ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

Model Syllabus for Electronics (Minor) in consonance with Curriculum framework w.e.f. AY 2025-26

Prepared by Yogi Vemana University, Kadapa

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	III	1	Circuit theory and electronic devices	3	3
			Circuit theory and electronic devices Practical Course	2	1
	IV	2	Digital Electronics	3	3
			Digital Electronics Practical Course	2	1
III	V	3	Analog circuits and Communication	3	3
			Analog circuits and Communication Practical Course	2	1
		4	Microprocessor system	3	3
			Microprocessor system Practical Course	2	1
	VI	5	Micro controller and Interfacing	3	3
			Micro controller and Interfacing Practical Course	2	1
		6	Industrial Electronics	3	3
			Industrial Electronics Practical Course	2	1

SEMESTER-III

COURSE 1: CIRCUIT THEORY AND ELECTRONIC DEVICES

Theory **Credits: 3** **3 hrs/week**

Course Objectives:

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

UNIT- 1: (9 Hrs)

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: (9 Hrs)

PASSIVE NETWORKS AND NETWORKS THEOREMS (D.C):

Branch current method, Nodal Analysis, star to delta & delta to star conversions. Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power, Milliman and Reciprocity theorems.

UNIT-III: (9 Hrs)

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: (9 Hrs)

BJT, FETand UJT:

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: (9 Hrs)

POWER SUPPLIES & PHOTO ELECTRIC DEVICES

Rectifiers: Half wave ,full wave rectifiers - Efficiency-ripple factor- Filters- L-section&π-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 &
3. Louisashelsky.
4. Circuit Analysis by P.Gnanasivam- Pearson Education
5. Electronic Devices and Circuit Theory Robert L. Boylestad &
6. Louis Nashelsky.
7. 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) byAgarwal- 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

SEMESTER-III

COURSE 1: CIRCUIT THEORY AND ELECTRONIC DEVICES

Practical **Credits: 1** **2 hrs/week**

Course Outcomes:

1. Apply concepts of electric network topology, nodes, branches, loops to solvecircuit problems including the use of computer simulation.
2. Apply time and frequency concepts of analysis.
3. Synthesize the network using passive elements.
4. Know about amplifier circuits, switching circuits and oscillator circuits theirdesign and use in electronics.
5. Design and construction of a power supply.

List of Experiments :

1. Thevenin's Theorem-verification
2. Norton's Theorem-verification
3. Maximum Power Transfer Theorem-verification
4. LCR series resonance circuit.
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 and output values are to be compared and justified for variation.

SEMESTER-IV

COURSE 2: DIGITAL ELECTRONICS

Theory **Credits: 3** **3 hrs/week**

Course Objectives:

1. To understand the number systems, Binary codes and Complements.
2. To understand the Boolean algebra and simplification of Booleanexpressions.
3. To analyze logic processes and implement logical operations usingcombinational logic circuits.
4. To understand the concepts of sequential circuits and to analyzesequential systems in terms of state machines.
5. To understands characteristics of memory and their classification.
6. To implement combinational and sequential circuits using VHDL.

Unit – I (9Hrs)

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 (9Hrs)

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

Unit-III (9Hrs)

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).

UNIT-IV (9Hrs)

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- V (9Hrs)

MEMORY DEVICES:

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

TEXT BOOKS:

1. M.Morris Mano, " Digital Design " 3rd 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 universitypress
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.*

SEMESTER-IV

COURSE 2: DIGITAL ELECTRONICS

Practical **Credits: 1** **2 hrs/week**

Course Outcomes:

1. Develop a digital logic and apply it to solve real life problems.
2. Analyze, design and implement combinational logic circuits.
3. Classify different semiconductor memories.
4. Analyze, design and implement sequential logic circuits.
5. Simulate and implement combinational and sequential logic circuits using VHDL

LIST OF EXPERIMENTS :

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

SEMESTER-V

COURSE 3: ANALOG CIRCUITS AND COMMUNICATION

Theory **Credits: 3** **3 hrs/week**

Unit – I (9 hrs)

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 (9 hrs)

OP-AMP CIRCUITS: voltage regulator, comparator, zero cross detecting circuit, instrumentation amplifier, sine wave generator, square wave generator (Astable multivibrator), 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 (9 Hrs) AMPLITUDE MODULATION:

Need for modulation, amplitude modulation-analysis of an amplitude modulated wave, side bands and bandwidth, power relations in the AM wave. Generation of AM- Transistor modulators. Detection of AM signals – Diode detector.

Unit - IV (9 hrs) 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 Basic Reactance modulator. Detection of FM waves – FM demodulation with discriminator. Advantages of FM over AM.

Unit - V (9 hrs) RADIO BROADCASTING AND RECEPTION:

Spectrum of electromagnetic waves, Radio broadcasting and reception, Transmitter, Radio receiver, AM receivers- Straight forward receiver, Superheterodyne receiver. FM receivers.

TEXT BOOKS:

1. Op Amp and Linear Integrated Circuits By Ramakant Gaykwad
2. Linear Integrated Circuits By Roy Choudhary
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 Communication Systems – Hayken 4th Edition
5. Modern digital and analog communication system –B.P.lathi

SEMESTER-V

COURSE 3: ANALOG CIRCUITS AND COMMUNICATION

Practical **Credits: 1** **2 hrs/week**

LIST OF EXPERIMENTS

1. Op-Amp as inverting and non-inverting
2. Op-Amp 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. Frequency modulation and demodulation.
9. AM Transmitter and Receiver.
10. FM Transmitter and Receiver.

SEMESTER-V

COURSE 4: MICROPROCESSOR SYSTEMS

Theory **Credits: 3** **3 hrs/week**

Course Objectives:

1. To understand basic architecture of 16 bit and 32 bit microprocessors.
2. To understand interfacing of 16 bit microprocessor with memory and peripheralchipsinvolving system design.
3. To understand techniques for faster execution of instructions and improve speed of operation and performance of microprocessors
4. To understand RISC based microprocessors.
5. To understand concept of multi core processors.

UNIT -I: (9 Hrs)

CPU ARCHITECTURE Introduction to Microprocessor, INTEL -8085(P) Architecture, CPU, ALU unit, Registerorganization, Address, data and control Buses. Pin configuration of 8085. Addressing modes 8086 Microprocessor: Architecture, Pin description. Instruction format, Instruction Executiontiming, Addressing modes

UNIT -II: (9 Hrs)

8085 Instruction Set:

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

UNIT -III: (9 Hrs)

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

UNIT -IV: (9 Hrs)

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: (9 Hrs)

ARM PROCESSOR: Introduction to 16/32 bit processors, Arm architecture & organization, Arm based MCUs, Programming model, Instruction set.

TEXTBOOKS:

1. Microprocessor Architecture, Programming and Applications

2. with the 8085 – Penram International Publishing, Mumbai.- Ramesh S. Gaonakar
3. Microcomputer Systems the 8086/8088 family – YU-Cheng Liu and Glenn SA Gibson
4. Microcontrollers Architecture Programming, Interfacing and System Design – Raj Kamal Chapter: 15.1, 15.2, 15.3, 15.4.1
5. 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.

SEMESTER-V

COURSE 4: MICROPROCESSOR SYSTEMS

Practical **Credits: 1** **2 hrs/week**

Course Outcomes:

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

List of Experiment

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):
10. Traffic Light Controller, Elevator, 7-Segment Display

SEMESTER-VI

COURSE 5: MICRO CONTROLLER SYSTEM

Theory **Credits: 3** **3 hrs/week**

COURSE OBJECTIVES:

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

UNIT-I: (9 Hrs)

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: (9 Hrs)

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:(9 Hrs)

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: (9 Hrs)

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

UNIT-V : (9 Hrs)

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, 4th Reprint, 2002.

REFERENCE BOOKS:

1. Microcontrollers Architecture Programming, Interfacing and System Design – Rajkamal.
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

SEMESTER-VI

COURSE 5: MICRO CONTROLLER SYSTEM

Practical **Credits: 1** **2 hrs/week**

COURSE OUTCOMES:

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

LIST OF EXPERIMENTS:

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).
10. Program For Swapping And Compliment Of 8-Bit Numbers (Keil Software).
11. Program To Find The Largest Number In Given Array (Keil Software).
12. Program To Find The Smallest Number In Given Array (Keil Software).
13. Interfacing Led To 8051 Microcontroller (Keil Software).
14. Interfacing Buzzer To 8051 Microcontroller (Keil Software).
15. Interfacing Relay To 8051 Microcontroller (Keil Software).
16. Interfacing Seven Segments To 8051 Microcontroller (Keil Software).

SEMESTER-VI

COURSE 6: INDUSTRIAL ELECTRONICS

Theory **Credits: 3** **3 hrs/week**

Learning Outcomes:
Students after successful completion of the course will be able to:

1. Identify various facilities required to set up a basic Instrumentation Laboratory.
2. Acquire a critical knowledge of various Electrical Instruments used in the Laboratory.
3. Demonstrate skills of using instruments like Rectifiers, Multimeters, Power supplies,Voltage Regulators etc. through hands on experience.
4. Understand the Principle and operation of different Electronic Heating devices.

UNIT-I (9 hours)
Rectifiers and filters: Rectifiers– Half wave, full wave and bridge rectifiers- Efficiency- Ripple factor- Regulation – Harmonic components in rectified output – Types of filters- Choke input (inductor) filter- Shunt capacitor filter- L section and section filters.
Voltage Regulators: Transistor Series voltage regulator - Transistor Shunt voltage regulator – Three terminal regulators (78XX and 79XX).

UNIT-II (9 hours)
Power Supplies: Block diagram of regulated power supply – A simple regulated transistorized power supply (circuit and working) – Principle and working of switch mode power supply (SMPS).

UNIT-III (9 hours)
Voltage Multipliers: Half wave voltage doubler, Full wavevoltage doubler, Voltage Tripler circuit diagramand working mentioning of applications of voltage multipliers.

UNIT-IV (9 hours)
Controlled rectifiers: SCR Half wave rectifier circuit, working with wave forms, mathematical analysis for resistive load - SCR Full wave rectifier circuit, working with wave forms, mathematical analysis for resistive load – SCR as inverter parallel and series circuits.

UNIT-V (9 hours)
Heat effects: Resistance, inductance and dielectric heating. Principle of operations and its applications.

Reference Books:

1. Unified Electronics Volume II by J.P Agarwal and Amit Agarwal.
2. Industrial Electronics, S.B. Biswas, Dhanapur Rai & Sons.
3. Industrial Electronics, G.K. Mithal, Khanna Publishers.
4. Electronic Devices and Circuits – G.K. Mithal.
5. Electronic Devices and Circuits-Millman and Halkias- Tata Mc Graw Hill (TMH)
6. Microelectronics- J. Millman and A. Grabel – TMH

SEMESTER-VI

COURSE 6: INDUSTRIAL ELECTRONICS

Practical **Credits: 1** **2 hrs/week**

(ANY SIX EXPERIMEMTS SHOULD BE DONE)

1. D.C Power supply and filters.
2. Transistor series regulator
3. Transistor as a shunt regulator
4. Voltage regulator using IC-7805and IC-7905.
5. Voltage doubler using diodes
6. Voltage Tripler using diodes
7. SCR VI characteristics.
8. SCR Series inverter
9. SCR parallel inverter.

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