



## **ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION**

(A Statutory body of the Government of Andhra Pradesh)

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### **REVISED SYLLABUS OF B.Sc. ELECTRONICS UNDER CBCS FRAMEWORK** **WITH EFFECT FROM 2020-2021**

**PROGRAMME: THREE-YEAR B.Sc. ELECTRONICS**

*(With Learning Outcomes, Unit-wise Syllabus, References, Co-curricular Activities & Model Q.P.)*

*For Fifteen Courses of 1, 2, 3 & 4 Semesters)*

**(To be Implemented from 2020-21 Academic Year)**

**A.P. STATE COUNCIL OF HIGHER EDUCATION**

**B.Sc. ELECTRONICS**

**REVISED SYLLABUS FOR CORE COURSES  
CBCS/ SEMESTER SYSTEM**

**(w.e.f. 2020-21 Admitted Batch)**

**CORE COURSES STRUCTURE**

**(Sem-I to Sem-IV)**

**B. Sc ELECTRONICS SYLLABUS UNDER CBCS**

| Semester     | Paper | Subject                               | IA | ES | Total |
|--------------|-------|---------------------------------------|----|----|-------|
| SEMESTER I   | I     | CIRCUIT THEORY AND ELECTRONIC DEVICES | 25 | 75 | 100   |
|              |       | Lab                                   | 50 | 0  | 50    |
| SEMESTER II  | II    | Digital Electronics                   | 25 | 75 | 100   |
|              |       | Lab                                   | 0  | 50 | 50    |
| SEMESTER III | III   | Analog Circuits and Communication     | 25 | 75 | 100   |
|              |       | Lab                                   | 50 | 0  | 50    |
| SEMESTER IV  | IV    | MICROPROCESSOR SYSTEMS                | 25 | 75 | 100   |
|              |       | Lab                                   | 0  | 50 | 50    |
|              | V     | MICRO CONTROLLER AND INTERFACING      | 25 | 75 | 100   |
|              |       | Lab                                   | 0  | 50 | 50    |

B.Sc. Electronics Syllabus under CBCS  
w.e.f. 2020-21 (revised in June 2020)

**SEMESTER-1**

**PAPER – I**

**CIRCUIT THEORY AND ELECTRONIC DEVICES**

**Objectives:**

- To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis techniques.
- To analyze circuits in time and frequency domain.
- To synthesize the networks using passive elements.
- To understand the construction, working and VI characteristics of electronic devices.
- To understand the concept of power supply.

**UNIT- 1: (12Hrs)**

**SINUSOIDAL ALTERNATING WAVEFORMS:**

Definition of current and voltage. The sine wave, general format of sine wave for voltage or current, phase relations, average value, effective (R.M.S) values. Differences between A.C and D.C. Phase relation of R, L and C

**UNIT-II: (12hrs)**

**PASSIVE NETWORKS AND NETWORKS THEOREMS (D.C):**

Kirchoff's Laws, Branch current method, Nodal Analysis, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power, Milliman and Reciprocity theorems.

**UNIT-III: (12hrs)**

**RC, RL AND RLC CIRCUITS:**

Frequency response of RC and RL circuits, their action as low pass and high pass filters. Passive differentiating and integrating circuits. Series resonance and parallel resonance circuits, Q – Factor.

**UNIT-IV: (12hrs)**

**BJT, FET and UJT:**

PN – Junction Diode: Construction, working and V-I characteristics, BJT: Construction, working, and characteristics of CE Configurations. Hybrid parameters and hybrid equivalent circuit of CE Transistor,

FET: Construction, working and characteristics of JFET and MOSFET. Advantages of FET over BJT.

UJT: Construction, working and characteristics of UJT. UJT as a Relaxation oscillator.

**UNIT-V:(12hrs)**

**POWER SUPPLIES & PHOTO ELECTRIC DEVICES**

Rectifiers: Half wave, full wave rectifiers-Efficiency-ripple factor- Filters- L-section &  $\pi$ -section filters. Three terminal fixed voltage I.C. regulators(78XX and &79XX). Light Emitting Diode – Photo diode and LDR.

### **TEXT BOOKS:**

1. Introductory circuit Analysis (UBS Publications) ---- **Robert L. Boylestad.**
2. Electronic Devices and Circuit Theory --- **Robert L. Boylestad & Louisashelsky.**
3. Circuit Analysis by **P.Gnanasivam- Pearson Education**
4. Electronic Devices and Circuit Theory --- **Robert L. Boylestad & Louis Nashelsky.**
5. Electronic Devices and Circuits I – **T.L.Floyd- PHI Fifth Edition**

### **REFERENCE BOOKS:**

1. Engineering Circuit Analysis **By: Hayt & Kemmerly - MG.**
2. Networks and Systems – **D.Roy Chowdary.**
3. Unified Electronics (Circuit Analysis and Electronic Devices) **by Agarwal- Arora**
4. Electric Circuit Analysis- **S.R. Paranjothi-** New Age International.
5. Integrated Electronics – **Millmam & Halkias.**
6. Electronic Devices & Circuits – **Bogart.**
7. Sedha R.S., A Text Book Of Applied Electronics, S.Chand & Company Ltd

### Outcomes:-

- ✓ Apply concepts of electric network topology, nodes, branches, loops to solve circuit problems including the use of computer simulation.
- ✓ Apply time and frequency concepts of analysis.
- ✓ Synthesize the network using passive elements.
- ✓ Know about amplifier circuits, switching circuits and oscillator circuits their design and use in electronics.
- ✓ Design and construction of a power supply.

(Circuit Theory and Electronic Devices)

**LAB LIST:**

1. Thevenin's Theorem-verification
2. Norton's Theorem-verification
3. Maximum Power Transfer Theorem-verification
4. LCR series resonance circuit.
5. PN – Junction Diode: V-I characteristics
5. BJT input and output characteristics
- 6.FET Output and transfer characteristics
7. UJT VI characteristics
- 8.LDR characteristics
9. IC regulated power supply(IC-7805)

**Lab experiments are to be done on breadboard and simulation software (using multisim) and output values are to be compared and justified for variation.**

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# B.Sc. Electronics Syllabus under CBCS

w.e.f. 2020-21 (revised in June 2020)

**SEMESTER – II**

**PAPER – 2**

## **Digital Electronics**

### **Objectives:**

- To understand the number systems, Binary codes and Complements.
- To understand the Boolean algebra and simplification of Boolean expressions.
- To analyze logic processes and implement logical operations using combinational logic circuits.
- To understand the concepts of sequential circuits and to analyze sequential systems in terms of state machines.
- To understand characteristics of memory and their classification.
- To implement combinational and sequential circuits using VHDL.
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### **Unit – I (12hrs)**

**NUMBER SYSTEM AND CODES:** Decimal, Binary, Hexadecimal, Octal. Codes: BCD, Gray and Excess-3 codes- code conversions- Complements (1's, 2's, 9's and 10's), Addition - Subtraction using complement methods.

### **Unit- II (12hrs)**

**BOOLEAN ALGEBRA AND THEOREMS:** Boolean Theorems, De-Morgan's laws. Digital logic gates, Multi level NAND & NOR gates. Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh Map Method: 2,3,4 variables).

### **Unit-III (12hrs)**

#### **COMBINATIONAL DIGITAL CIRCUITS:**

Adders-Half & full adder, Subtractor-Half and full subtractors, Parallel binary adder, Magnitude Comparator, Multiplexers (4:1) and Demultiplexers (1:4), Encoder (8-line-to-3-line) and Decoder (3-line-to-8-line). IC-LOGIC FAMILIES: TTL logic, CMOS Logic families (NAND&NOR Gates).

### **UNIT-IV (12hrs)**

#### **SEQUENTIAL DIGITAL CIRCUITS:**

Flip Flops: S-R FF, J-K FF, T and D type FFs, Master-Slave FFs, Excitation tables, Registers:-Serial In Serial Out and Parallel In and Parallel Out, Counters Asynchronous, Mod-8, Mod-10, Synchronous-4-bit & Ring counter.

### **UNIT-(12hrs)**

#### **MEMORY DEVICES:**

General Memory Operations, ROM, RAM (Static and Dynamic), PROM, EPROM, EEPROM, EAROM,

**TEXT BOOKS:**

1. M.Morris Mano, “ Digital Design “ 3<sup>rd</sup> Edition, PHI, New Delhi.
2. Ronald J. Tocci. “Digital Systems-Principles and Applications” 6/e. PHI. New Delhi. 1999.(UNITS I to IV )
3. G.K.Kharate-Digital electronics-oxford university press
4. S.Salivahana & S. Arivazhagan-Digital circuits and design
5. Fundamentals of Digital Circuits by Anand Kumar

**Reference Books :**

1. Herbert Taub and Donald Schilling. “Digital Integrated Electronics” . McGraw Hill. 1985.
2. S.K. Bose. “Digital Systems”. 2/e. New Age International. 1992.
3. D.K. Anvekar and B.S. Sonade. “Electronic Data Converters : Fundamentals & Applications”. TMH. 1994.
4. *Malvino and Leach. “ Digital Principles and Applications” . TMG Hill Edition.*

**Outcomes:-**

- ✓ Develop a digital logic and apply it to solve real life problems.
- ✓ Analyze, design and implement combinational logic circuits.
- ✓ Classify different semiconductor memories.
- ✓ Analyze, design and implement sequential logic circuits.
- ✓ Simulate and implement combinational and sequential logic circuits using VHDL

**ELECTRONICS LAB-2**  
**(DIGITAL ELECTRONICS LAB)**

**LAB LIST:**

1. Verification of IC-logic gates
2. Realization of basic gates using discrete components (resistor, diodes & transistor)
3. Realization of basic gates using Universal gates (NAND & NOR gates)
4. Verify Half adder and full adder using gates
5. Verify Half subtractor and full subtractor using gates.
6. Verify the truth table Multiplexer and demultiplexer.
7. Verify the truth table Encoder and decoder.
8. Verify the truth table of RS , JK, T-F/F using NAND gates
9. 4-bit binary parallel adder and subtractor using IC 7483
10. BCD to Seven Segment Decoder using IC -7447/7448

**Lab experiments are to be done on breadboard and simulation software (using  
multisim) and output values are to be compared and justified for variation.**

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**2nd YEAR**

**SEMESTER – III**

**PAPER – 3**

**Analog Circuits and Communication**

**OBJECTIVES:**

- To understand the concepts, working principles and key applications of linear integrated circuits.
- To perform analysis of circuits based on linear integrated circuits.
- To design circuits and systems for particular applications using linear integrated circuits.
- To introduce students to various modulation and demodulation techniques of analog communication.
- To analyse different parameters of analog communication techniques.
- It also focuses on Transmitters and Receivers.

**Unit – I (12hrs)**

**OPERATIONAL AMPLIFIERS:** Definition, Characteristics of Op-Amp, Block diagram of op-amp, inverting, noninverting, virtual ground, , summing amplifier, subtractor, voltage follower, op-amp parameters, voltage to current convertor ,integrator, differentiator, differential amplifier, Logarithmic amplifier.

**Unit- II:(12hrs)**

**OP-AMP CIRCUITS:** voltage regulator, comparator, zero cross detecting circuit, instrumentation amplifier, Schmitt trigger. sine wave generator, square wave generator, triangular wave generator, Active filters (Basics)-low pass, high pass, band pass filters  
IC-555 –functional block diagram and mention it's applications

**UNIT –III (12Hrs) AMPLITUDE MODULATION:**

Need for modulation, amplitude modulation-frequency spectrum of AM wave, representation of AM, power relations in the AM wave. Generation of AM- Transistor modulators. Detection of AM signals – Diode detector.

**UNIT-IV (12hrs) FREQUENCY MODULATION:**

Theory of FM, Frequency deviation and carrier swing, modulation index, deviation ratio, percent modulation. Mathematical representation of FM, frequency spectrum and bandwidth of FM waves, Generation of FM signals – Varactor diode modulator and Reactance modulator. Detection of FM waves – FM demodulation with discriminator.

**UNIT-V (12hrs) RADIO BROADCASTING AND RECEPTION:**

Spectrum of electromagnetic waves, Radio broadcasting and reception, Transmitters, AM receivers- Straight forward receiver, Super heterodyne receiver. FM receivers.

**TEXT BOOKS:**

1. Op Amp and Linear Integrated Circuits By Ramakant Gaykwad
2. Linear Integrated Circuits By Roy Choudary
3. Unified Electronics Vol II – J.P. Agarwal and Amit Agarwal.
4. Electronic Communications - George Kennedy
5. Antennas and Wave Propagation – G.S.N.Raju – PHI
6. Principles of communication system –Herbert Taub & D.L.Schilling

**Reference Books :**

1. Jacob Millan ,Micro Electronics,McGraw Hill.
2. Mithal G K, Electronic Devices and Circuits Thana Publishers.
3. Allan Motter shead ,Electronic Devices and Circuits – An Introduction- Prentice Hall
4. Electronic Communications – Roody & Colen
5. Communication Systems – Hayken --- 4<sup>th</sup> Edition
6. Modern digital and analog communication system –B.P. Lathi

**OUTCOMES:**

- ✓ Understand the fundamentals and areas of applications for the integrated circuits.
- ✓ Analyze important types of integrated circuits.
- ✓ Demonstrate the ability to design practical circuits that perform the desired operation.
- ✓ Select the appropriate integrated circuit modules to build a given application.
- ✓ Use of different modulation and demodulation techniques used in analog communication.
- ✓ Identify and solve basic communication problems.
- ✓ Analyze transmitters and receiver circuits.

## Electronics Lab - 3

### (Analog Circuits and Communication)

#### **LAB LIST:**

1. Op-Amp as inverting and non-inverting
  2. OpAmp Voltage follower and current follower.
  3. Op-Amp as integrator and differentiator
  4. Op-Amp as adder & subtractor
  5. Op-Amp as voltage to current converter
  6. Op-Amp as square wave generator
  7. Amplitude modulation and demodulation.
  8. AM Transmitter and Receiver.
  9. FM Transmitter and Receiver.
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**2<sup>nd</sup> YEAR**

**Semester-IV**

**Paper- IV**

**I**

**TITLE: MICROPROCESSOR SYSTEMS**

**OBJECTIVES:**

- To understand basic architecture of 16 bit and 32 bit microprocessors.
- To understand interfacing of 16 bit microprocessor with memory and peripheral chips involving system design.
- To understand techniques for faster execution of instructions and improve speed of operation and performance of microprocessors
- To understand RISC based microprocessors.
- To understand concept of multi core processors.

**UNIT -I: (12Hrs)**

**CPU ARCHITECTURE**

*Introduction to Microprocessor, INTEL -8085(P) Architecture, CPU, ALU unit, Register organization, Address, data and control Buses. Pin configuration of 8085. Addressing modes*  
8086 Microprocessor: Architecture, Pin description. Instruction format, Instruction Execution timing, Addressing modes

**UNIT -II: (12 Hrs)**

**8085 Instruction Set:**

Data transfer Instruction, Logical Instructions, Arithmetic Instructions, Branch Instructions, **Machine Control instructions.**

**UNIT -III: (12Hrs)**

Assembly Language Programming using 8085, Programmes for Addition, Subtraction, Multiplication, Division, largest and smallest number in an array. BCD to ASCII and ASCII to BCD, Block of data transfer.

**UNIT -IV: (12Hrs)**

Basic 8086 Configurations – Minimum mode and Maximum Mode, Interrupt Priority Management I/O Interfaces: Serial Communication interfaces, Parallel Communication, Programmable Timers, Keyboard and display, DMA controller

**UNIT -V: (12Hrs) ARM PROCESSOR:** Introduction to 16/32 bit processors, Arm architecture & organization, Arm based MCUs, Programming model, Instruction set.

**TEXT BOOKS:**

1. Microprocessor Architecture, Programming and Applications with the 8085 – Penram International Publishing, Mumbai.- Ramesh S. Gaonakar
2. Microcomputer Systems the 8086/8088 family – YU-Cheng Liu and Glenn SA Gibson
3. Microcontrollers Architecture Programming, Interfacing and System Design  
– **Raj Kamal Chapter: 15.1, 15.2, 15.3, 15.4.1**
4. 8086 and 8088 Microprocessor by Tribel and Avatar Singh

**REFERENCES:**

1. Microprocessors and Interfacing – Douglas V. Hall
2. Microprocessor and Digital Systems – Douglas V. Hall
3. Advanced Microprocessors & Microcontrollers - B.P.Singh & Renu Singh – New Age
4. The Intel Microprocessors – Architecture, Programming and Interfacing – Bary B. Brey.
5. Arm Architecture reference manual –Arm ltd.

**OUTCOMES:**

- The student can gain good knowledge on microprocessor and implement in practical applications
- Design system using memory chips and peripheral chips for 16 bit 8086 microprocessor.
- Understand and devise techniques for faster execution of instructions, improve speed of operations and enhance performance of microprocessors.
- Understand multi core processor and its advantages

**ELECTRONICS LAB-IV**  
**MICROPROCESSOR SYSTEMS**

LAB LIST:

Programs using Intel 8085 /8086

1. Addition and Subtraction (8 bit and 16-bit)
2. Multiplication and Division (8-bit)
3. Largest number in an array.
4. Smallest number in an array.
5. BCD to ASCII and ASCII to BCD .
6. Program To Convert Two Bcd Numbers In To Hex
7. Program To Convert Hex Number In To Bcd Number.
8. Program To Find The Square Root Of A Given Number.
9. Interfacing Experiments Using 8086 Microprocessor (Demo):
  1. Traffic Light Controller
  2. Elevator,
  3. 7-Segment Display

**B.Sc. Electronics CBCS Syllabus**  
**2<sup>nd</sup> YEAR**

**IV SEMESTER**

**Paper: V**

**MICRO CONTROLLER AND INTERFACING**

**OBJECTIVES:**

- To understand the concepts of microcontroller based system.
- To enable design and programming of microcontroller based system.
- To know about the interfacing Circuits.

**UNIT-I:** (10Hrs) Introduction, comparison of Microprocessor and micro controller, Evolution of microcontrollers from 4-bit to 32 bit , Development tools for micro controllers, Assembler-Compiler-Simulator/Debugger.

**UNIT -II:** (10Hrs)

**Microcontroller Architecture:** Overview and block diagram of 8051, Architecture of 8051, program counter and memory organization, Data types and directives, PSW register, Register banks and stack, pin diagram of 8051, Port organization, Interrupts and timers.

**UNIT-III:**(10Hrs)

**Addressing modes, instruction set of 8051:** Addressing modes and accessing memory using various addressing modes, instruction set: Arithmetic, Logical, Simple bit, jump, loop and call instructions and their usage. Time delay generation and calculation, Timer/Counter Programming,

**Unit -IV:** (15Hrs)

Assemble language programming Examples: Addition, Multiplication, Subtraction, division, arranging a given set of numbers in largest/smallest order.

**UNIT-V :** (15Hrs)

**Interfacing and Application of Microcontroller:** Interfacing of – PPI 8255, DAC (0804), Temperature measurement (LM35), interfacing seven segment displays, displaying information on a LCD, control of a stepper Motor (Uni-Polar),

**TEXT BOOKS:**

1. The 8051 microcontroller and embedded systems using assembly and c-kennet j. Ayalam, Dhananjay V. gadre, cengage publishers
- 2.The 8051 microcontrollers and Embedded systems - By Muhammad Ali Mazidi and Janice Gillispie Mazidi – Pearson Education Asia, 4<sup>th</sup> Reprint, 2002.

## **REFERENCE BOOKS:**

1. Microcontrollers Architecture Programming, Interfacing and System Design – **Raj Kamal**.
2. The 8051 Microcontroller Architecture, Programming and Application - **Kenneth J. Ajala** , west publishing company (ST PAUL, NEW YORK, LOS ANGELES, SAN FRANCISCO).
3. Microcontroller theory and application-Ajay V. Deshmukh

## **OUTCOMES:**

- The student can gain good knowledge on microcontrollers and implement in practical applications
- learn Interfacing of Microcontroller
- get familiar with real time operating system

## **ELECTRONICS LAB-V MICROCONTROLLER LAB**

### **LAB LIST:**

1. Addition And Subtraction Of Two 8-Bit Numbers.
2. Multiplication And Division Of Two 8-Bit Numbers.
3. Largest number /smallest in an array.
4. Exchange Of Higher And Lower Nibbles In Accumulator.
5. Addition Of Two 8-Bit Numbers (Keil Software).
6. Addition Of Two 16-Bt Numbers (Keil Software)
7. Subtraction Of Two 8-Bit Numbers (Keil Software).
8. Subtraction Of Two 16-Bit Numbers (Keil Software).
9. Multiplication Of Two 8-Bit Numbers (Keil Software).
11. Program For Swapping And Compliment Of 8-Bit Numbers (Keil Software).
12. Program To Find The Largest Number In Given Array (Keil Software).
13. Program To Find The Smallest Number In Given Array (Keil Software).
14. Interfacing Led To 8051 Microcontroller (Keil Software).
15. Interfacing Buzzer To 8051 Microcontroller (Keil Software).
16. Interfacing Relay To 8051 Microcontroller (Keil Software).
17. Interfacing Seven Segments To 8051 Microcontroller (Keil Software).



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w.e.f. 2020-21 (Revised in May 2020)

**MODEL QUESTION PAPER COMMON FOR ALL FIVE THEORY COURSES**

*Time : 3 hrs*

*Max marks : 75*

**SECTION-A**

**(Short Answer Type Questions)** *Marks : 5x5M = 25M*

*Answer any five questions*

1. Essay type question from Unit-I
2. Essay type question from Unit-I
3. Essay type question from Unit-II
4. Essay type question from Unit-II
5. Essay type question from Unit-III
6. Essay type question from Unit-III
7. Essay type question from Unit-IV
8. Essay type question from Unit-IV
9. Essay type question from Unit-V
10. Essay type question from Unit-V

**SECTION-B**

**(Essay Type Questions)** *Marks : 5x10M = 50M*

*Answer any five of the following questions*

11. Short answer type question from Unit-I
12. Short answer type question from Unit-I
13. Short answer type question from Unit-II
14. Short answer type question from Unit-II
15. Short answer type question from Unit-III
16. Short answer type question from Unit-III
17. Short answer type question from Unit-IV
18. Short answer type question from Unit-IV
19. Short answer type question from Unit-V
20. Short answer type question from Unit-V

**B.Sc. ELECTRONICS**

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**MODEL QUESTION PAPER COMMON FOR ALL FIVE PRACTICAL COURSES**

*Time : 2 hrs*

*Max marks : 50*

*Answer any TWO of the following (2 x 15 = 30M)*

1.

2.

3.

4.

*Record Submission*

*10 Marks*

*Viva - Voice*

*10 Marks*