THE NATIONAL COLLEGE

AUTONOMOUS

Jayanagar, Bengaluru-70

DEPARTMENT OF ELECTRONICS

III Semester B.Sc **PAPER:** Programming in C and Digital Design using Verilog	
Total Teaching Hours : 56	No. Of Lecture Hours/Week:4
Max Marks:60	

Course Objectives

After the successful completion of the course, the student will be able to:.

1. Learn good coding techniques required for current industrial practices.
2. Gain the knowledge of programming the system using C programming language.
3. Code and simulate any digital function in Verilog HDL.
4. Know the difference between synthesizable and non-synthesizable code.

   Understand library modeling, behavioral code and the differences between simulator algorithms and logicverification using Verilog simulation

Course Outcomes

.After the successful completion of the course, the student will be able to:

CO1. Design and analyze algorithms for solving simple problems.

CO2. Know the Basics of C Programming Language

CO2. Write and execute and debug C codes for solving problems

CO3. Apply the acquired knowledge of digital circuits in different levels of modeling using Verilog HDL.

CO4. Design and verify the functionality of digital circuit/system using test benches.

CO5. Develop the programs more effectively using directives, Verilog tasks and constructs

Content	Hrs
UNIT – 1	14
C Programming: 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, bitwise operators, expressions and evaluation of expressions, type cast operator, implicit conversions, precedence of operators.	
Arrays: Basics of arrays, declaration, accessing elements, storing elements, two-dimensional and multi- dimensional arrays. Input output statement – printf(), scanf() and getch(), and library functions (math and string related functions).	
UNIT – 2	14
Decision making, branching, and looping: if, if-else, else-if, switch statement, break, for loop, while loop and do loop. **Functions**: Defining functions, function arguments and passing, returning values from functions, example programs.	
Pointers: Pointer declaration, assigning values to pointers, pointer arithmetic, array names used as pointers, pointers used as arrays, pointers and text strings, pointers as function parameters. **Structures**: Structure type declarations, structure declarations, referencing structure members, initialization of structures.	
UNIT – 3	14
Overview of Verilog HDL: Evolution of CAD, emergence of HDLs, typical HDL flow, Trends in HDLs. **Hierarchical Modelling Concepts**: Top-down and bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block, Lexical conventions. Data types, system tasks, compiler directives.	

Modules and Ports: Module definition, port declaration, connecting ports, hierarchical name referencing.**Gate-Level Modelling**: Modelling using basic Verilog gate primitives, Description of and/or and buf/not type gates, Rise, fall and turn-off delays, min, max, and typical delays. Combinational logic circuit designusing Gate level modeling	
UNIT – 4	14
Dataflow Modelling: Continuous assignments, delay specification, expressions, operators, operands,operator types. **Behavioral Modelling**: Structured procedures, initial and always, blocking and non-blocking statements. Delay control, generate statement, event control, conditional statements, Multiway branching, loops, sequential and parallel blocks.	
Dataflow Modelling: Continuous assignments, delay specification, expressions, operators, operands,operator types. **Behavioral Modelling**: Structured procedures, initial and always, blocking and non-blocking statements. Delay control, generate statement, event control, conditional statements, Multiway branching, loops, sequential and parallel blocks.	

References

1	Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis," 2nd Edition, Prentice HallPTR, 2006.
2	E. Balagurusamy, "Programming in ANSI C", 4th Edition, Tata McGraw-Hill, 2008.
3	Donald E. Thomas, Philip R. Moorby, "The Verilog Hardware Description Language", 5th Edition,Springer, 2002.
4	Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL", 2nd Edition, Pearson Education,2010.
5	Padmanabhan, Tripura Sundari, "Design through Verilog HDL", Wiley Eastern, 2016.
7	Yashavant P. Kanetkar, "Let us C", 18th Edition, BPB Publications, 2021.
8	Byron Gottfried "Progrtamming with C" Second Edition , TMH

Course Code: **3SELE3P** **Title: Programming in C and Digital Design using Verilog (Practical)**	Course Credits: 2
Total Contact Hours: 32Hrs	Duration of ESA: 3 Hrs
Formative Assessment Marks: **25 marks**	Summative Assessment Marks: **25 marks**

Content	Hrs
Part -A: Programming in C Laboratory	16

Write and Execute C Program to

1. Find the area and circumference of a circle.
2. Find the biggest and smallest elements in a series.
3. Find the factorial of a given number.
4. Check the prime number in a series.
5. Find the gross salary of an employee.
6. Upper case and lower-case conversion and vice-versa
7. Reverse a string without using library functions.
8. Check whether the string is palindrome or not.
9. Arrange the array in ascending and descending order using bubble sort.
10. To perform arithmetic operations for a matrix.
11. Display prime numbers between intervals 0 to 100.

Find GCD of two numbers.

Part – B: Verilog HDL Laboratory	16
1. Realization of logic gates. 2. Encoder without priority and with priority. 3. Decoder ,BCD to decimal decoder. 4. Multiplexer, De-multiplexer. 5. Comparator, 6. Code converters – Binary to Gray and vice versa. 7. Adder/Subtractor (Half and Full) using different modelling styles. 8. 4-bit parallel adder and 4-bit ALU/8-bit ALU. 9. SR, D, JK, T-flip-flops. 10. To realize counters: Up/Down (BCD and Binary). **11.** 4-bit Binary counter, BCD counters (Synchronous reset) and any arbitrary sequence counters. 12. Modelling of Universal shift registers.	

Course Code: **OE3-ELE3** **Title: APPLICATION OF ELECTRONICS-1**	Course Credits: 3
Total Contact Hours: 42 Hrs	Duration of ESA: 3 Hrs
Formative Assessment Marks**: 40 marks**	Summative Assessment Marks: **60 marks**
Model Syllabus Authors:	

CONTENT	Hrs
Unit–1: Basic Electronics	14
Introduction to circuit components- Resistors, Capacitors, I nductor, Transformer, Diode and Transistor.Symbols. LED and LCD display, relay, fuse, switches, wires. AC and DC applications.	
Unit -2: Power Supplies	14
DC power supply, Rectifiers-principle, Types Inverter and UPS. Adopter and SMPS. Inverter and UPS. Mobile chargers.	
Unit -3: Amplifiers and Oscillators	**14**
Amplifiers, Types, applications frequency response. Oscillators, types and applications	
Unit -4: Applied Electronics	
Electronic instruments: DMM, CRO, Biomedical instruments-ECG, EEG, EMG, pH meter, X-ray, sphygmomanometer, Glucometer, Pulse Oximeter, Digital thermometer. Sensor-OMR, MICR, Scanner, Barcode reader. Calculators Types, Functions of Basic calculators-block diagram, Keypad using, use of calculator	

Suggested References

1. Basic Electronics-Solid State – B L Theraja - S Chand And Company Ltd.
2. Electronic Devices And Circuit Theory – Robert L Boylestad And Louis Nashelsky (PHI)

FOURTH SEMESTER

IV Semester B.Sc

PAPER IV: 4SELE4T: Electronic Communication-I (Theory)

Total Teaching Hours : 56	No. Of Lecture Hours/Week:4
Max Marks:60	

Course Objectives

1. .To understand the communication system, Principle and working communication system, means and medium of communication.
2. To understand the Principle and working of different modulation techniques.
3. Will be able to differentiate between analog and digital communication.
4. To understand the Principle and working of Satellite and optical fibre communication

Course Outcomes

At the end of the course the student should be able to:

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CO1. Know the basic concept of Analog Communication, means and medium of communication.

CO2. Understand the principle of Analog and digital modulation.

CO3. Familiar with "AM" and "FM"techniques.

CO4. Understand the basic concept of Pulse Modulation, Carrier Modulation for digital transmission andable to construct simple pulse modulation.

CO5. Understand the basic concept of Satellite Communication.

CO6. Understand the basic concept of Optical Fibre Communication

PAPER IV: 4SELE4T: Electronic Communication-I (Theory)

Content	Hrs
UNIT – 1	14
Electronic communication: Introduction to communication – means and modes. Need for modulation. Block diagram of an electronic communication system. Brief idea of frequency allocation for radio communication system in India (TRAI). Electromagnetic communication spectrum, band designations andusage. Channels and base-band signals. Concept of Noise, signal-to-noise (S/N) ratio.	
Propagation of "EM" Wave: Introduction, Loss of "EM" Energy due to noise, Ground Wave, Sky-waveand Space-wave propagation. Ionosphere and its effects.	
Communication medium: Transmission lines, coaxial cables, wave guides and optical fibers.	
Antenna: Introduction, Antenna parameters, Ferrite rod antenna, yagi-Uda antenna, Dish-antenna,principle, Working and applications only	
UNIT – 2	14
Analog Modulation: Amplitude Modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation), Amplitude Demodulation (diode detector), Concept of Single side band generation and detection. Am Super heterodyne Receiver	
Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector), FM Super heterodyne receiver.	
Analog Pulse Modulation: Channel capacity, sampling theorem, Basic Principles-PAM, PWM, PPM,modulation and detection technique for PAM only, Multiplexing	
UNIT – 3	14
Digital Pulse Modulation: Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques.	

Introduction to Communication and Navigation systems: Satellite Communication Introduction, need,Geosynchronous satellite orbits, Geostationary satellite, advantages of geostationary satellites. Satellite visibility, transponders (C - Band), path loss, ground station, simplified block diagram of earth station. Uplink and downlink. Satellite Navigation, GPS, Segments of GPS. SPS and PPS.	
UNIT – 4	14
Optical Fiber Communication: Optical Fibers: Nature of light, basic optical laws and definitions, optical fiber types, Rays and modes, Ray optics. Signal degradation in optical fibers, attenuation, scattering losses, radiation losses, absorption losses, core and cladding losses, signal distortion in optical wave guides, group delay, dispersion, pulse broadening in graded index wave guide.	
Optical Sources: LEDs, Structure, Source materials, Laser diodes: Structures, threshold conditions, modalproperties and radiation patterns. **Optical Receiver**: Fundamental receiver operations, digital signal transmission, analog receivers. Photodiode.	

References	
1	Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
2	Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
3	Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011, OxfordUniversity Press.
4	K.D Prasad, "Antenna and Wave Propagation", Satyaprakashan, New Delhi.
5	Electronic Communication systems, G. Kennedy, 3rd Edn., 1999, Tata McGraw Hill.
6	Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill
7	Communication Systems, S. Haykin, 2006, Wiley India
8	Electronic Communication system, Blake,Cengage, 5th edition.
9	Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press
10	Gerd Keiser, "Optical Fibre Communication ", McGraw Hill, 3rd Edn.

Course Code: **4SELE4P: Electronic Communication-1 (Practical)**	Course Credits: 2
Total Contact Hours: 32 Hrs	Duration of ESA: 3 Hrs
Formative Assessment Marks: **25 marks**	Summative Assessment Marks: **25 marks**
Model Syllabus Authors:	

4SELE4P: Electronic Communication-1 (Practical)

Content	Hrs
Minimum TEN Experiments to be performed	32
1. . Construct amplitude modulator using transistor/I.C. Determination the modulation index. 2. Construct frequency modulator circuit – determine the modulation index. 3. "AM" Liner Diode detector- trace the input and output waveforms. 4. Frequency mixer circuit – Verify output frequency for different input frequencies."FM" Detector – Plot the frequency response curve. 5. Frequency Multiplier. 6. Study of Balanced demodulator. 7. Study of IF amplifier circuit. 8. Pulse amplitude modulation (PAM) – trace the output waveforms. Pulse width modulation (PWM) – trace the output waveforms. 9. Pulse position modulation (PPM) – trace the output waveforms. 10. Characteristics of LED in OFC. Study of Numerical aperture. 11. Study of OFC losses. 12. Setting up simple OFC Link.	