University of Pune

Three Year B. Sc. Degree Course inComputer Science

Subject : Electronics

1) Title of the Course :

F.Y.B.Sc.Electronics of Computer Science

(To be implemented from Academic Year 2013-14)

2) Preamble:

The systematic and planned curricula for first year and second yearelectronics shall motivate and encourage the students for pursuing higher studies in Electronics and computer and for becoming an enterprenur.

3) Introduction:

At **first year of under-graduation:** The basic topics related to the fundamentals of electronicsare covered. Since electronics is an inherent part of technological advancements, the practical course is intended to achieve the basic skills required for circuit building and testing.

At **second year under-graduation**: The level of the theory and practical courses shall be one step ahead of the first year B.Sc. Courses based on content of first yearshall be introduced. Analog and digital circuit design concepts will be introduced at this stage.

Objectives:

- To provide indepthknowledge of scientific and technological aspects of electronics
- To familiarize withcurrent and recent technological developments
- To enrich knowledge through programmessuch asindustrial visits, hobby projects, market survey, projects etc.
- To train students in skills related to electronics industry and market.
- To creat foundation for research and development in Electronics
- To develop analytical abilities towards real world problems
- To help students build-up a progressive and successful career in Electronics

4) Eligibility:

1 First Year B.Sc.:
Higher Secondary School Certificate (10+2) Science stream or its equivalent Examinationas per the University of Pune eligibility norms.

2 Second Year B.Sc.:
Keeping terms of First Year of B.Sc. Computer Science,withelectronis as one of the subjects. Other sudents if they fulfill the conditions approved by the equivalence committee of Faculty of Science of the University of Pune are also eligible.

Note: Admissions will be given as per the selection procedure / policies adopted by the respective college, in accordance with conditions laid down by the University of Pune.Reservation and relaxation will be as per the Government rules.

5 A) Examination Pattern:

First Year B.Sc. Computer Science Subject : Electronics

Pattern of Exmination: Annual

Theory courses (ELC-101 and ELC-102) : Annual

Practical Course (ELC-103) : Annual

Paper/ Course No.	Title	Total Number of lectures/practicals per Term	Standard of passing		
			Internal marks out of **20**	External marks out of **80**	Total marks out of **100**
Theory Paper I (ELC-101) (First term)	Principles of Analog Electronics	Three lectures/Week (Total 36 lectures per term)	08	32	40 *
Theory Paper I (ELC-101) (Second term)	Principles of Analog Electronics	Three lectures/Week (Total 36 lectures per term)			
Theory Paper II (ELC-102) (First term)	Principles of Digital Electronics	Three lectures/Week (Total 36 lectures per term)	08	32	40 *
Theory Paper II (ELC-102) (Second term)	Principles of Digital Electronics	Three lectures/Week (Total 36 lectures per term)			
Practical Paper III (ELC-103) (First & Second Term)	Practical	10 Practicals of 4 lectures in each term (20 practicals / year)	08	32	40 *

* Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Notes:

1. Total marks: Theory (100 + 100) = 200 marks
2. Total marks per year 200 (Theory) + 100 marks (practicals) = 300 marks
3. Internal marks for theory papers given on the basis of internal assessment tests and for practicals on internal assessment tests + journals + attendance + study visit reports/ market survey/hobby projects etc.

Theory examination will be of three hours duration for each theory course. There shall be 5 questions each carrying equal marks. The pattern of question papers shall be:

Question 1	8 sub-questions, each of 2 marks; answerable in 2 -3 lines and based on entire syllabus
Question 2 and 3 and 4	4 out of 6– short answer type questions, each of 4 marks; answerable in 8 – 10 lines
Question 5	2 out of 3 – long answer type questions; 8 marks each; answerable in analytical fashion or circuit/logic diagrams

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each term. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain).There shall be 20 questions.
For practicals: one internal assessment test + marks for journals + attendance + hobby project - tour report etc.

Practical Examination: Practical examination shall be conducted by the respective college at the end of the academic year. Practical examination will be of 6 hours duration (2-Sessions). Certified journal is compulsory to appear for practical examination. There shall be two expert and two examiners per batch for the practical examination.

Second Year B.Sc. Computer Science Subject : Electronics

Pattern of examination: Semester

Theory courses (SemI: ELC 211 and ELC 212): Semester

(Sem II: ELC 221 and ELC 222): Semester

Practical Course (ELC 223): Annual

Paper/ Course No.	Title	Total Number of lectures/practicals Per Semester	Standard of passing		
			Internal marks out of 10 (theory) Out of 20 (practicals)	External marks out of 40 (theory) Out of 80 (practicals)	Total passing marks out of 50 (theory) and out of 100 (practicals)
Theory Paper I (ELC 211)	**Paper I**	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Theory Paper II (ELC 212)	**Paper II**	Four lectures/Week	04	16	20 *

		(Total 48 per Semester)			
Theory Paper I (ELC 221)	**Paper I**	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Theory Paper II (ELC 222)	**Paper II**	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Practical paper III (ELC 223) (First & Second Semester)	**Paper III**	12 Practicals of 4 lectures in each Semester (24 practicals / year)	08	32	40 **

* Subject to compulsory passing in external examination and getting minimum 20 marks out of 50
** Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Notes:

1. Total marks: Theory for each semester (50 + 50) = 100 marks
2. Total marks per year 200 (Theory) + 100 marks (practicals) = 300 marks
3. Internal marks for theory papers given on the basis of internal assessment tests and for practicals on internal assessment tests + journals + attendance + study visit reports/ market survey/hobby projects etc.

Theory examination will be of two hours duration for each theory course. There shall be 4 questions each carrying marks as per the table. The pattern of question papers shall be:

Question 1	10 sub-questions, each of 1 marks	10 marks
Question 2 and 3	2 out of 3 sub-questions, each of 5 marks; short answer type questions; answerable in 8 – 10 lines	10 marks each
Question 4	2 out of 3 sub-questions, each of 5 marks; long answer type questions (12-16 lines), problems, circuit/logic diagrams and designs	10 marks

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each Semester. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain) There shall be 20 questions.
For practicals: one internal assessment test + marks for journals + attendance + visit report.

Practical Examination: Practical examination shall be conducted at the respective college at the end of the academic year. Practical examination will be of 6 hours (2-Sessions) duration. Certified journal is compulsory to appear for practical examination. There shall be one expert and two examiners per batch for the practical examination. One of the examiners will be external.

5 B) Standard of Passing:

i. In order to pass in the first year theory examination, the candidate has to obtain 40 marks out of 100 in each course. (Minimum 32 marks out of 80 must be obtained in the University Theory Examination.)
ii. In order to pass in the Second Year and Third Year theory examination, the candidate has to obtain 20 marks out of 50 in each course of each semester. (Minimum 16 marks out of 40 must be obtained in the University Theory Examination.)
iii. In order to pass in practical examination, the candidate has to obtain 40 marks out of 100 in each course. (Minimum 32 marks out of 80 must be obtained in the University Examination.)

5 C) ATKT Rules:

While going from F.Y.B.Sc. toS.Y.B.Sc. at least 8 courses (out of total 12) should be passed; however all F.Y.B.Sc. courses should be passed while going to T.Y.B.Sc.

5 D) External Students: There shall be no external students.

5 E) Setting Question papers:

F.Y.B.Sc.: For theory papers I and II annual question papers shall be set by the University of Pune and assessment done at the respective colleges. Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject. For Practical Paper IIIpapers shall be set by the University of Pune and assessment done at the respective colleges.

S.Y.B.Sc.: For theory papers I and II for each semester and also for the annual practical examination question papers set by the University of Pune. Centralized assessment for theory papers done as per the University instructions. Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject. For Practical Paper IIIpapers shall be set by the University of Pune and assessment done by the inyernal examiner and external examiner appointed by University of Pune.

5F)Verification and Revaluation Rules:

As per university Statues and rules for verification and revaluation of marks in stipulated time after declaration of the semester examination result.

6) Course Structure:

Duration: The duration of B.Sc. (Computer Science) Degree Program shall be three years. Electronics is offered at first and second year.

a) Compulsory Papers : All Theory and Practical Papers

b) Optional Papers : Nil

c) Question Papers :

F.Y.B.Sc.
Theory paper: University Examination – 80 marks (at the end of 2nd term)
Internal Examination – 20 marks
Practical Paper:University Examination – 80 marks (at the end of 2nd term)
Internal Examination – 20 marks

S.Y.B.Sc.
Theory paper: University Examination – 40 marks (at the end of each semester)
Internal Examination – 10 marks
Practical Paper: University Examination – 80 marks (at the end of 2nd semester)
Internal Examination – 20 marks

d) Medium of Instruction: The medium of instruction for the course shall be **English.**

7) Equivalence of Previous Syllabus:

Old Course (2008 Pattern)	**New Course (2013 Pattern)**
Paper I: Electronic Devices, circuits and computer peripherals	ELC-101: Principles of Analog Electronics
Paper II: Fundamentals of Digital Electronics	ELC-102: Principles of Digital Electronics
PaperIII: Practical	ELC-103: Practical

8) University Terms: Dates for commencement and conclusion for the first and second terms will be declared by the University authorities. Terms can be kept by only duly admitted students. The term shall be granted only on minimum 75 percent attendance at theory and practical course and satisfactory performance during the term.

9) Qualification of Teachers:M.Sc. Electronic Science or equivalent master degree in science with class/grades and NET/SET as per prevailing University /Government /UGC rules.

10) Detail Syllabus with Recommended Books:

Electronics Subject of F.Y. B.Sc.Computer Science

Paper I

ELC-101: Principles of Analog Electronics

Objectives:

1. To get familiar with basic circuit elements and passive components
2. To understand DC circuit theorems and their use in circuit analysis
3. To study characteristic features of semiconductor devices
4. To study elementary electronic circuits and applications
5. To understand basics of operational amplifiers.

Term I

Unit 1: Passive Components (12)

Study of basic circuit elements and passive components (with special reference to working principle,circuit symbols, types, specifications and applications): Resistor, Capacitor, Inductor, Transformer,Cables, Connectors, Switches, Fuses, Relays, Batteries.

Unit 2: Basic Electrical Circuits and Circuit Theorems (14)

Concept of Ideal Voltage and Current source, internal resistance, dc sources(voltage/current) and sinusoidal ac source(amplitude, wavelength, period, frequency, phase angle), Network terminology,Ohms law, series and parallel circuits of resistors, capacitors and inductors, voltage and current dividers, Kirchhoff's Laws (KCL, KVL), Superposition theorem, concept of black box, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem (numerical problems with maximum two meshes), Charging-discharging of capacitor,AC applied to R, C and L, concept of impedance, LCR series resonant circuit,concept of phase difference, RC low pass and high pass filter

Unit 3: Semiconductor Diodes and Circuits (10)

Study of semiconductor devices with reference to symbol, working principle, I-V characteristics, parameters, specifications: diode, zener diode, light emitting diode, photo diode, optocoupler, varactordiode, solar cell, clipper and clamper circuits
Rectifiers (half and full wave), rectifier with capacitor-filter, Zener regulator, Block diagram of power supply

Term II

Unit 4: Bipolar JunctionTransistor and Circuits (14)

Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, I-V characteristics, parameters, specifications, Concept of amplification, voltage and current amplifer,Transitor amplifierconfiguarations - CB, CC and CE, biasing circuits-voltage divider, collector feedback bias and emitter feedback bias, DC load line (CE), Q point and factors affecting the stability, transistor as a switch,concept of class A, B

and class C amplifiers, emitter follower amplifier, Single stage RC coupled CE amplifer, concept of frequency response and bandwidth

Unit-5:**UJT,FETs and Applications** (10)

Symbol, types, construction, working principle, I-V characteristics, Specifications parameters of: Uni-Junction Transistor (UJT), Junction Field Effect Transitor (JFET), Metal Oxide Semiconductor FET (MOSFET), comparison of JFET, MOSFET and BJT

Appications: JFET as voltage variable resistor, MOSFET as a switch

Unit 6: Operational Amplifier (12)

Symbol, block diagram, Opamp characteristics, basic parameters (ideal and practical) such as input and output impedance, bandwidth, differential and common mode gain, CMRR, slew rate, Concept of virtual ground, concept of feedback, Information about IC741

Opamp as inverting and non-inverting amplifier, volage follower, adder, substractor

Opamp as a comparator and Schmitt trigger

Text/ Reference Books:

1. Basic Electronics:Bernard Grob, McGraw Hill Publication, 8th Revised Edition, 2010
2. Electronic Principles:Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
3. Principals of Electronics: V.K. Mehta, S.Chand and Co.
4. A text book of electrical technology: B.L.Theraja, S.Chand and Co.
5. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., Gupta S.C., Tata McGraw Hill.
6. A First Course in Electronics: Khan Anwar, K.K.Day, PHI learning Pvt.Ltd.
7. Electronic Devices and Circuits: Bolyestad, Tata McGraw Hill.
8. Electronic Devices and circuits: A. Motorshed, Prentice Hall of India.
9. Basic Electronic Devices and Circuits: R.Y.Borse, 1stEdition 2012, Adhyayan Publishers and Distributors, New Delhi.

Paper II

ELC-102: Principles of Digital Electronics

Objectives:

1. To get familiar with concepts of digital electronics
2. To learn number systems and their representation
3. To understand basic logic gates, booleanalgebra and K-maps
4. To study arithmetic circuits, combinational circuits and sequential circuits
5. To study comparative aspects of logic families.

Term I

Unit 1: Number Systems and Logic Gates (12)

Introduction to decimal, Binary and hexadecimal number systems and their inter-conversions,Signed and fractional binary number representations, BCD, Excess-3 and Graycodes, Alphanumeric representation in ASCII codes.

Positive and Negative Logic, Basic Logic gates (NOT, OR, AND) & derived gates (NAND, NOR, EX-OR) Symbol and truth table, Applications of Ex-OR gates as parity checker and generator.

Unit 2: Boolean Algebra and Karnaugh maps (12)

Boolean algebra rules and Boolean laws: Commutative, Associative, Distributive, AND, OR and Inversion laws, DeMorgen's theorem, Universal gates.
Min terms, Max terms , Boolean expression in SOP and POSform, conversion of SOP/POS expression to its standard SOP/POSform., Simplifications of Logic equations usingBoolean algebra rules and Karnaugh map (up to 3 variables).

Unit 3: Arithmetic Circuits (12)

Rules of binary addition and subtraction, subtraction using 1's and 2's complements, halfadder, full adder, Half subtractor, Full subtractor, Four bit parallel adder, Universal adder / subtractor, Digital comparator, Introduction to ALU.

Term II

Unit 4: Combinational Circuits (14)

Multiplexer (2:1, 4:1), demultiplexer (1:2, 1:4) and their applications, Code converters - Decimal to binary, Hexadecimal tobinary, BCD to decimal, Encoder & decoder 3x4 matrix keyboard encoder, prority encoder,BCD to seven segment decoder.

Unit 5: Sequential Circuits (14)

Flip flops :RS using NAND/NOR, latch, clocked RS, JK, Master slave JK, D and T.
Counters: Ripple Binary counter, up down counter, concept of modulus counters,Decade counter, Counters for high-speed applications (Synchronous counters) withtiming diagrams.
Shift registers: SISO, SIPO, PISO, PIPO shift registers, ring counter, universal 4-bit shift register and Applications.

Unit 6: Logic Families (8)

Introduction to Integrated circuit technologies TTL, ECL, CMOS
IC parameters: Logiclevels, switching speed, propagation delay, power dissipation, noise margins andfanout of TTL and CMOS.
TTL NAND & NOT gate, Open collector gates, Wired OR operation. CMOS - NOT, NAND, NOR gate, precautions while handling CMOS gates, tri-state logic.

Text/ Reference Books:

1. Digital Electronics: Jain R.P., Tata McGraw Hill
2. Digital Principles and Applications:Malvino Leach, Tata McGraw-Hill.
3. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education

Paper III

ELC-103: Practical Course

1 The practical course consists of 20 experiments.

2 Any two of the following activities with proper documentation will be considered as equivalent of 4 experiments weightage in term work.

i. Preparatory experiments
ii. Hobby projects
iii. Internet browsing
iv. industrial visit / live work experience
v. PCB Making
vi. Market Survey of Electronic Systems
vii. Circuit Simulations and CAD tools

These will be evaluated in an oral examination for 20% marks at internal and term end examination.

3. All the students are required to complete a minimum of 16 experiments

(four from each group) from the following list.

Group A Any Four

1. Study of forward and Reverse biased characteristics of PN Junction Diode
2. Study of breakdown characteristics and voltage regulation action of Zener diode
3. Study of output characteristics of Bipolar Junction Transistor in CE mode
4. Study of output and transfer characteristics JFET/MOSFET
5. Study of I-V characteristics of UJT and Demonstration of UJT based relaxation oscillator .
6. Study of solar cell.

Group B Any four

1. Verification of network theorems: KCL / KVL, Thevenin, Norton.
2. Verification of network theorems: Maximum Power Transfer, Superposition theorem.
3. Design, build and test Low pass and High pass RC filters.
4. Study of low voltage Half-wave, Full-wave and Bridge rectifier circuits.
5. Study of amplification action of BJT.
6. Study of potential divider biasing of BJT and its use in DC motor driving.
7. Build and test Inverting and non inverting amplifier using OPAMP.
8. Build and test adder and subtractor circuits using OPAMP.
9. Study of clipping and clamping circuits.

Group C Any Four

* Minimum Two experiments may be carriedout with CMOS ICs

1. Basic Logic gates using Diodes and transistors
2. Interconversions and realizations of logic expressions using ICs
3. Study of RS, JK and D flip flops using NAND gates
4. Study of Up/Down Counter
5. Study of decade counter IC circuit configurations
6. Study of 4-bit Shift register IC

Group D Any Four

1. Build and Test 4 bit parity checker/ generator using X-OR gate IC
2. Build and Test Half Adder, Full Adder and Subtractor using basic gate
3. Build and Test 2:1 Multiplexer and 1:2 Demultiplexer using gates
4. Build and Test 3X4 matrix Keyboard Encoder
5. Build and Test a Debounce switch using NAND or NOR gate IC
6. Build and Test Diode matrix ROM
7. Study of Four bit Universal Adder/Subtractor / ALU

Preparatory Experiments

1. Identification of Components / Tools

- Minimum 10 different types of components must be given
- Identification based on visual inspection / data sheets be carried out

2. Use of Multimeters (Analog and Digital)

- Measurement of AC/DC voltage and Current – on different ranges
- Measurement of R & C
- Testing of Diodes & Transistors
- Measurement of h_{fe}
- Use of Multimeter in measurement of Variation of Resistance of LDR.
- Thermister

3. Study of Signal Generator/CRO

- Understand how to use Signal Generator/CRO
- Study of front panel controls
- Measurement of amplitude and frequency of Sine/Square waveform
- Measurement of Phase with the help of RC circuit
- Demonstration of Lissajous figures
- Demonstrate the use of Component testing facility

Hobby Project Examples

Build and Test gadgets like

- Water level Indicator
- Photo relay / smoke detector
- Burglar Alarm
- Fan regulator
- Logic Probe
- Experiments with some software's like PSPICE / LTSPICE
