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BE BOUNDLESS

BENGALURU CITY UNIVERSITY

SYLLABUS For B.Sc ELECTRONICS
(I & IV Semester)

CHOICE BASED CREDIT SYSTEM

2020-2021

BENGALURU CENTRAL UNIVERSITY

Department of Electronics

Proceedings of Board of Studies (UG) in Electronics held on 27th Febrauary 2019 at 2 PM in Department of Electronic Science, J.B. Campus, Banglore University, Banglore -560 056.

Members Present	Signature
1. Dr. J.T. Devaraju Professor, Dept. of Electronic Science, Bangalore University, Bangalore-56	Chairman 27/2/19
2. Sri. Ramesh B Patil Assoc. Professor, Dept. of Electronics, HKES Veerendrapatil Degree College, 11th main, 11th cross, Sadashivanagar, Bangalore-80	Member
3. Sri. Revanasiddappa S Masali Assoc. Professor, Dept. of Electronics, HKES Veerendrapatil Degree College, 11th main, 11th cross, Sadashivanagar, Bangalore-80	Member
4. Dr. M. Subramanya Bhat Assoc. Professor, Dept. of Electronics, Vijaya College, R.V. Road, Basavanagudi, Bangalore.	Member ← ABSENT →
5. Sri. R. Mallikarjuna Shetty Assoc. Professor, Dept. of Electronics, Vijaya College, R.V. Road, Basavanagudi, Bangalore.	Member
6. Sri. K.M Thipperudra Swamy Assoc. Professor, Dept. of Electronics, Vivekananda Degree College, Rajajinagar, Bangalore.	Member
7. Sri. Vijayakumar A Patil Asst. Professor, Dept. of Electronics, Basaveshwara College of Arts, Science & Commerce, Rajajinagar, Bangalore.	Member
8. Dr. Godwin D'Souza, Assoc. Professor, Dept. of Electronics, St. Jpseph's College of Arts & Science (Autonomous), Lalbhagh Road, Bangalore.	Member — ABSENT —
9. Dr. Rekha Annigere, Asst. Professor, Dept. of Electronics, GFGC, Kalaburgi	Member — ABSENT —

The Chairman extended a warm welcome to the members and then the agenda was taken up for discussion.

Syllabus for B.Sc I to IV semester in Electronics was prepared and discussed. The board resolved to approve I to IV semester syllabus for B.Sc in Electronics to be implemented effective from academic year 2019-20 and onwards

The Chairman of the BOS thanked members for attending the meeting.

27/2/19

Dr. J. T. Devaraju
Professor and Chairman,
Dept. of Electronic Science,
Bangalore University,
Bangalore - 560056

BENGALURU CENTRAL UNIVERSITY
Central College Campus, Dr.B.R. Ambedkar Veedi, Bangalore -56001.

Syllabus

Subject: Electronics (UG) (Effective from 2020-21)

Semester/ Teaching Hours	Title of the Paper	Hours /week		Max.Marks/paper				Duration of Exam (hours)		Total Marks / paper	Credits
				Theory		Practical					
		Theory	Practical	Exam	IA	Exam	IA	Theory	Practical		
Semester I (52 hours)	Basic Electronics (EL-101T and EL-101P)	4	3	70	30	35	15	3	3	150	4 +2= 6
Semester II (52 hours)	Electronics circuits and special purpose devices (EL-201T and EL-201P)	4	3	70	30	35	15	3	3	150	4 +2= 6
Semester III (52 hours)	Linear integrated circuits and C-Programming (EL-301T and EL-301P)	4	3	70	30	35	15	3	3	150	4 +2= 6
Semester IV (52 hours)	Digital Electronics and Verilog (EL-401T and EL-401P)	4	3	70	30	35	15	3	3	150	4 +2= 6
Semester V (40 +40 hours)		3	3	70	30	35	15	3	3	150	3+2=5
		3	3	70	30	35	15	3	3	150	3+2=5
Semester VI (40 +40 hours)		3	3	70	30	35	15	3	3	150	3+2=5
		3	3	70	30	35	15	3	3	150	3+2=5

Note: Internal assessment marks will be based on attendance, assignment & tests.
In addition to this, internal assessment marks may be awarded for the report submitted by the students towards industrial/Exhibition visits/field visits/study tour

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6)
7)

Dr. J. T. Devaraju
Professor and Chairman,
Dept. of Electronic Science,
Bangalore University,
Bangalore - 560056

B.Sc. Electronics Syllabus
Semester I – Paper 1
EL-101T BASIC ELECTRONICS

Unit 1: **10 hours**
Basic Circuit Concepts
Review of R, L and C

Voltage and current sources: Ideal and practical, conversion from voltage source to current source and vice versa, numerical problems.

DC Transient Analysis: Series RC Circuit- Charging and discharging with initial charge (mention only - no derivations), graphical representation, time constant. RL Circuit with Initial Current, Time Constant, growth and decay equations (mention only), numerical problems.

AC Circuit Analysis: Series RC and RL circuits, Impedance of series RC & RL circuits, Series and parallel RLC circuit, series and parallel resonance, condition for resonance, resonant frequency, band width, significance of quality factor, numerical problems.

Transformer: Principle, construction and working.

Switches: SPST, SPDT, DPST and DPDT, fuse and electromagnetic relay, MCB and ELCB, RCCB– brief note on each.

Unit 2: **08 hours**
Review of KVL and KCL

Circuit Analysis: Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), voltage divider and current divider rules, concept of open and short circuits, Node voltage Analysis, Mesh voltage Analysis, Star-Delta Conversion (no derivations).

Network Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem. Reciprocity theorem (statement only). Maximum Power Transfer theorem (derivation), problems on all theorems (DC analysis only).

Unit 3: **12 hours**
Semiconductor Diode and its Applications

P-N Junction Diode: Ideal diode and diode approximations – representations. Review of PN junction diode, Zener diode and their characteristics, Zener and Avalanche Junction Breakdown Mechanism.

Diode Rectifiers: HWR, FWR (center tapped and bridge type), Circuit diagram, working and waveforms, ripple factor & efficiency (no derivations) and numerical problems.

Filters: Types of filters, circuit diagram and explanation of shunt capacitor filter with waveforms.

Voltage Regulators: Zener diode as regulators, circuit diagram and explanation for load and line regulation, numerical problems on load regulation, disadvantages of Zener diode regulator, Transistor series regulator circuit diagram and working.

Fixed and Variable IC Regulators: IC 78xx and IC 79xx -concepts only, IC LM317- output voltage equation (mention only) and simple numerical problems.

Unit 4: **14 hours**

Bipolar Junction Transistors (BJT): Types of BJT (mention only), Construction, principle & working of NPN transistor, terminology. Transistor configurations, Definition of α, β and γ and their interrelations, leakage currents (mention only), numerical problems. Study of CE

Characteristics with experimental circuit and procedure. Study of CB Characteristics, Concept of Base width modulation-Early effect.

Hybrid Parameters: Definitions, hybrid model of CE configuration.

Transistor Biasing: Need for biasing, DC load line, operating point (Q point), thermal runaway, stability and stability factor (mention the equation-no derivation).

Different Types of Biasing: Mention different biasing circuits. Voltage divider bias, effect of R_E on stability, circuit diagrams and its working. DC analysis of voltage divider bias (Q point analysis), numerical problems.

Transistor as a switch: circuit and working. Darlington pair and its applications,

Field Effect Transistor (FET): Types of FET, construction and working of N- channel Junction Field Effect Transistor (JFET), characteristics, FET parameters and their relationships. Comparison of FET with BJT.

Unit 5: **8 hours**

Number Systems: Binary, hexadecimal – conversion from binary to decimal and vice-versa, binary to hexadecimal and vice-versa, decimal to hexadecimal and vice versa, addition and subtraction of binary numbers and hexadecimal numbers. Subtraction using 2's complement method, signed number arithmetic – addition.

Codes: BCD code: 8421, 2412, excess-3 Code. Gray code, self-complementing property. Gray to binary conversion and vice versa. Parity generator and checker alphanumeric codes.

Text books:

1. A Text book of Electronics, R.S.Sedha, S Chand and Co., 3rd edition, 2012.
2. Electronic Principles, Albert Malvino & David J Bates, TMH, 7th edition-2010
3. Introductory circuit analysis, Robert Boylstead, PHI 5th edition-2010.

Reference books:

1. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition, 2013, PHI
2. Basic electronics- B.L. Theraja - S. Chand and Co. 3rd edition -2012.
3. Electronics text lab manual, Paul B. Zbar.
4. Electric circuits, JoesephEdminister, Schaums series.
5. Electric circuits Book 1,Schaums series - Syed. A. Nasar. Mc-Graw hill edition.
6. Basic Electronics and Linear circuits, N.N. Bhargava, D.C. Kulshresta and D.C
   1. Gupta-TMH.
7. Electronic devices, David A Bell, Reston Publishing Company/DB Tarapurwala Publ.
8. Principles of Electronics By V.K. Mehta, S.Chand & Co.
9. Electronic devices, applications and Integrated circuits, Mathur, Kulshreshta and Chadha, Umesh Publications.

Semester I - Practical I

EL-101P BASIC ELECTRONICS LAB

PART A (Demonstration experiments- not for evaluation)

1. Identification and description of Electronic Components, and their circuit symbols.
2. Familiarization of Electronic instruments: Digital Multimeter, DC Regulated Power Supply- fixed and variable, Function Generator and C.R.O.

PART B (Experiments to be performed)

1. Series resonance
2. Verification of Thevenin's theorem
3. Verification of Super position theorem
4. Verification of Maximum power transfer theorem.
5. V-I Characteristics of a Zener diode.
6. Half wave Rectifier – without and with shunt capacitance filter.
7. Full wave bridge rectifier – without and with shunt capacitance filter.
8. Zener diode as voltage regulator – load and line regulation.
9. Transistor characteristics in CE mode – determination of ri, ro and β.
10. Transistor characteristics in CB mode – determination of ri and α.
11. Study of the I-V Characteristics of JFET
12. Design and study of voltage divider biasing.

Note: Minimum of 8 experiments to be performed

B.Sc. Electronics Syllabus
Semester II – Paper 2
EL-201T ELECTRONIC CIRCUITS AND SPECIAL PURPOSE DEVICES

Unit 1 **12 hours**

Small Signal Amplifiers: Classification of amplifiers based on different criteria, small signal CE amplifier circuit, working and frequency response. r_e model of CE amplifier, derivation for Av, expressions for Zin and Zout. Numerical problems on Av, Zin and Zout. Need for swamped amplifier, circuit diagram of Swamped amplifier, expressions for Av & its applications. Circuit diagram, importance & applications (mention only) of CC-amplifier.

Multistage Amplifiers: Qualitative study of cascaded stages, overall gain of multistage amplifier, loading Effect, numerical problems.

Types of coupling: RC coupled, transformer coupled and direct coupled multi stage amplifier (only circuit diagrams and frequency response graph, advantages and disadvantages for each). Darlington amplifier circuit diagram and its characteristic features.

JFET Amplifier: circuit and operation of JFET amplifier in CS mode, equivalent circuit, derivation for Av, Numerical problems.

Unit 2 **8 hours**

Power and Tuned amplifiers

Power Amplifiers: Difference between voltage and power amplifier, Classification of power amplifiers and their comparisons. Circuit operation of complementary symmetry Class-B push pull power amplifier and derivation for overall efficiency. crossover distortion and heat sinks.

Tuned amplifiers: Single tuned and double tuned amplifiers circuit diagram, working and frequency response for each. limitations of single tuned amplifier. brief note on use of tuned amplifiers in communication circuits.

Unit 3 **8 hours**

Differential Amplifier: Circuit diagram, types of configurations (mention only). Dual Input Balanced Output Differential Amplifier– working, DC and AC analysis, tail current, expressions for Q point, differential gain, common mode gain, CMRR, input impedance and output impedances.

Current Mirror: Circuit diagram and working, differential amplifier with current mirror– circuit diagram and working (explanation of increase in CMRR).

Unit 4 **10 hours**

Feedback Amplifier and Oscillator

Feedback Amplifier: Principle of feedback amplifier, types of feedback, advantages and disadvantages of positive & negative feedback, types of negative feedback configurations- voltage series, voltage shunt, current series and current shunt (block diagram representation for each).

Voltage Series Negative Feedback: Effect of negative feedback on voltage gain-derivation, effect of negative feedback (no derivations) on Stability, Zi, Zo, Bandwidth, Noise & distortion, Numerical problems.

Sinusoidal Oscillators: Principle of oscillator (barkhausen criterion), damped and undamped oscillations, classification of oscillators (LC, RC and crystal oscillators). Study of Collpitt &

Hartley oscillators using transistors (no derivation)and numerical problems. Equivalent circuit of a piezo electric crystal and working of Collpitt crystal oscillator.

Multivibrators–types, block diagrams of astable, monostable & bistable multivibrators with waveforms. Circuit diagram and working of astable, monostable and bistable multivibrator using transistors (no derivation) and their comparisons.

Unit 5 **14 hours**

Special Purpose Devices

Types of MOSFETs and their circuit symbols, N-channel enhancement type MOSFET- Working and characteristic curves (without experimental circuit)

UJT: Basic construction and working, Equivalent circuit, intrinsic Standoff Ratio, Characteristics and relaxation oscillator-expression, Numerical problems.

SCR: Construction, Working and Characteristics, full wave controlled rectifier-derivations for average values of load current and voltage, numerical problems.

Triac and Diac – circuit symbol, basic constructional features, operation and applications (mention only).

LED– circuit symbol, operation and applications (mention only) and 7 segment display- common cathode and common anode (mention only), pin/segment identification- display of decimal digits.

LCD – types, applications (mention only), comparison with 7 segment display.

Tunnel diode, varactor diode, photo diode, photo Transistor & solar cell – circuit symbol, characteristics and applications (mention only).

Text books:

1. A Text book of Electronics, R.S.Sedha, S Chand and Co., Multicolour,3rd edition , 2012.
2. Electronic Principles , Albert Malvino& David J.Bates, TMH, 7th edition-2010
3. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition, 2013, PHI

Reference books:

1. Basic electronics- B.L. Theraja - S. Chand and Co. 3rd edition -2012.
2. Electronics text lab manual, Paul B. Zbar.
3. Basic Electronics and Linear circuits, N.N. Bhargava, D.C. Kulshresta and D.C
4. Gupta-TMH.
5. Electronic devices, David A Bell, Reston Publishing Company/DB Tarapurwala Publ.
6. Principles of Electronics By V.K. Mehta, S.Chand& Co.
7. Electronic devices, applications and Integrated circuits, Mathur, Kulshreshta and Chadha, Umesh Publications.

Semester II - Practical II

EL-201P ELECTRONIC CIRCUITS AND SPECIAL PURPOSE DEVICES LAB

PART A –Demonstration experiment - not for Evaluation

1. Measurement of voltage, time period and frequency using C.R.O.

PART B –Performance experiments

1. CE Amplifier – frequency response
2. CC amplifier – voltage gain at one frequency, input and output impedances.
3. Tuned amplifier – frequency response
4. FET characteristics.
5. MOSFET characteristics
6. Common source FET amplifier
7. Hartley / Colpitt's oscillator
8. UJT characteristics
9. UJT relaxation oscillator.
10. SCR characteristics.
11. Transistor series regulator.
12. Current mirror.
13. Differential amplifier – common mode & differential gain, CMRR.
14. Clipping and clamping circuits-unbiased shunt type positive & negative Clippers, unbiased positive & negative Clampers.

Note: Minimum of 8 experiments to be performed.

B.Sc. Electronics Syllabus
Semester III - Paper 3
EL-301T LINEAR INTEGRATED CIRCUITS AND C PROGRAMMING

Unit 1 **12 hours**

Integrated circuit and operational amplifier

Integrated circuit, Advantages and disadvantages of ICs, scale of integration- classification of ICs by structure and by function (mention only), IC terminology, fabrication of monolithic IC-steps involved in the fabrication of a NPN transistor (epitaxial planar diffusion process).

Operational Amplifiers- Block diagram, equivalent circuit, various parameters op-amp -input bias current, input offset voltage, output offset voltage, CMRR, slew rate, SVRR, Characteristics of ideal and practical op-amps. Mention 3 different op-amp ICs with their characteristics, limitations of op-amp in open loop mode.

Op - Amp with Negative Feedback: Inverting amplifier- derivations for Av, concept of virtual ground. Non- inverting amplifier-derivations for Av. Voltage follower-circuit and features, Summing amplifier/adder and subtractor-derivation for the output voltage. Averaging amplifier, scale changer, numerical problems.

Op-Amp Integrator and Differentiator- derivation for the output voltage, output waveforms for sine and square wave inputs, small signal half wave rectifier-circuit and working.

Unit 2 **12 hours**

Applications of Operational Amplifier

Open loop applications: comparator-circuit and characteristics. Schmitt trigger-circuit and waveforms. Schmitt trigger ICs (mention only)

First Order Active Filters- low pass, high pass, band pass, band reject and all pass filters. Circuit diagrams, derivation for cutoff frequency and numerical problems for low pass and high pass filters only. **Instrumentation amplifier** – circuit and working.

Op - Amp based Oscillator circuit: circuit, working, expression for frequency of oscillation of Phase-shift & Wein bridge oscillator (no derivation) and numerical problems.

D-A Conversion (DAC): Types of DAC, circuit and working of 4 bit binary weighted resistor type DAC.

A-D Conversion (ADC): Characteristics, Types of ADC (mention only) and their comparison, circuit diagram and working of successive approximation ADC

Unit 3 **08 hours**

PCB Design and Fabrication

Introduction to PCB: Definition and need of PCB, background and history of PCB, types of PCB, classes of PCB design, terminology in PCB, Different Electronic Design automation (EDA) tools and comparison.

PCB design process: PCB design flow, placement and routing steps involved in layout design, Art work generation methods-manual and CAD, General design factor for digital and analog circuits, Layout and Artwork making for single-side double-side and multilayer boards, Design for manufacturability, Design – Specification standards.

Introduction to PCB fabrication & Assembly: Steps involved in fabrication of PCB, PCB fabrication techniques-single, double sided and multilayer. Etching-chemical principles and mechanisms. Post operations- stripping, black oxide coating and solder masking. PCB component assembly process.

Unit 4 **20 hours**

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, bit wise operators, expressions and evaluation of expressions, type cast operator, implicit conversions, precedence of operators. Arrays-concepts, declaration, accessing elements, storing elements, two-dimensional and multi-dimensional arrays. Input output statement–sprintf(), scanf() & getch()) and library functions (math and string related functions).

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 and Structures

Pointers, Defining and declaring a structure variables, accessing structure members, initializing a structure, example programs

Text books:

1. A Text book of Electronics, R.S.Sedha, S Chand and Co., Multicolour,3rd edition , 2012.
2. Operational Amplifier and Linear Integrated circuits - Ramakanth Gayekwad PHI 5th edition.
3. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition, 2013, PHI.
4. Programming in ANSI C, Balagurusamy, 2nd edition, TMH.

Reference books:

1. Liner Integrated circuits by Roy Choudhury, New age international, 4th edition,2010
2. Basic electronics- B.L. Theraja - S. Chand and Co. 3rd edition -2012.
3. Electronics text lab manual, Paul B. Zbar.
4. Electronic devices, David A Bell, Reston Publishing Company/DB Tarapurwala Publ.
5. Electronic devices, applications and Integrated circuits, Mathur, Kulshreshta and Chadha, Umesh Publications.
6. Computer concepts and C Programming techniques by Padma Reddy, Nandi publications, 4th edition, 2010.

Semester III - Practical III
EL-301P LINEAR INTEGRATED CIRCUITS AND 'C' PROGRAMMING LAB

PART- A
Experiments on Linear Integrated Circuits

1. Inverting and non inverting amplifiers.
2. Adder and Subtractor.
3. Study of first order low-pass filter and high-pass filter.
4. RC phase shift oscillator/ Wein bridge oscillator Using op-amp.
5. Small signal half wave rectifier using OP-AMP.
6. Astable multivibrator / Monostable multivibrator using IC555.
7. Fixed voltage IC regulators using 78 series and 79 series.
8. Variable voltage regulator using IC LM 317.
9. Op-amp as Integrator /differentiator.
10. Design PCB of regulator circuit using 7805.
11. Design PCB of Astable/monostable multivibrator using IC 555.
12. Design PCB of RC phase shift/ wein bridge oscillator using transistor.

Note: Minimum of 5 experiments to be performed in PART- A.

One PCB experiment is compulsory: Design and Etching of PCB for the circuit with minimum of 10 component and Demonstration of its working. Same should be demonstrated at the time of practical examination as part Viva-Voce.

PART- B
Experiments on C Programming

1. To generate the Fibonacci series up to the given limit N and also print the number of elements in the series.
2. To find minimum and maximum of N numbers.
3. Find the GCD of two integer numbers.
4. Write a program to calculate factorial of a given number.
5. Find all the roots of a quadratic equation $Ax^2 + Bx + C = 0$ for non-zero coefficients A, B and C. Else report error.
6. Calculate the value of sin (x) and cos (x) using the series. Also print sin (x) and cos (x) value using library function.
7. To generate and print prime numbers up to an integer N.
8. To sort given N numbers in ascending order.
9. To find the sum & difference of two matrices of order MxN and PxQ.
10. To find the product of two matrices of order MxN and PxQ.
11. To find the transpose of given MxN matrix.
12. To find the sum of principle and secondary diagonal elements of the given M×N matrix.
13. Write a program to calculate the subject wise and student wise totals and store them as a part of the structure.

Note: Minimum of 5 experiments to be performed in PART- B

B.Sc. Electronics Syllabus
Semester IV – Paper 4
EL-401T DIGITAL ELECTRONICS AND VERILOG

Unit 1

Boolean algebra and Logic Families **10 hours**

Boolean algebra: Constants, variables, operators and basic logic gates-AND, OR, NOT, logic symbol, truth table. Positive and negative logic, Boolean laws, Duality Theorem, De Morgan's Theorem, simplification of Boolean expressions-SOP and POS. Derived logic gates (NAND, NOR, XOR & XNOR). Universal property of NOR and NAND gates. Minterm, Maxterm, SSOP and SPOS. K-Map: 3 and 4 variable. Expressions simplifications.

Logic Families: Pulse characteristics, Logic Families-classification of digital ICs. Characteristics of logic families, circuit description of TTL NAND gate with totem pole and open collector. TTL IC terminology. Circuit description of CMOS inverter, comparison of TTL and CMOS families.

Unit 2

10 hours

Combinational Logic Circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor. Two bit comparator. Encoder, decimal to BCD priority encoder. Decoder, 2:4 decoder using AND gates, 3:8 decoder using NAND gates, BCD to decimal decoder, BCD to 7-Segment decoder, Multiplexer, 4:1 multiplexer, 8:1 multiplexer, Demultiplexer, 1:4 demultiplexer using gates. Realization of Full adder and Full subtractor using Mux and Decoder. Code Converters: Binary to Gray Code and vice versa, BCD to Excess-3code conversion using K-Map

Unit 3

Sequential Logic Circuits **12 hours**

Flip-Flops: RS latch, Flip-Flops, clocked RS Flip Flop, edge triggering and level triggering, D Flip Flop and edge triggered J-K Flip Flop, T Flip Flop, edge triggered Master Slave JK Flip Flop, clear & preset inputs.

Registers and Counters: Types of Shift Registers, 4bit serial in serial out, serial in Parallel out, parallel in serial out, parallel in parallel out, applications. Ring counter, Johnson counter applications. **Asynchronous Counters**: Logic diagram, Truth table and timing diagrams of 3 bit ripple counter, 3 bit Up-Down counter and modulo counters. **Synchronous Counter**- Mod 3, Mod 5 and Decade Counters design using K-maps.

Programmable Logic Devices: Basic concepts. Types of PLDs (mention only) – SPLDs-ROM, PLA, PAL and GAL. CPLD and FPGA.

UNIT 4

Introduction to Verilog **10 Hours**

A Brief History of HDL, Structure of HDL Module, Comparison of Verilog and VHDL. Introduction to Simulation and Synthesis Tools, Test Benches.

Verilog: Module, Delays, brief description - data flow style, behavioral style, structural style, mixed design style, simulating design.

Language Elements: Introduction, Keywords, Identifiers, White Space Characters, Comments, format, Logic Values.

Data Types: net types, undeclared nets, scalars and vector nets, Register type, Integers, Reals and strings. Parameters.

Expressions: Operands, Operators, Types of Expressions

Gate Level Modeling: Introduction, Built in Primitive Gates, Multiple input gates, Tri-state gates, pull gates, MOS switches, bidirectional switches, gate delay, array instances, implicit nets, Illustrative Examples (both combinational and sequential logic circuits).

UNIT 5 **10 hours**

Data Flow Modeling and Behavioral Modeling

Data Flow Modeling: Continuous assignment, net declaration assignments, delays, net delays and examples.

Behavioral Modeling: Procedural constructs, timing controls, block statement, procedural assignments, conditional statement, loop statement, procedural continuous assignment, Illustrative Examples

Text books:

1. Digital Fundamentals : Floyd , CBS Publishers
2. Modern Digital Electronics: R.P. Jain, 3rd edition, TMH Publications.
3. A Verilog HDL Primer – J. Bhasker, BSP, 2003 II Edition.
4. Verilog HDL-A guide to digital design and synthesis-SAMIR PALNITKAR, Pearson, 2nd edition. 5. Design through Verilog HDL – T.R. Padmanabhan and B. Bala Tripura Sundari, WSE, 2004 IEEE Press.

Reference books:

1. Digital Principles and applications: Malvino and Leach-TMH 3rd edition.
2. Digital Systems : Ronald J Tocci, PHI.
3. Design with TTL ICs, Robert L Morries, TMH. 3. Verilog and VHDL by BOTROS.
4. Digital Logic and Compuer design: M. Morris Mano- PHI, new edition
5. Digital Design: M. Morris Mano- PHI 2nd edition, 2000.
6. Digital computer Electronics: Malvino-TMH
7. Digital computer Fundamentals: Thomas C. Bartee-TMH
8. Experiments in digital principles: Malvino and Leach-TMH

Semester IV - Practical IV

EL-401P DIGITAL ELECTRONICS AND VERILOG LAB

Part-A

Experiments in Digital Electronics

1. Characteristics of logic gates 7400, 7402, 7404, 7406,7432
2. Study of logic gates using ICs (7404,7408, 7432,7402,7400,7486,7410) and study of universal property of NAND and NOR gates.
3. Half adder and Full adder using gates.
4. Half subtractor and full subtractor using gates.
5. Clocked RS and D FF using IC 7400 and JK FF using IC 7476.
6. D-A converter-Binary weighted resistor.
7. Shift registers-SISO and SIPO.
8. 4 bit ripple counter using IC 7476 and conversion to decade counter.
9. Decimal to BCD encoder, BCD to 7 segment decoder-7447.
10. Comparator-Study of 4 bit magnitude comparator.
11. Decoder (2:4) using AND gates & (3:8) using 74138
12. Realization of Full adder and Full subtractor using Mux and Decoder.
13. Study of Multiplexer using IC 74150 and De-Multiplexer using IC 74154.
14. Design and Realization of 4 bit Adder/Subtractor using IC 7483.
15. Design and Realization of BCD Adder using IC 7483.

Note: Minimum of 6 experiments to be performed in part A

Part-B

Experiments in Verilog

1. Write code to realize basic and derived logic gates.
2. Half adder, Full Adder using basic and derived gates.
3. Half subtractor and Full Subtractor using basic and derived gates.
4. Clocked D FF, T FF and JK FF (with Reset inputs).
5. Multiplexer (4x1, 8x1) and Demultiplexer using logic gates.
6. Decoder (2x4, 3x8), Encoders and Priority Encoders.
7. Design and simulation of a 4 bit Adder.
8. Code converters (Binary to Gray and vice versa).
9. 2 bit Magnitude comparator.
10. 3 bit Ripple counter.

Note: Minimum of 8 experiments to be performed in part B

BENGALURU CENTRAL UNIVERSITY

B. Sc. CBCS (Semester) SCHEME

Subject: ELECTRONICS

QUESTION PAPER PATTERN

Theory Question paper

Maximum marks: 70 — Duration: 3 hours

Instructions: Answer all the questions from Part–A, any FIVE questions from Part–B and any FOUR questions from Part–C.

All the answers for Part –A should be written in any one page and to be answered once. Multiple answers are not allowed.

PART – A

Multiple choice questions (based on knowledge, skill, application and thought provoking):

15 out of 15 questions to be answered. 15×1 = 15

PART – B

Essay type questions:

Any FIVE questions to be answered out of EIGHT. 5 × 7 = 35

PART – C

Questions based on: Numerical problems /block diagrams/schematic diagrams/circuit diagrams/logic diagrams/truth tables/timing diagrams wherever applicable.

Any FOUR questions to be answered out of SIX . 4 × 5= 20

Theory internal assessment — Maximum marks: 30

Attendance	10 marks
Internal tests	10 marks
Assignment/seminar/report on industrial visits /field visits/study tour...	10 marks

Dr. J. T. Devaraju
Professor and Chairman,
Dept. of Electronic Science,
Bangalore University,
Bangalore - 560056

Marks weightage for CBCS Question paper in B.Sc. (70 marks)

I Semester-ELECTRONICS

EL-101T **BASIC ELECTRONICS**

As per the Syllabus, total number of teaching Hours: 52

Question paper pattern:

Part A (M.C.Q) : 15 Questions to be answered out of 15. $15\times1=15$ marks
Part B (descriptive) : 5 to be answered out of 8 Questions. $08\times7=56$ marks
Part C (numerical or/ other type): 4 to be answered out of 6. $06\times5=30$ marks
Total : 101 marks

∴ Question paper to be set for .... : 101 marks including choice.
Student is required to answer for .... : 70 marks out of 101 marks.
Marks weightage = 101 marks/52 hours ≅ 1.94 marks / hour.

Unit wise marks weightage

Unit 1: 10 hours $=10\times1.94\cong19$ or 20marks.
Unit 2: 08 hours $=8\times1.94\cong15$ or 16 marks.
Unit 3: 12 hours $=12\times1.94\cong23$ or 24 marks.
Unit 4: 14 hours $=14\times1.94\cong27$ or 28 marks.
Unit 5: 08 hours $=08\times1.94\cong15$ or 16 marks.
Total: 101 marks.

Blue print 1:

Unit no. and title	Marks weightage to be assigned	Part A (1 mark)	Part B (7 marks)	Part C (5 marks)	Total marks
1(10 hrs) – Basic circuits	19 or 20	0	2	1	19
2(08hrs) –Network theorems	15 or 16	4	1	1	16
3(12 hrs) - SC diode & app	23or 24	4	2	1	23
4(14 hrs) - Transistor	27 or 28	4	2	2	28
5(08hrs) - Number systems	15 or 16	3	1	1	15
		15	56	30	101

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Blue print 2:

Unit no. and title	Marks weightage to be assigned	Part A (1 mark)	Part B (7 marks)	Part C (5 marks)	Total marks
1(10 hrs) - Basic circuits	19 or 20	1	2	1	20
2(08hrs) - Network theorems	15 or 16	3	1	1	15
3(12 hrs) - SC diode & app	23or 24	5	2	1	24
4(14 hrs) - Transistor	27 or 28	3	2	2	27
5(08hrs) - Number systems	15 or 16	3	1	1	15
		15	56	30	101

Dr. J. T. Devaraju

Marks weightage for CBCS Question paper in B.Sc. (70 marks)

II Semester-ELECTRONICS

EL-201T ELECTRONIC CIRCUITS AND SPECIAL PURPOSE DEVICES

As per the Syllabus, total number of teaching Hours: 52

Question paper pattern:

Part A (M.C.Q) : 15 Questions to be answered out of 15. : $15\times1=15$ marks
Part B (descriptive) : 5 to be answered out of 8 Questions. $08\times7=56$ marks
Part C (numerical or/ other type): 4 to be answered out of 6. $06\times5=30$ marks
Total : 101 marks

$\therefore$ Question paper to be set for .... : 101 marks including choice.
Student is required to answer for .... : 70 marks out of 101 marks.
Marks weightage = 101 marks/52 hours $\cong$ 1.94 marks / hour.

Unit wise marks weightage

Unit 1: 12 hours $=12\times1.94\cong23$ or 24marks.
Unit 2: 08 hours $=8\times1.94\cong15$ or 16 marks.
Unit 3: 08 hours $=8\times1.94\cong15$ or 16 marks.
Unit 4: 10 hours $=10\times1.94\cong19$ or 20 marks.
Unit 5: 14 hours $=14\times1.94\cong27$ or 28 marks.
Total: 101 marks.

Blue print 1:

Unit no. and title	Marks weightage to be assigned	Part A (1 mark)	Part B (7 marks)	Part C (5 marks)	Total marks
1(12 hrs) –Small signal amplifier	23 or 24	4	2	1	23
2(08hrs) –Power and tuned amplifier	15 or 16	4	1	1	16
3(08hrs)– Differential amplifier	15or 16	3	1	1	15
4(10 hrs) - Feedback amplifier and oscillator	19 or 20	1	2	1	20
5(14hrs) - Special purpose devices	27 or 28	3	2	2	27
		15	56	30	101

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Blue print 2:

Unit no. and title	Marks weightage to be assigned	Part A (1 mark)	Part B (7 marks)	Part C (5 marks)	Total marks
1(12 hrs) –Small signal amplifier	23 or 24	5	2	1	24
2(08hrs) –Power and tuned amplifier	15 or 16	1	2	0	15
3(08hrs)– Differential amplifier	15 or 16	4	1	1	16
4(10 hrs) - Feedback amplifier and oscillator	19 or 20	2	1	2	19
5(14hrs) – Special purpose devices	27 or 28	3	2	2	27
		15	56	30	101

Marks weightage for CBCS Question paper in B.Sc. (70 marks)

III Semester-ELECTRONICS

EL-301T LINEAR INTEGRATED CIRCUITS AND C PROGRAMMING

As per the Syllabus, total number of teaching Hours: 52

Question paper pattern:

Part A (M.C.Q) : 15 Questions to be answered out of 15. $15\times1 = 15$ marks
Part B (descriptive) : 5 to be answered out of 8 Questions. $08\times7 = 56$ marks
Part C (numerical or/ other type): 4 to be answered out of 6. $06\times5 = 30$ marks

Total : 101 marks

∴ Question paper to be set for .... : 101 marks including choice.
Student is required to answer for .... : 70 marks out of 101 marks.
Marks weightage = 101 marks/52 hours ≅ 1.94 marks / hour.

Unit wise marks weightage

Unit 1: 12 hours $= 12 \times 1.94 \cong 23$ or 24marks.
Unit 2: 12 hours $= 12 \times 1.94 \cong 23$ or 24 marks.
Unit 3: 08 hours $= 8 \times 1.94 \cong 15$ or 16 marks.
Unit 4: 20 hours $= 20 \times 1.94 \cong 38$ or 39 marks.

Total: 101 marks.

Blue print 1:

Unit no. and title	Marks weightage to be assigned	Part A (1 mark)	Part B (7 marks)	Part C (5 marks)	Total marks
1(12 hrs) –IC and op-amp	23 or 24	5	2	1	24
2(12hrs) –Applications of op-amp	23 or 24	0	2	2	24
3(08hrs)– PCB design & fabrication	15or 16	3	1	1	15
4(20 hrs) - C programming	38 or 39	7	3	2	38
		15	56	30	101

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Marks weightage for CBCS Question paper in B.Sc. (70 marks)

IV Semester-ELECTRONICS

EL-401T DIGITAL ELECTRONICS AND VERILOG

As per the Syllabus, total number of teaching Hours: 52

Question paper pattern:

Part A (M.C.Q) : 15 Questions to be answered out of 15. $15 \times 1 = 15$ marks
Part B (descriptive) : 5 to be answered out of 8 Questions. $08 \times 7 = 56$ marks
Part C (numerical or/ other type): 4 to be answered out of 6. $06 \times 5 = 30$ marks
Total : 101 marks

∴ Question paper to be set for .... : 101 marks including choice.
Student is required to answer for .... : 70 marks out of 101 marks.
Marks weightage = 101 marks/52 hours ≅ 1.94 marks / hour.

Unit wise marks weightage

Unit 1: 10 hours $= 10 \times 1.94 \cong 19$ or 20marks.
Unit 2: 10 hours $= 10 \times 1.94 \cong 19$ or 20 marks.
Unit 3: 12 hours $= 12 \times 1.94 \cong 23$ or 24 marks.
Unit 4: 10 hours $= 10 \times 1.94 \cong 19$ or 20 marks.
Unit 5: 10 hours $= 10 \text{ X } 1.94 \cong 19$ or 20 marks
Total: 101 marks.

Blue print 1:

Unit no. and title	Marks weightage to be assigned	Part A (1 mark)	Part B (7 marks)	Part C (5 marks)	Total marks
1(10 hrs) –Booiean Algebra and logic families	19 or 20	2	1	2	19
2(10hrs) –Combinational logic circuits	19 or 20	1	2	1	20
3(12hrs)– Sequential logic circuits	23or 24	5	2	1	24
4(10 hrs) - Introduction to Verilog	19 or 20	0	2	1	19
5(10 hrs)- Data flow modeling and behavioral modeling	19 or 20	7	1	1	19
		15	56	30	101

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Scheme of Evaluation for B. Sc. I & II Semester (CBCS)
Electronics Practical Examination
Maximum marks: 35 Duration: 3 hours

Scheme of Evaluation:

Maximum marks for practical Examination.................................... 35 marks

a) Write up
(principle, circuit diagram, formulae, tabular columns and typical graph) 10 marks

b) Setting/circuit connections, performance & tabulation.................. 10 marks

c) Calculation, graph& results .... 05 marks

d) Viva related to the experiment .... 05 marks

e) Practical record (for minimum of 8 experiments performed)................ 05 marks.

Scheme of Evaluation for B. Sc. III & IV Semester (CBCS)

Note: Each student has to perform any ONE experiment either from Part-A or from Part-B during Practical examination. However, in every batch of students assigned for practical examination,equal weightage must be given to both the sections of experiments (i.e., Part-A and Part-B).

Maximum marks for practical examination.................................. 35 marks

PART-A

a) Practical record (for minimum of 10 experiments performed. i.e.,
for minimum of 5 experiments performed in part A and part B each..... 05 marks.

b) Write up (principle, circuit diagram, formulae and typical graph........ 10 marks
c) Setting/circuit connections, performance & tabulation................. 10 marks
d) Calculation, graph & results .... 05 marks
e) Viva related to the experiment.. 05 marks

Or

PART-B

b) Program write up .... 15 marks
c) Execution and result .... 10 marks
d) Viva related to the experiment.. 05 marks
Total .... 30 marks