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BE BOUNDLESS

**BENGALURU CITY UNIVERSITY**

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

**CHOICE BASED CREDIT SYSTEM**

**2020-2021**



BENGALURU CITY UNIVERSITY

SYLLABUS FOR B.TECH ELECTRONICS  
(I & IV Semesters)

COURSE NAME: CIRCUIT SYSTEM

2019-2021

# BENGALURU CENTRAL UNIVERSITY

## Department of Electronics

Proceedings of Board of Studies (UG) in Electronics held on 27<sup>th</sup> February 2019  
at 2 PM in Department of Electronic Science, J.B. Campus, Bangalore University,  
Bangalore -560 056.

### Members Present

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

### Signature

Chairman

 27/2/19

Member



Member



Member

← ABSENT →

Member



Member



Member



Member

— ABSENT —

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.

  
Dr. J. T. Davar 27/2/19  
President and Chairman,  
Dept. of Electronics Education,  
Bangalore University,  
Bangalore - 560019

## Syllabus

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

Semester/ Teaching Hours	Title of the Paper	Hours /week		Max.Marks/paper				Duration of Exa m (hour s)		Total Marks / paper	Credits
		Theory	Practical	Theory		Practical		Theory	Practical		
				Exam	IA	Exam	IA				
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

1) Rajash

5)

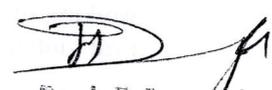
2) K. Balu

6) R. Anil

3) R. Harish

7) R. Praveen

4)

  
**D. V. I. Devgan**  
 Professor and Chairman,  
 Dept. of Electronics Science,  
 Bengaluru Central University,  
 Bangalore - 560001

**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  $\alpha$ ,  $\beta$  and  $\gamma$  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., 3<sup>rd</sup> edition, 2012.
2. Electronic Principles, Albert Malvino & David J Bates, TMH, 7<sup>th</sup> edition-2010
3. Introductory circuit analysis, Robert Boylestad, PHI 5<sup>th</sup> edition-2010.

#### Reference books:

1. Electronic Devices and circuit theory, Robert Boylestad and Louis Nashelsky, 9<sup>th</sup> Edition, 2013, PHI
2. Basic electronics- B.L. Theraja - S. Chand and Co. 3<sup>rd</sup> edition -2012.
3. Electronics text lab manual, Paul B. Zbar.
4. Electric circuits, Joseph Edminister, 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. Kulshrestha and D.C. 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, Kulshrestha 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  $r_i$ ,  $r_o$  and  $\beta$ .
10. Transistor characteristics in CB mode – determination of  $r_i$  and  $\alpha$ .
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  $A_v$ , expressions for  $Z_{in}$  and  $Z_{out}$ . Numerical problems on  $A_v$ ,  $Z_{in}$  and  $Z_{out}$ . Need for swamped amplifier, circuit diagram of Swamped amplifier, expressions for  $A_v$  & 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  $A_v$ , 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,  $Z_i$ ,  $Z_o$ , 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 Boylestad 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. Kulshrestā 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  $A_v$ , concept of virtual ground. Non- inverting amplifier-derivations for  $A_v$ . 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–printf(), 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 Boylestad and Louis Nashelsky, 9th Edition, 2013, PHI.
4. Programming in ANSI C. Balagurusamy, 2nd edition. TMH.

### Reference books:

1. Linear 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  $M \times N$  and  $P \times Q$ .
10. To find the product of two matrices of order  $M \times N$  and  $P \times Q$ .
11. To find the transpose of given  $M \times N$  matrix.
12. To find the sum of principle and secondary diagonal elements of the given  $M \times N$  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**

**10 hours**

**Boolean algebra and Logic Families**

**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-3 code conversion using K-Map

**Unit 3**

**12 hours**

**Sequential Logic Circuits**

**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**

**10 Hours**

**Introduction to Verilog**

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 Computer 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**

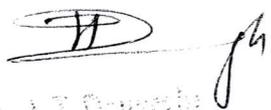
**Experiments in Verilog**

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**

<u>Theory Question paper</u>		<b>Duration: 3 hours</b>
<b>Maximum marks: 70</b>		
<p>Instructions: Answer all the questions from Part-A, any FIVE questions from Part-B and any FOUR questions from Part-C.</p> <p><u>All the answers for Part -A should be written in any one page and to be answered once. Multiple answers are not allowed.</u></p>		
<b>PART – A</b>		
Multiple choice questions (based on knowledge, skill, application and thought provoking):		
15 out of 15 questions to be answered.		15×1 = 15
<b>PART – B</b>		
Essay type questions:		
Any FIVE questions to be answered out of EIGHT.		5 × 7 = 35
<b>PART – C</b>		
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
<b>Theory internal assessment</b>		<b>Maximum marks: 30</b>
Attendance .....		10 marks
Internal tests .....		10 marks
Assignment/seminar/report on industrial visits /field visits/study tour...		10 marks

  
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## 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.  $15 \times 1 = 15$  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 =  $101 \text{ marks} / 52 \text{ hours} \cong 1.94 \text{ marks} / \text{hour}$ .

#### Unit wise marks weightage

Unit 1: 10 hours =  $10 \times 1.94 \cong 19$  or 20 marks.

Unit 2: 08 hours =  $8 \times 1.94 \cong 15$  or 16 marks.

Unit 3: 12 hours =  $12 \times 1.94 \cong 23$  or 24 marks.

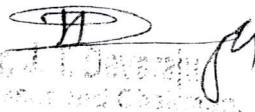
Unit 4: 14 hours =  $14 \times 1.94 \cong 27$  or 28 marks.

Unit 5: 08 hours =  $08 \times 1.94 \cong 15$  or 16 marks.

Total: 101 marks.

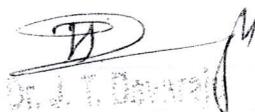
#### Blue print 1:

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	23 or 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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Bangalore - 560075

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

  
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## 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.  $15 \times 1 = 15$  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

$\therefore$  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.

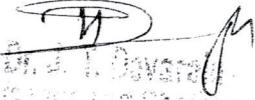
#### Unit wise marks weightage

Unit 1: 12 hours =  $12 \times 1.94 \cong 23$  or 24 marks.  
Unit 2: 08 hours =  $8 \times 1.94 \cong 15$  or 16 marks.  
Unit 3: 08 hours =  $8 \times 1.94 \cong 15$  or 16 marks.  
Unit 4: 10 hours =  $10 \times 1.94 \cong 19$  or 20 marks.  
Unit 5: 14 hours =  $14 \times 1.94 \cong 27$  or 28 marks.

Total: 101 marks.

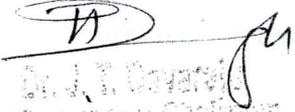
#### Blue print 1:

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

  
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Bangalore - 560085

## 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.	15×1 =15 marks
Part B (descriptive)	: 5 to be answered out of 8 Questions.	08×7 =56 marks
Part C (numerical or/ other type):	4 to be answered out of 6.	<u>06×5 =30 marks</u>
		<u>Total : 101 marks</u>

∴ 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 =  $12 \times 1.94 \cong$  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

  
Approved by  
Dept. of Electronic Science,  
Bangalore University,  
Bangalore - 560005

**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  $\cong$  1.94 marks / hour.

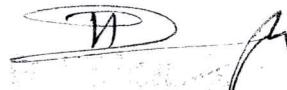
**Unit wise marks weightage**

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 =  $10 \times 1.94 \cong 19$  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

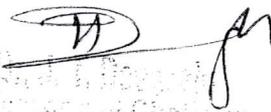
PART-A

- 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

  
The Vice-Chancellor,  
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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 (including circuit diagram, formulae, tables, columns and typical graphs) ..... 10 marks
- b) Setting/Practical conventional, performance & tabular work ..... 10 marks
- c) Calculation, graph & results ..... 05 marks
- d) Viva related to the experiment ..... 05 marks
- e) Practical record (It is an account of 5 experiments performed) ..... 05 marks

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

Note: Each student has to perform any ONE experiment of choice from Part-A or Part-B. If a student performs more than one experiment, the marks assigned for practical will be the marks of the best experiment. The marks of the other experiments will be zero. Equal weightage will be given to both the parts of the examination. (Total 15 marks)

Maximum marks for practical Examination ..... 15 marks

PART A

- 1) The student will perform any ONE experiment out of 10 experiments given below. The marks of 7 experiments performed in part A will be 10 marks.
- 2) Write up (including circuit diagram, formulae, tables, columns and typical graphs) ..... 10 marks
- 3) Setting/Practical conventional, performance & tabular work ..... 10 marks
- 4) Calculation, graph & results ..... 05 marks
- 5) Viva related to the experiment ..... 05 marks

PART B

- 1) The student will perform any ONE experiment out of 10 experiments given below. The marks of 7 experiments performed in part B will be 10 marks.
- 2) Write up (including circuit diagram, formulae, tables, columns and typical graphs) ..... 10 marks
- 3) Setting/Practical conventional, performance & tabular work ..... 10 marks
- 4) Calculation, graph & results ..... 05 marks
- 5) Viva related to the experiment ..... 05 marks