorporatingtimedelay ()function, delayMicroseconds()function ,millis()function ,micros()function

Unit-3:

Programming different types of Robots:

1. Temperature&Humidity controlledRobot(FanRegulation,thermostat)
2. Infra-RedsignalControlledRobot(Measuringthe speedofthevehicle)
3. Ultra-sonicsignaloperatedRobot(automaticTap system/HandDrier/Floor drier)

ObstacleFollower&avoiderRobot

References:

1. FundamentalsofRoboticsbyDKPratihar

2. RoboticsSimplified:AnIllustrativeGuidetoLearnFundamentalsofRobotics,byDr.JisuElsaJacob, Manjunath N

3.IntroductiontoRobotics|FourthEdition byJohnCraig

4.ArduinoRoboticsbyJohn-DavidWarren (Author),JoshAdamsduino

5. Programmingin24Hours byRichardBlum

6.GettingStartedwithArduino:TheOpenSourceElectronicsPrototypingPlatformBookbyMassimoBanziand Michael Shiloh

Course Outcomes (COs) :After successful completion of the course student will be able to:

CO1 : understand basic components of robotics, classification of robots and their applications.

CO2 : understand about various types of sensory devices their working and applications.

Semester IV

CourseObjectives:

- Tounderstandthecommunicationsystem,Principleandworkingcommunicationsystem,meansandmedium of communication.
- TounderstandthePrincipleandworkingofdifferentmodulation techniques.
- Willbe ableto differentiatebetween analogand digitalcommunication.
- Tounderstandthe Principleand workingofSatelliteandoptical fibrecommunication.

Semester- IV

ELECT 4.1: ElectronicCommunication-I(Theory)

(Credits: Theory – 04, Practical– 02) Total Teaching Hours: 56

UNIT-1 14 Hrs

Electronic communication: Introduction to communication – means and modes. Need for modulation.Block diagram of an electronic communication system. Brief idea of frequency allocation for radiocommunicationsysteminIndia(TRAI).Electromagneticcommunicationspectrum,banddesignationsandusage.Channels and base-band signals.Concept ofNoise, signal-to-noise (S/N)ratio.

Propagationof"EM"Wave: Introduction,Lossof "EM"Energy duetonoise,GroundWave,Sky-waveandSpace-wavepropagation. Ionosphereand its effects.

Communicationmedium: Transmissionlines,coaxialcables,waveguidesandopticalfibres.

Antenna: Introduction,Antennaparameters,Ferriterodantenna,yagi-Udaantenna,Dish-antenna,principle,Working andapplications only

UNIT-2 14 Hrs

Analog Modulation: Amplitude Modulation, modulation index and frequency spectrum,FrequencyModulation(FM)andPhaseModulation(PM),modulationindexandfrequency spectrum.

Analog Pulse Modulation: Channel capacity, sampling theorem, Basic Principles- PAM, PWM, PPM,modulationand detection technique for PAM only.

DigitalPulseModulation: Needfordigitaltransmission,PulseCodeModulation.Digital modulation techniques-Binary Generation and detection (coherent and non-coherent) of Binary ASK, FSK, PSK

UNIT-3 14 Hrs

Introduction to Communication and Navigation systems: Satellite Communication Introduction, need,geosynchronous satellite orbits, geostationary satellite advantages of geostationary satellites. Satellitevisibility, transponders (C - Band), path loss, ground station, simplified block diagram of earth station.Uplink anddownlink.

Basics of Radar: Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance,

Minimum Detectable Signal, Receiver Noise, Modified Radar Range

UNIT- 4 14 Hrs

OpticalFiberCommunication:OpticalFibers:Structureandwaveguides,fundamentals,Natureoflight,basic optical laws and definitions, optical fiber types, Rays and modes, ray optics. Signal degradation inoptical fibers, attenuation, scattering losses, radiative losses, absorption losses, core and cladding losses,signal distortion in optical wave guides, group delay, dispersion, pulse broadening in graded index waveguide.

Optical sources: LEDs, structure, source materials, Laser diodes: Structures, threshold conditions, modalpropertiesandradiationpatterns

Optical Receiver Operations: Fundamental receiver operations, digital signal transmission, receiver noise, analog receivers.

References:

1. ElectronicCommunications,D.RoddyandJ.Coolen,PearsonEducationIndia.
2. AdvancedElectronicsCommunicationSystems-Tomasi,6thedition,PrenticeHall.
3. ModernDigitalandAnalogCommunicationSystems,B.P.Lathi,4thEdition,2011,OxfordUniversityPress.
4. K.D.Prasad, "Antenna and Wave Propagation", Satyaprakashan, NewDelhi.
5. SanjeevGupta,"ElectronicCommunicationSystems",KhannaPublishers,NewDelhi.
6. ElectronicCommunicationsystems,G.Kennedy,3rdEdn.,1999,TataMcGrawHill.
7. Principles of Electronic communicationsystems–Frenzel,3rdedition,McGrawHill
8. CommunicationSystems,S.Haykin,2006,WileyIndiaElectronicCommunicationsystem,Blake,Cengage,5th edition.
9. Wirelesscommunications,AndreaGoldsmith,2015, CambridgeUniversityPress
10. GerdKeiser,"OpticalFibreCommunication",McGrawHill,3rdEdn.

Course Outcomes (COs): After the successful completion of the course, the student will be abl to:

CO1: Understand the principle of Analog and digital modulation.

CO2: Familiar with "AM" and "FM" techniques.

CO3: Understand the basic concept of Pulse Modulation, Carrier Modulation for digital transmission and able to construct simple pulse modulation.

CO4: Understand the basic concept of Satellite & Optical Fiber Communication

ELECP 4.1 : ElectronicCommunication-I(Practical)

ListofExperiments

1. Construct amplitude modulator using IC/ Determination of modulation index.
2. Constructfrequencymodulatorcircuit–determine themodulationindex.
3. Frequencymixer circuit–Verifyoutputfrequencyfordifferentinputfrequencies.
4. Study of IF amplifier circuit.
5. Pulse amplitude modulation (PAM) –trace the output waveforms.

6. Pulse width modulation(PWM) –trace the output waveforms.
7. Pulse position modulation(PPM) – trace the output waveforms.
8. Study of ASK.
9. Study of FSK.
10. Study of Numerical aperture
11. Study of OFClosses.
12. Characteristics of OFC

Note: Minimum 8 experiments has to be performed

Course Outcomes (COs): After completion of this course, students will be able to –

CO1: Demonstrate generation and detection of analog and digital modulation techniques.

CO2: Examine the losses and propagation characteristics of an optical signal.

ELE OEC4.1 : ApplicationofElectronics-2 (Theory)

(Credits: Theory – 03) **Total Teaching Hours:45**

Unit–1:IntroductiontoAdvancedCommunication **12Hrs**

Radio, TV- principles, block diagram &

applicationsOFCapplications andadvantages,

Embeddedsystem –Smartcard,SIMcard
Mobiles-Bockdiagram &applications

Unit–2:AdvanceElectronics **12Hrs**

CCTVcamera, ATM-principles,blockdiagram&applications
Electronicvoting Machine(EVM)-CU,BU,VVPAT.,

Unit–3:Application ofSatellite **11Hrs**

Types,EDUSAT,TV& Internet-modem,Wi-Fi.

Unit–4:E-wastemanagement **10Hrs**

Course Outcomes (COs) : After successful completion of the course student will be able to:

CO1 : know the working mechanism of communication gadgets like TV & radio and also analyze various satellite subsystems and its functionality

CO2 : Apply various concept learned under e-waste management hierarchy.

E-wastemanagement-identification,segregation,disposal

ELE OEC 4.2 : IOTandApplications (Theory)

(Credits: Theory – 03) **Total Teaching Hours:45**

Unit–1: **12 Hrs**

FundamentalsofIoT:Introduction,HistoryofIoT,Definitions&CharacteristicsofIoT,IoTArchitectures,Physical & Logical Design of IoT, Enabling Technologies in IoT, Components of an IoT Solution, IoTframeworks, IoTandM2M,OpenSource andCommercialExamples,Competing Standardsfor IoT

Unit-2: **12 Hrs**

Sensors & Networks: Definition, Traditional Data Storage, Analog and Digital I/O Basics, Types of Sensors,Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types,RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History andContext,Thenode, Connecting nodes, NetworkingNodes, WSN andIoT.

Unit-3: **11 Hrs**

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus. IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP,MQTT.Edgeconnectivity and protocols

Unit-4: **10 Hrs**

DataHandling&Analytics:Introduction,Bigdata,Typesofdata,CharacteristicsofBigdata,DatahandlingTechnologies,Flowof data,Dataacquisition, Data StorageApplications of IoT:HomeAutomation

References:

1. InternetofThings,Vasudevan,NagrajanandandSundaram,WileyIndia.
2. SrinivasaKG"InternetofThings",CengageLearning, India2017.
3. DavidHanes,GonzaloSalgueiro,PatrickGrosstete,RobertBarton,JeromeHenry,IoTfundamentals:Networking Technologies, Protocols and uses cases for the Internet of things, 1st Edition, PearsonEducation.
4. Iot Fundamentals,David Hence etal,Ciscopress.

Course Outcomes (COs) : After successful completion of the course student will be able to:
CO1 : understand building blocks of Internet of Things, characteristics and Sensors Networks.
CO2 : realize the revolution of Internet of things in Wireless Technologies and Data handling and analytics