Shri Sangameshwar Education Society's
Sangameshwar College, Solapur
[Autonomous]
(Affiliated to Punyashlok Ahilyadevi Holkar Solapur University, Solapur)
Kannada Linguistic Minority Institute
NAAC Accredited with 'A' Grade (III Cycle CGPA 3.39)

Academic Council 1(6)
2nd July, 2020

UG Science Programme: B.Sc.-I To be implemented from A.Y. 2020-2021

System: Choice Based Credit System (CBCS) with SGPA and CGPA

B.O.S. in: **ELECTRONICS**

Syllabus for: Discipline Specific Core Courses (DSC-A and DSC-B)

Table-1

Semester	Course		Teaching Scheme/week			
			Course Code	Hours	Lectures	Credits
I	DSC-A	Theory-I: Basic Circuit Theory and Network Analysis	2031110	4	5	4
		Theory-II: Digital Fundamentals	2031111			
		Practical-I: Electronics Practical	2031224	3.2	4	2
II	DSC-B	Theory-I: Semiconductor Devices	2031210	4	5	4
		Theory-II: Digital Electronics	2031211			
		Practical-I: Electronics Practical	2031224	3.2	4	2

Table-2

Semester	Course		EXAMINATION			Credits
			Marks			
			CA	SEE	Total	
I	DSC-A	Theory-I: Basic Circuit Theory and Network Analysis	15	35	50	4
		Theory-II: Digital Fundamentals	15	35	50	

II	DSC-B	Theory-I: Semiconductor Devices	15	35	50	4
		Theory-II: Digital Electronics	15	35	50	
	DSC-A & DSC-B	Practical-I: Electronics Practical	30	70	100	4

CA: Continuous Assessment SEE: Semester End Examination

Note: -

The above structure (Table-1 and Table-2) is for Sem-I and Sem-II of the undergraduate B.Sc.-I * /B.S.Ecs.-I /B.C.A.-I programmes under science faculty.

* B.Sc.-I Select any four DSC form Chemistry /Physics /Mathematics /Statistics /Electronics /Botany /Zoology /Geography /Psychology.

DSC: Discipline Specific Core Course **AECC:** Ability Enhancement Compulsory Course

Passing in each course is compulsory including Democracy. course.

SGPA/CGPA and Total Marks will be calculated excluding AECC and Democracy. courses.

Compulsory Course:

DEMOCRACY	2000232	DEMOCRACY ELECTIONS AND GOVERNANCE
PHY EDU	2000233	PHYSICAL EDUCATION

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SEM I

DSC-A Theory-I ELECTRONICS-I (2031110)

Title: Basic Circuit Theory and Network Analysis

Marks: 50

Credits: 2 **Lectures: 30 Hours**

1. **Circuit Elements** (6)

Active and passive elements, Resistors, Capacitors, Inductors, Transformers, Relays and Fuses, PCBs

(Classification, construction, Specifications and Applications only)

2. **Circuit Fundamentals** (5)

DC sources, Constant voltage and current sources, AC sources, Sinusoidal and non-sinusoidal sources, R.M.S current and voltage, Phase relationship of current and voltage with pure resistor, capacitor and inductor. (Numerical examples are expected)

3. **Network Theorem** (7)

Kirchhoff's Laws, Mesh and Nodal analysis

(Only DC resistive circuits)

Star-Delta network, Star-Delta Conversion

Principal of Duality, Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Reciprocity Theorem, Millman's Theorem, Maximum power transfer theorem (Statements only) (Numerical examples are expected)

4. **AC Circuit analysis** (6)

Series and Parallel RLC circuits Phase diagram, Impedance, Admittance

Series and Parallel resonance, Response curve, Band width, Quality factor

Low Pass, High Pass, Band Pass and Band Stop (Qualitative only)

(Numerical Examples are expected)

5. **Two Port Network** (6)

Black box theory, Concept of equivalent network, Z, Y, H & Transmission (ABCD) parameters, T-network, π-network and them inter conversion (expressions only) (Numerical examples are expected)

Course Outcome:

- ✔ *Explore fundamental laws and elements of electrical circuits.*
- ✔ *Understand DC circuit, theorems, and networks.*
- ✔ *Reduce more complicated circuits into simpler equivalent circuits*
- ✔ *Understands AC circuits and related terminologies with examples.*
- ✔ *Design simple DC and AC circuits and solve numerical problems.*

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SEM I

DSC-A Theory-II ELECTRONICS-II (2031111)

Title: Digital Fundamentals

Marks: 50

Credits: 2 **Lectures: 30 Hours**

1. **Number Systems & Binary Codes** (6)

Binary, Octal, Decimal, Hexadecimal number systems and their inter- conversions,

1's compliment, 2's compliment, Arithmetic operations along with

1's compliment, 2's compliment8421 code, Excess-3 code, Gray code, ASCII code

2. **Logic Gates** (6)

OR, AND, NOT, NAND, NOR, Ex-OR, Ex-NOR gates,

Positive and Negative logic, De Morgan's Theorems,

Universality of NAND and NOR gates,

Study of IC 7400, 7402, 7404, 7408, 7432, 7486

3. **Boolean Algebra** (6)

Rules and laws of Boolean algebra, Simplification of Boolean expression, K-map,

K-maps for 2, 3 and 4 variables, Use of K-map for reduction of Boolean expressions

4. **Arithmetic Circuits** (7)

Exclusive OR gate as a Binary to Gray and Gray to Binary converter,

Parity checker, Controlled inverter, Half adder, Full adder, Parallel binary adder,

Half and Full subtractor, Parallel binary subtractor

5. **Digital Logic Families** (5)

Introduction to logic families, Standard TTL NAND gate,

Specifications of Standard TTL logic family (Sinking, sourcing current,

Input/output voltage limits, Fan-in, Fan-out, Noise margin, Propagation delay, Power dissipation)

Course Outcome:

- ✔ *Convert different type of codes and number systems in computers and communication.*
- ✔ *Describe switch model used to illustrate building blocks of digital circuits.*
- ✔ *Use Boolean algebra and Karnaugh maps for reduction of logic expressions and circuits.*
- ✔ *Perform arithmetic operation on binary numbers and design simple arithmetic logic circuits*
- ✔ *Introduction to TTL logic family*

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SEM II

DSC-B Theory-I ELECTRONICS-III (2031210)
Title: Semiconductor Devices

Marks: 50

Credits: 2 **Lectures: 30 Hours**

1. **Semiconductor and p-n Junction** (6)

Intrinsic and extrinsic semiconductors, Formation of p-n junction,

Barrier potential, I-V characteristics, Diode equation, Static and dynamic resistance,

Junction capacitance

Zener diode, Breakdown mechanism (Zener & avalanche), I-V characteristics

LED, Photo diode (Construction, working, I-V characteristics and applications only)

2. **Diode Circuits** (7)

Rectifiers: HWR, FWR (center tapped and bridge).

Circuit diagrams, working and waveforms and derivation for output voltage,

ripple factor & efficiency, comparison of half and full rectifiers.

Filters: types, shunt, LC, CLC (π) filter (Qualitative analysis)

Zener diode as a regulator, circuit diagram and explanation for

load and line regulation, disadvantages of Zener diode regulator

3. **Bipolar Junction Transistor (BJT)** (5)

BJT construction and operation, Transistor configurations, I/P and O/P characteristics

of CE and CB configurations, Graphical determination of α and β.

(Numerical examples are expected)

4. **Field Effect Transistor (FET)** (6)

FET, Comparison between BJT and FET, Structure and operation of n-channel

and p-channel JFET, I-V characteristics, Parameters, Applications

(Numerical examples are expected) Depletion and Enhancement MOSFET,

Structure and operation, I-V characteristics

5. **Power Devices** (6)

UJT: Basic construction and working, Equivalent circuit, intrinsic Standoff Ratio,

Characteristics and relaxation oscillator expression.

SCR Triac, Diac, Power MOSFET and IGBT:

Circuit symbol, Construction, Operation and Applications.

Course Outcome:

- ✔ *Understand the basic material and properties of semiconductors*
- ✔ *Explore the constructional features of basic semiconductor devices.*
- ✔ *Describe the biasing principles of semiconductor devices like diode and transistors*
- ✔ *Understand basic diode circuits*
- ✔ *Explain the I-V characteristics of semiconductor devices like diode, BJT, UJT, JFET, MOSFET,*
- ✔ *SCR, DIAC, TRIAC & IGBT*

SEM II

DSC-B Theory-II ELECTRONICS-IV (2031211)

Title: Digital Electronics

Marks: 50

Credits: 2 **Lectures: 30 Hours**

1. **Programmable logic devices** (5)

Introduction to PLA, PAL, PLD, CPLD, FPGA, ASIC

2. **Combinational Logic** (7)

Encoder: Decimal to BCD encoder, Priority encoder (IC 74147)

Decoder: 2-4 and 3-8 decoders (IC 74138), BCD-Decimal decoder,

BCD-7segment decoder (IC 7447). Multiplexer: 4-1 and 8-1 multiplexer (IC 74153)
De-multiplexer: 1-4 and 1-8 de-multiplexer

3. **Flip Flops** (6)

RS flip flop using NOR and NAND gates, Clocked RS flip flop, D-flip flop,
Edge triggered D-flip flop, JK-flip flop, Master slave JK flip flop,
T flip flop, (Timing diagrams are expected)

4. **Shift Registers** (6)

Shift register, Types of shift registers, SISO, SIPO, PISO and PIPO,
Serial and parallel loading, Study of Right shift, Left shift, Ring counter,
Johnson counter (IC 7495) (Timing diagrams are expected)

5. **Counter Techniques** (6)

Basic counter operation, 4-bit asynchronous and synchronous counters,
Combination counter, MOD-2, MOD-5 counter, Decade counter (IC 7490)
(Timing diagrams are expected)

Course Outcome:

- ✔ *Introduction to PLCs*
- ✔ *Understand different combinational logic circuits such as decoder, encoder, multiplexers and de-multiplexers*
- ✔ *Understand flip flops*
- ✔ *Develop counters, shift registers using flip flops*

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SEM II
DSC-A & DSC-B

ELECTRONICS PRACTICAL-I (2031224)

Marks: 100
Credits: 4 **Lectures: 30 Hours**

Group-A

1. Study of Kirchhoff's Laws
2. Study Series /Parallel Resonance
3. Study Thevenin's Theorem
4. Study Superposition Theorem
5. Study Maximum Power Transfer Theorem

6. Measurement of Z, Y, and h-parameters for two port resistive network
7. Characteristics of Semiconductor Diode
8. Characteristics of Zener Diode
9. Characteristics of CE/CB configuration
10. Characteristics of JFET

Group-B

1. Study De Morgan's Theorems
2. Study of Universal Gates
3. Study Half and Full Adder
4. Study Half and full Subtractor
5. Study of RS, D and JK Flip flop
6. Study of Counters (divided by 2, 5 and 10) using IC-7490
7. Study and Ring counter using IC7495
8. Study of Multiplexer and De-multiplexer
9. Study of Encoder (74148) and Decoder (74138)
10. Study of BCD to 7 segment decoders

Teaching-Learning Equipments/Tools/Methods/etc:

- ✔ *Use appropriate ICT tool, wherever necessary, for effective teaching.*
- ✔ *Use diagrams to discuss different AC/DC circuits.*
- ✔ *Use diagrams to discuss different device structures.*
- ✔ *Use audio-visual media to demonstrate practical related concepts.*
- ✔ *Use of simulation tools to demonstrate basic digital circuits*

List of Books:

1. Circuit and Networks: Analysis and Synthesis A. Sudhakar& S.P. Sham Mohan, (TMH)
2. Network Lines and Fields J. D. Ryder, (McGraw Hill)
3. Network Analysis M.E. Van Valkenberg (PHI, New Delhi)
4. Basic Electronics Bernard Grob
5. A Text Book of Applied Electronics by R.S. Shedha (S. Chand & Co.)
6. Digital Fundamentals by Floyd, Pearson Education
7. Digital Principles & Applications by A. P. Malvino & D.P. Leach (TMH, New Delhi)
8. Modern Digital Electronics by R.P. Jain
9. Digital Systems: Principles and Applications by Ronald J Tocci, N S Widerman
10. Digital Electronics, Circuits & Systems by V. K. Puri, TMH, New Delhi.
11. Electronic Devices and Circuits: Jacob Milman &C S Halkias, MGH
12. Electronic Devices and Circuits, An introduction: Allen Mottershed (PHI Delhi)

Chairman
BOS in Electronics