BANGALORE UNIVERSITY

SUBJECT: ELECTRONICS

Regulations and Scheme of Study for the B Sc (Electronics) course
[From 2014 – 15]

Preamble:

Bangalore University wishes to initiate qualitative and substantial changes to its UG program. One step towards this is to introduce the Credit Based Choice System in all its programs.

The rules governing the CBCS (semester scheme) UG program are as per the university guidelines.

The course structure has been detailed in Appendix – 1 and syllabus in Appendix – 2.

APPENDIX – 1

BANGALORE UNIVERSITY
DETAILS OF COURSE PATTERN AND SCHEME OF EXAMINATION
B Sc, CBCS (semester) SCHEME
Subject: **ELECTRONICS**

Semester/ Teaching hours	*Title of the Paper*	*Hours / week*		*Exam. marks /paper*				*Duration of Exam. (hours)*		*Total marks /paper*	*CREDITS*
				Theory		*Practical*					
		Theory	*Practical*	*Exam*	*I.A*	*Exam*	*I.A*	*Theory*	*Practical*		
Semester I (56 hours)	*Basic Electronics (EL-101T and EL-101P)*	*4*	*3*	*70*	*30*	*35*	*15*	*3*	*3*	*150*	*1×2+ 1×1= 3*
Semester II (56 hours)	*Electronic Circuits & Special Purpose devices (EL-201T and EL-201P)*	*4*	*3*	*70*	*30*	*35*	*15*	*3*	*3*	*150*	*3*
Semester III (56 hours)	*Linear Integrated Circuits & C Programming (EL-301T and EL-301P)*	*4*	*3*	*70*	*30*	*35*	*15*	*3*	*3*	*150*	*3*
Semester IV (56 hours)	*Digital Electronics & Verilog (EL-401T and EL-401P)*	*4*	*3*	*70*	*30*	*35*	*15*	*3*	*3*	*150*	*3*
Semester V (42 +42 hours)	*Communication I (EL-501T and EL-501P)*	*3*	*3*	*70*	*30*	*35*	*15*	*3*	*3*	*150*	*1×2+ 1×1= 3*
	Microprocessors & Instrumentation (EL-502T and EL-502P)	*3*	*3*	*70*	*30*	*35*	*15*	*3*	*3*	*150*	*3*
Semester VI (42 +42 hours)	*Communication II (EL-601T and EL-601P)*	*3*	*3*	*70*	*30*	*35*	*15*	*3*	*3*	*150*	*3*
	Microcontrollers (EL-602T and EL-602P)	*3*	*3*	*70*	*30*	*35*	*15*	*3*	*3*	*150*	*3*

Note: Internal assessment marks will be based on attendance, assignment & tests.
In addition to this, internal assessment marks may be awarded marks for the report submitted by the students towards industrial visits /field visits/study tour in the 5th or 6th semester.

APPENDIX - 2

B.Sc. Electronics Syllabus

Semester I – Paper 1

EL-101T BASIC ELECTRONICS

Unit 1: **10 hours**

DC and AC response of electronic passive components

Review of passive components – R, L & C

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

Transient analysis of RC and RL circuits: Series RC circuit excited by DC source- charging& discharging of a capacitor through resistor- circuit diagram and qualitative study, charge/voltage at any instant during charging and discharging–equations (mention only - no derivations), graphical representation, RC time constant, numerical problems.

Series RL circuit excited by DC source: circuit diagram and qualitative study, current at any instant during growth and decay–equations (mention only - no derivations), graphical representation, RL time constant, numerical problems.

AC applied to Series RC and RL circuits: Impedance of series RC & RL circuits (qualitative study-no derivations), Numerical problems.

AC applied to Series and parallel RLC circuit(qualitative study–no derivations), 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: **09 hours**

Network theorems (DC analysis only)

Review of Ohms law, Kirchhoff's laws, voltage divider and current divider theorems, open and short circuits.

Thevenin's theorem, Norton's theorem and interconversion, superposition theorem –statements and steps involved, reciprocity theorem– statement, maximum power transfer theorem-derivation, numerical problems on all theorems.

Unit 3: **12 hours**

Semiconductor Diode and its applications

Review of PN junction diode and characteristics, ideal diode and diode approximations – representations. Block diagram of a Regulated Power Supply, Rectifiers – HWR, FWR-center tapped and bridge FWRs. Circuit diagrams, working and waveforms, ripple factor & efficiency(no derivations), comparison and numerical problems. Filters– types, circuit diagram and explanation of shunt capacitor filter with waveforms.

Zener diode regulator– 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.

Unit 4: **13 hours**

BJT and FET

Bipolar Junction Transistor: Construction, principle & working of NPN transistor, terminology. Configuration – CE, CB, CC (mention only). Definition of α, β and γ and their interrelations, leakage currents(mention only), numerical problems.

Study of CE Characteristics - different regions. Experimental circuit and procedure.

Study of CB Characteristics - different regions, Base width modulation-Early effect.

Hybrid parameters –definitions of h_{ie}, h_{oe}, h_{fe} and h_{re}

Transistor biasing – need for biasing, DC load line, operating point, thermal runaway, stability and stability factor (mention the equation-no derivation).

Different types of biasing– Fixed bias(base bias) without and with R_E, collector to base bias, voltage divider bias and emitter bias ($+V_{CC}$ and $-V_{EE}$ bias) –circuit diagrams and their working, Q point expressions for voltage divider biasing only with numerical problems.

Transistor as a switch – circuit and working**.** Darlington pair and its applications (mention only).

Junction Field Effect Transistor (JFET) – types (mention only), construction and working of N channel FET, characteristics, FET parameters and their relationships, comparison of FET with BJT.

Unit 5: **12 hours**

Number systems & Codes

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, signed number arithmetic – addition. Types of codes–BCD code, gray code, gray to binary conversion and vice versa, excess – 3 Code - self complementing property, ASCII and EBCDIC.

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. 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 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 of Electronic Components and their circuit symbols.
2. Familiarisation 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. Centre tapped full wave 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 β.
10. Transistor characteristics in CB mode – determination of r_i and α.
11. Design and study of voltage divider biasing.
12. Study of emitter 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, frequency response, r_e model for CE configuration, derivation for Av, expressions for Z_{in} and Z_{out}. Numerical problems on A_v, Z_{in} and Z_{out}. Swamped amplifier and CC amplifier – circuit diagrams & applications (mention only).

Multistage amplifiers– qualitative study of cascaded stages, overall gain of multistage amplifier, loading Effect. Numerical problems on $A=A_1 \times A_2$. Types of coupling–RC coupled, transformer coupled and direct coupled (only circuit diagrams and frequency response graph, advantages and disadvantages for each). Darlington amplifier-circuit diagram and its characteristic features.

JFET amplifier in CS mode – circuit and operation, equivalent circuit and expression for voltage gain (derivation).Numerical problems.

Unit 2: 9 hours

Power and Tuned amplifiers

Difference between voltage and power amplifier, classification of power amplifiers-Class A, Class B, Class C and their comparisons.

Class A single ended power amplifier–working. Transformer coupled Class A power amplifier-working, overall efficiency (derivation). Circuit operation of complementary symmetry class B push pull power amplifier (no derivation), crossover distortion, 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: 9 hours

Differential amplifier

Circuit diagram, different configurations (mention only) – working, dc and ac analysis (r_e model) of dual input balanced output differential amplifier – tail current, expressions for Q point, differential gain, common mode gain, C.M.R.R, input impedance and output impedances.

Current Mirror – circuit diagram and working, differential amplifier with current mirror–circuit diagram and working (explanation of increase in C.M.R.R).

Unit 4: 12 hours

Feedback and Oscillators

Feedback–concept of feedback, types of feedback–positive & negative feedback, advantages and disadvantages for each, 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 Z_i, Z_o, BW, noise & distortion and stability. Numerical problems.

Sinusoidal Oscillators–damped and undamped oscillations, basic principle of oscillator, positive feedback, barkhausen criterion, classification of oscillators–LC, RC and crystal oscillators. Collpitt & Hartley oscillators using transistors – circuit diagrams, working (no

derivations) and numerical problems. Equivalent circuit of a piezo electric crystal, working of Colpitt crystal oscillator. Types of RC oscillators (mention only).
Multivibrator–types, block diagrams of astable, monostable & bistable multivibrators with waveforms. Circuit diagram and working of astable Multivibrator using transistors (no derivation).

Unit 5: **14 hours**

Special purpose devices

MOSFET–types, circuit symbols of depletion type MOSFET (both N channel and P Channel). Circuit symbols of enhancement type MOSFET(both N channel and P channel).
N channel enhancement type MOSFET–working, characteristic curves (without experimental circuit).
UJT– Basic construction, equivalent circuit, intrinsic standoff ratio, working, characteristics and relaxation oscillator-expression. Numerical problems.
SCR– working, V-I 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), advantages over LED.
Tunnel diode, varactor diode, photo diode, photo Transistor & solar cell – circuit symbol, characteristics, 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, C.M.R.R.
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: 14 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 (Mono, dual and quad op-amp ICs(mention only). 741, OP 07, LM 308, etc. and their comparison with respect to parameters, limitations of op-amp in open loop mode.

Op - Amp with negative feedback**:** Inverting amplifier- derivations for A_v, concept of virtual short and 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.
Integrator, differentiator- derivation for the output voltage, output waveforms for sine and square wave inputs, small signal half wave rectifier-circuit and working.

Unit 2: 14 hours

Applications of operational amplifier & IC 555

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.
Phase-shift & Wein bridge oscillator using op-amp**:** circuit, working, expression for frequency of oscillation (no derivation), numerical problems.
Fixed and variable IC regulators– IC 78xx and IC 79xx -concepts only, IC LM317- output voltage equation (mention only) and simple numerical problems.
555 timer: functional block diagram, Multivibrator–types (mention only), Circuit diagram and Astable Multivibrator – circuit with 555 timer and working, equation for frequency of oscillations (no derivation),numerical problems. Circuit of monostable multivibrator using 555.

Unit 3 12 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).

Unit 4 **08 hours**

Decision making, branching & looping

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.

Unit 5 **08 hours**

Structures and unions

defining and declaring a structure variables, accessing structure members, initializing a structure, copying and comparing structure variables, array of structures, arrays within structures, structures within structures, structures and functions. Unions-size of structures, bit fields, 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

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

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 $Ax2 + Bx + C = 0$ 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 $\times$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 **12 hours**

Boolean algebra and Logic gates

Boolean algebra- Positive and negative logic. Boolean laws. De Morgan's theorems, simplification of Boolean expressions-SOP and POS. Logic gates- basic logic gates-AND, OR, NOT, logic symbol and truth table. Derived logic gates (NAND,NOR, XOR & XNOR). Universal property of NOR and NAND gates. K-map-3 and 4 variable expressions. 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, comparision of TTL and CMOS families.

Unit 2 **12 hours**

Combinational logic circuits

Combinational logic circuits-half adder, full adder, half subtractor, full subtractor. Two bit comparator. Encoder, decimal to BCD priority encoder. 2:4 decoder using AND gates, 3:8 decoder using NAND gates, BCD to decimal decoder, BCD to 7 segment decoder, 4:1 multiplexer, 1:4 demultiplexer using gates. D-A conversion– 4 bit binary weighted resistor type, circuit and working. Circuit of R-2R ladder–concept only.

A-D conversion–characteristics, successive approximation ADC. (mention the relevant ICs for all).

Unit 3 **14 hours**

Sequential logic circuits

RS latch, NAND and NOR latches, Flipflops, clocked RS F/F, edge triggering and level triggering, D F/F and edge triggered J-K F/F, T F/F, edge triggered M/S JK flip flop, clear & preset inputs. Registers and counters- 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 modified counters. Synchronous counter- design using K-maps (for mod 3 & mod 5 counters only).

Programmable Logic devices – basic concepts.

Types of PLDs (mention only) - SPLDs–ROM, PLA, PAL and GAL.

CPLD and FPGA.

UNIT 4: **09 hours**

Introduction to Verilog

A Brief History of HDL, Structure of HDL Module, Comparison of VHDL and Verilog 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, Integers, reals and strings. Logic Values, Data Types-net types, undeclared nets, scalars and vector nets, Register type, 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: 09 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
   Digital Systems : Ronald J Tocci, PHI.
2. 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. Realisation 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 5 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 5 experiments to be performed in part B

B.Sc. Electronics Syllabus

Semester V – Paper 5

EL-501T COMMUNICATION-I

UNIT 1 **07 hours**

Noise and Transmission lines

Noise-Introduction, internal and external noises, signal to noise ratio and noise figure-numerical examples.

Transmission lines - types and equivalent circuit of T-lines, primary and secondary constants. reflection co-efficient, VSWR and CSWR-numerical examples, losses and distortions in T-lines. propagation of waves-ground wave, sky-wave and space wave propagations, ionosphere and its effects.

UNIT 2 **10 hours**

Analog Modulation techniques

Block diagram of electronic communication system. modulation-need and types of modulation-AM, FM & PM. Amplitude modulation – representation, modulation index, expression for instantaneous voltage, power relations, frequency spectrum, DSBFC, DSBSC and SSBSC (mention only), AM collector modulator. Limitations of AM. FM - definition, modulation index, FM frequency spectrum diagram, bandwidth requirements, frequency deviation and carrier swing, FM generator-varactor diode modulator. Block diagram of AM transmitter and FM transmitter with AFC, qualitative study of pre-emphasis. Comparison of AM and FM, numerical examples.

UNIT 3 **09 hours**

Radio Receivers

Demodulation- AM detection – principles of detection, linear diode and Transistor detector-circuits, principle of working and waveforms. FM detector – principle, slope detector-circuit, working. AM superheterodyne receiver– principle, block diagram, function of each stage with waveform, qualitative study of AGC. FM superheterodyne receiver– principle, block diagram, function of each stage with waveform, qualitative study of de-emphasis. Characteristics of radio receivers-qualitative study of sensitivity, selectivity, signal to noise ratio, fidelity, stability, image frequency and its rejection.

Unit 4: **08 hours**

Antennas

Radiation mechanism, wire Radiators in space-resonant antennas-radiation pattern and current distribution for different lengths, non - resonant antenna, antenna parameters-gain, directive gain, power gain, bandwidth, beam width, polarisation, efficiency, radiation resistance, total effective resistance, derivation for the power radiated by antenna and expression for radiation resistance. Ungrounded and grounded antennas, effect of antenna height. Folded dipole, numerical examples wherever applicable. Qualitative study of helical antenna and loop antenna.

Unit 5 **08 hours**

Television

Introduction, scanning, interlaced scanning, T.V. camera tube (vidicon), composite video signal – blanking and synchronizing pulses, vestigial side band transmission, TV systems and standards – comparison between American and European systems. Block diagrams of monochrome TV transmitter and receiver. basic principles of colour TV, primary and

secondary colours, colour combinations, chromo and luminance processing as per PAL system. Colour TV receiver (PAL). Concept of CCTV, HDTV, Picture in Picture, Picture phones, TV games, numerical examples wherever applicable.

Text Books:

1. Electronic Communication, George Kennedy, 3rd edition, TMH.
2. Electronic Communication, Roddy and Coolen, 4th edition, PHI.

Reference Books:

3. Electronics Communications Systems, Wayne Thomasi, 5th edition, Pearson Ed.
4. Digital Communication System : Ronald J. Tocci

Semester V - Practical V
EL-501P COMMUNICATION LAB

1. Amplitude modulator and Amplitude demodulator
2. FM modulator using IC8038
3. Pre –emphasis and De- emphasis
4. Three way Audio cross over network.
5. IF amplifier
6. Class C tuned amplifier
7. AGC
8. VCO using IC 566
9. Frequency mixer
10. Time Division Multiplexing and de multiplexing
11. Frequency Multiplier
12. Study of Sensitivity, Selectivity and Fidelity of an AM radio receiver

Note: Minimum of 8 experiments to be performed.

B.Sc. Electronics Syllabus

Semester V – Paper 6

EL-502T MICROPROSSESOR and ELECTRONIC INSTRUMENTATION

UNIT 1: 09 hours

Introduction to Microprocessor

Introduction, applications, basic block diagram, speed, word size, memory capacity, classification of microprocessors (mention different microprocessors being used)

Microprocessor 8085: Features, architecture –block diagram, internal registers, register pairs, flags, stack pointer, program counter, types of buses. Multiplexed address and data bus, generation of control signals, pin description of microprocessor 8085.

8085 Instructions-Operation code, Operand & Mnemonics.

Instruction set of 8085, instruction classification, addressing modes, instruction format.

Data transfer instructions, arithmetic instructions, increment & decrement instructions, logical instructions, branch instructions and machine control instructions.

UNIT 2: 09 hours

Stack operations and Microprocessor Programming

Stack operations, subroutine calls and return operations. Delay loops, use of counters, timing diagrams-instruction cycle, machine cycle, T- states, time delay-numerical examples.

Programs for data transfer and memory operations (direct & indirect addressing), addition and subtraction of two 8-bit & 16- bit numbers, multiplication, display of smallest / largest number in a given array of numbers, sorting of numbers in descending / ascending order. Number of 1's and 0's in a given byte, testing for zero condition. 1's and 2's complements. Verification of truth tables of logic gates, program to add two N byte numbers, program to generate Fibonacci series up to the limit, program to find the factorial of a number, program to find the GCD of two integer numbers.

UNIT 3: 08 hours

I/O instructions and Interfacing

I/O instructions and, interrupts in 8085. Basic interfacing concepts, compatible ICs of μP 8085, data transfer, synchronous I/O data transfer using interrupts.

Memory interfacing – address decoding, interfacing RAM and ROM.

Interfacings I/O devices– input port, output port, IN & OUT instructions, interfacing input devices (interfacing matrix key board-block diagram), interfacing output devices (LED display interfacing-block diagram).

PPI IC 8255– features, pin diagram, functional block diagram, ports & their modes.

UNIT 4: 08 hours

Measurement systems, Transducers & Electronic Instrumentation

Introduction to general measurement system – characteristics - definition –static & dynamic. Transducers, types – resistive, capacitive and inductive transducers, strain gauge, LVDT (variable inductive transducers) temperature transducers- thermo couple, thermistors – ultrasonic temperature transducer, photoelectric transducers, pressure transducers-MIC and and loud speaker, signal conditioning (concept only), amplifier – chopper amplifier –carrier amplifier - lock in amplifier.

UNIT 5: **08 hours**

Introduction to Bio-medical instruments

Origin of bio-electric signals, resting & action potential – propagation, physiological transducers – active & passive transducer for medical application – diagnostic & analytical equipments -electrodes for ECG, EEG, and EMG, block diagram of ECG and EEG systems.

Text Books:

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

Reference Books:

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

Semester V - Practical VI

EL-502P 8085 Microprocessor programs and Interfacing

1. Program to add (with carry) 8 bit numbers - Binary and BCD
2. Program to subtract two 8 bit numbers - Binary and BCD
3. Program to add & subtract two 16-bit numbers (with carry.
4. Program to multiply two 8-bit numbers.
5. Program to find GCD of two numbers.
6. Program to find the ratio (division) of two 8-bit numbers.
7. Program to find the number of 1's & 0's in a given byte and program to display the smallest number in a given array of numbers.
8. Program to sort the given array of numbers (descending order) and to find the smallest number.
9. Program to display decimal up counting (00-99).
10. Program to verify the truth table of logic gates.
11. Interfacing 20 keys matrix keyboard
12. Interfacing seven-segment display
13. Interfacing DAC card to convert digital input to equivalent analog output (preferably using IC DAC 08 and IC 741)
14. Interfacing a stepper motor.

(Any EIGHT Experiments – any two interfacing experiments compulsory)

B.Sc. Electronics Syllabus

Semester VI – Paper 7

EL-601T COMMUNICATION-II

UNIT 1: 08 hours

Digital communication

Introduction to pulse and digital communications, digital radio, sampling theorem, types- PAM, PWM, PPM, PCM – quantization, advantages and applications, digital modulations (FSK, PSK, and ASK). Advantage and disadvantages of digital transmission, characteristics of data transmission circuits – Shannon limit for information capacity, bandwidth requirements, data transmission speed, noise, cross talk, echo suppressors, distortion and equalizer, MODEM– modes, classification, interfacing (RS232).

UNIT 2 09 hours

RADAR Systems

RADAR– principles, frequencies and powers used in RADAR, maximum Unambiguous range, detailed block diagram of pulsed RADAR system, RADAR range equation-derivation, factors influencing maximum range, effect of ground on RADAR antenna characteristics, Doppler effect, MTI RADAR-block diagram, CW RADAR-block diagram, advantages, applications and limitations, FM CW RADAR-block diagram, numerical examples wherever applicable.

UNIT 3 08 hours

Satellite communication

Introduction, need, satellite orbits, advantages and disadvantages of geostationary satellites. Satellite visibility, satellite system – space segment, block diagrams of satellite sub systems, up link, down link, cross link, transponders (C- Band), effect of solar eclipse, path loss, ground station, simplified block diagram of earth station. Satellite access – TDMA, FDMA, CDMA concepts, comparison of TDMA and FDMA, Satellite antenna (parabolic dish antenna), GPS-services like SPS & PPS.

UNIT 4 09 hours

Optical Fiber Communication

Introduction – need for OFC. Block diagram of OFC system. Fiber optic cables, light propagation through fiber – step index fiber, graded index fiber, Snell's law, numerical aperture (derivation). Types of optical fiber cables, light sources – requirements, LEDs and semiconductor laser diodes. Photo detectors – PN, PIN and avalanche photodiodes. Losses in optical fibers – Rayleigh scattering, absorption, leaky modes, bending, joint junction losses. Advantages and disadvantages of OFC over metallic cables.

Unit 5 08 hours

Cellular Communication and Wireless LANs

Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of data encryption, architecture (block diagram) of cellular mobile communication network, CDMA technology, CDMA overview, simplified block diagram of cellular phone handset, Comparative study of GSM and CDMA, 2G, 3G and 4G concepts.

Major components of local area network- Primary characteristics of ethernet-mobile IP, OSI model, wireless LAN requirements-concept of Bluetooth, WiFi and WiMAX.

Text Books:

1. Electronic Communication systems, Kennedy & Davis, IVth edition-TATA McGraw Hill.
2. Introduction to RADAR systems – Skolnik- McGraw Hill.
3. Advanced Electronic Communication systems, Wayne Tomasi- 6th edition, Low priced edition- Pearson education

Reference Books:

1. Electronic Communication systems, Fundamentals through Advanced, Wayne Tomasi - 5th edition.

Semester VI - Practical VII

EL-601P COMMUNICATION and MICROCONTROLLER LAB

PART- A

Communication Experiments.

1. ASK modulator and demodulator
2. FSK modulation
3. PWM and PPM
4. PAM modulator and demodulator
5. Band Elimination Filter
6. Two stage RC coupled Amplifier-Determination of mid - band gain of individual stages, overall gain and the concept of loading effect.
7. Study of switched mode regulator using PWM
8. Characteristics of OFC

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

PART- B

Experiments on Microcontroller Programming

01. Program to add (with carry) and subtract two 8-bit numbers.
02. Program to find 2's complement of a 16-bit number.
03. Program to find the sum of N 8-bit numbers.
04. Program to find largest of N numbers.
05. Program to find smallest of N numbers
06. Program to find whether the given data is palindrome.
07. Program to arrange the numbers in ascending order.
08. Program to arrange the numbers in descending order .
09. Program to interchange Two one – byte numbers.
10. Program to interchange N one – byte numbers.

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

B.Sc. Electronics Syllabus
Semester VI – Paper 8
EL-602T MICROCONTROLLERS

UNIT 1: 10 hours

Introduction to Microcontrollers

Basic block diagram, comparison of microcontroller with microprocessors, comparison of 8 bit, 16 bit and 32 bit microcontrollers.

Overview of 8051 series–comparison of 8051, 8052, 8031.

Other Microcontroller families (Mention only) – Maxim 89C420, 89C440, 89C450

Atmel Corporation AT89C51, AT 89LV51, AT89C1051, AT89C2051, AT89C52.

MICROCONTROLLER 8051- architecture -internal block diagram, key features of 8051, pin diagram, memory organization, Internal RAM memory, Internal ROM. General purpose data memory, special purpose/function registers, external memory.

Counters and timers – 8051 oscillator and clock, program counter, TCON, TMOD, timer counter interrupts, timer modes of operation. Input / output ports and circuits/ configurations, serial data input / output – SCON, PCON, serial data transmission modes.

UNIT 2: 10 hours

8051- Interrupts, Addressing modes and Instruction set

Interrupts – IE, IP, time flag interrupts, serial port interrupt, external interrupts, reset, interrupt control, interrupt priority, interrupt destinations & software generated interrupts.

Addressing modes–immediate addressing, register addressing, direct and indirect addressing,

Data transfer instructions – internal data move, external data move, code memory read-only data move, Push and Pop and data exchange instructions.

Logical Instructions – byte level logical operations, bit level logical operations, rotate and swap operations.

Arithmetic Instructions – flags, incrementing and decrementing, addition, subtraction, multiplication and division, decimal arithmetic, simple programs in assembly language.

UNIT 3: 09 hours

8051 programming in C

Jump and call instructions – jump and call program range, jumps, calls and subroutines, interrupts and returns, simple example programs in assembly language.

8051 programming using C– Data types and time delays in 8051C, I/O programming, logic operations, data conversion programs, accessing code ROM space and data serialization.

Timer / Counter Programming in 8051–Programming 8051 timers, counter programming, programming timers 0 and 1 in 8051 C , example programs.

UNIT 4: 09 hours

Interfacing with 8051

Basic interfacing concepts and interrupts, Programming–8051 interrupts, programming Timer interrupts, programming the external hardware interrupts.

Schematic diagrams and basic concepts of Interfacing of 8051 to keyboard, seven segment display, stepper motor, DAC, ADC and traffic light controller circuits.

UNIT 5: **04 hours**

PIC microcontrollers

Core features of PIC microcontrollers, overview of various PIC microcontroller series. PIC 16F877A-features, pin diagram, I/O ports, interfacing with LCD.

Semester VI - Practical VIII

EL-602P PROJECT WORK

- Students in a group, not exceeding **THREE**, should design, fabricate and assemble ONE Electronic project in their respective colleges. The department faculty is required to guide the project work.
- Each student should prepare a report and submit the report at the time of the practical examination duly certified by the concerned faculty guide & HOD.
- Department faculty shall ensure that the entire project work is carried out in their respective colleges by utilising the practical classes assigned to practical VIII. A seminar on the project work is compulsory.

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