Electronics

B.Sc. (M.E.Cs.& M.P.E.)

(For the Students admitted in 2019-20&onwards)

Department of Physics

Nizam College (Autonomous)

Osmania University

Hyderabad – 500 001

NIZAM COLLEGE (AUTONOMOUS)

CBCS Pattern for Undergraduate B.Sc. Electronics

Academic year 2016-17 onwards

Semester	Courses	Hours per week	Duration of Exam Hrs	Marks			No. of Credits
				Internal	External	Total	
SEM-I	**Theory**						
	DSC-103: **Circuit Analysis** (Paper-I)	4	3	20	80	100	4
	Practicals						
	DSC-103: **Circuit analysis Lab** (Paper-I)	3	3		50	50	1
SEM-II	**Theory**						
	DSC-203: **Electronic Devices** (Paper-II)	4	3	20	80	100	4
	Practicals						
	DSC-203: **Electronic Devices Lab** (Paper-II)	3	3		50	50	1
SEM III	**Theory**						
	DSC-303: **Power supplies and Analog circuits** (Paper-III)	4	3	20	80	100	4
	Practicals						
	DSC-303: **Power supplies and Analog circuits Lab** (Paper-III)	3	3		50	50	1
	SEC-III:Basic Instrumenation	2	11/2	10	40	50	2
S EM IV	**Theory**						
	DSC-403: **Linear Integrated Circuits basics and Communication** (Paper-IV)	4	3	20	80	100	4
	Practicals						
	DSC-403:: **Linear Integrated Circuits basics and Communication** (Paper-IV)	3	3		50	50	1
	SEC-IV: Electronic hardware and networking	2	11/2	10	40	50	2

Semester	Courses	Hours per week	Duration of Exam Hrs	Marks			No. of Credits
				Internal	External	Total	
SEM V	**Theory**	4	3	20	80	100	4
	DSE-503A: **Digital Electronics** DSE-503B: **Electronics Instrumentation**	4	3	20	80	100	4
	Practicals	3	3		50	50	1
	DSE-503A:**Digital electronics Lab** DSE-503A: **Electronics Instrumentation Lab**	3	3		50	50	1
	GE: Generic Elective **Basic Electronics**	4	3	20	80	100	4
SEM VI	**Theory**	4	3	20	80	100	4
	DSE 603A: **Digital Communication** DSE -603B: **8051 Microcontroller and applications**	4	3	20	80	100	4
	Project Report / **Optional Paper**	4 4	11/2 3	15 VV+ 10 PR 20	75 80	100 100	4 4
	Practicals	3	3		50	50	1
	DSE 603A : **Digital Communication Lab** DSE -603B : **8051 Microcontroller and applications lab**	3	3		50	50	1

SNO	COURSE CATEGORY	NO OF COURSES	CREDITS PER COURSE	TOTAL CREDITS
1	SEC	2	2	4
2	GE	1	4	4
3	PROJECT	1	4	4
4	DSC	4	4+1	20
5	DSE	4	4+1	20
		TOTAL CREDITS		52

CC: Core Course DSC: Discipline Specific Course, DSE: Discipline Specific Elective

Skill enhancement courses:

1. Electronic hardware and networking
2. Mat-lab and Applications
3. Basic Instrumentation
4. Digital Photography

Generic Elective:

1. Basic Electronics (V-Sem)

Project work (OR) Optional paper : Digital System Design using VHDL(VI-Sem).

B.Sc. ELECTRONICS SYLLABUS
B.Sc. I YEAR
Semester – I,Paper –I
DSC-1A :Circuit Analysis

Total number of hours: 60
No of hours per week:4
Credits:4

UNIT - I

Basic electronic components:

Resisters : Concept of resistance, ohm's law, types of resisters, colour code.

Inductors : Concept of inductance, inductive reactance and susceptance, types of inductors, colour code, self inductance and mutual inductance.

Capacitors : Concept of capacitance, capacitive reactance and susceptance, types of capacitors, colour code.

AC Fundamentals : The sine wave –average and RMS values – The J Operator –Polar and Rectangular forms of complex numbers – Phasor diagram-Complex impedance and admittance.

Kirchhoff's Current and Voltage Laws: Concept of Voltage and current sources-KVL and KCL-application to simple circuits (AC and DC) consisting of resistors and sources – Node voltage analysis and Mesh analysis.

UNIT-II

Network Theorems (DC and AC): Superposition Theorem,Thevenin's Theorem, Norton's Theorem, Maximum power transfer Theorem, Reciprocity Theorem, Milliman's Theorem, Application to simple Networks.

AC Bridges : AC Wheatstone bridge, Maxwell's inductance bridge, Desauty's bridge, Anderson's bridge.

UNIT-III

RC and RL Circuits: Transient Response of RL and RC Circuits with step input, Time constants. Frequency response of RC and RL circuits,Types of filters – Low pass filter and High pass filter-frequency response, passive differentiating circuit and passive integrating circuit.

UNIT-IV

Resonance:RLC Series and parallel resonance circuits –Resonant frequency –Q Factor- Bandwidth-Selectivity.

Cathode Ray Oscilloscope: Cathode Ray Tube (CRT) block diagram and its working principle, electron gun focusing, deflection sensitivity, florescent screen. Measurement of Time period, Frequency,Phase and Amplitude.

Note:

Solving related problems from all topics is compulsory.

The question paper contains about 75% theory and 25% problems.

Text Books:

1) Basic Electronics-Bernard Grob10th edition (TMH)
2) Circuit Analysis-P.Gnanasivam Pearson Education
3) Circuit and Networks-A. Sudhakar& S. Pallri (TMH)
4) Pulse, digital & switching waveforms-Milliman & Taub.
5) Networks, Lines and Fields-John Ryder (PHI)
6)Network theory-Smarajit Ghosh (PHI)
7) Fundamentals of electronics – VK Mehta
8) Electrical Technology - BL Theraja, AK Theraja (S CHAND)

B.Sc. I Year, Electronics Practical
Semester – I,Paper – I
DSC-1A: Circuit Analysis Lab

No. of hours per week: 3
Credits : 1

1. Colour coding
2. Superposition theorem-verification
3. Reciprocity theorem-verification
4. Thevenin's theorem-verification
5. Norton's theorem-verification
6. Maximum power transfer theorem-verification
7. CR and LR circuits (low pass and high pass)
8. CR and LR circuits- Differentiation and integration-tracing wave forms
9. LCR series resonance circuits (determination of of and Q)
10. Maxwell Inductance Bridge
11. Desauty's bridge
12. Measurement of peak voltage, frequency and phase using CRO.
13. Simulation:
    i) verification of KVL and KCL.

ii) study of network theorems.
iii) study of frequency response (LR).

Note: *Minimum of eight experiments should be performed*

Reference Books:

1) Lab manual for Electronic Devices and Circuits – 4th Edition. By David A Bell – PHI
2) Basic Electronics – A Text Lab Manual –Zbar, Malvino, Miller.

B.Sc. ELECTRONICS SYLLABUS
B.Sc. I YEAR
Semester – II, Paper –II
DSC-1B : Electronic Devices

Total number of hours : 60
No of hours per week: 4
Credits :4

UNIT-I

PN Junction: Formation of PN junction, Depletion region, Junction capacitance, Diode equation (no derivation) Effect of temperature on reverse saturation current , V - I characteristics and simple applications of i) Junction diode ii) Zener diode and Zener diode as a voltage regulator or stabilizer iii) Tunnel diode and iv) Varactor diode or Varicap diode v) Metaloxide- Semiconductor diode vi) schottky diode.

UNIT-II

Bipolar Junction Transistor(BJT) : PNP and NPN transistors, current components in BJT, BJT static characteristics (Input and Output) , Early effect , CB , CC , CE configurations of transistor and bias conditions (cut off, active, and saturation regions), CE configuration as two port network, h – parameter model and its equivalent circuit. Determination of h – parameters from the characteristics, Load line analysis (AC and DC). Transistor Biasing – Fixed and self bias.

UNIT-III

Field Effect Transistor (FET): Construction and working of JFET, output and transfer characteristics of FET, Determination of FET parameters. Application of FET as Voltage variable resistor. Advantages of FET over BJT.**MOSFET** :Construction and working of enhancement and depletion modes , output and transfer characteristics, Application of MOSFET as a switch .
Uni Junction Transistor (UJT): Construction and working of UJT and its Characteristics. Application of UJT as a relaxation oscillator.

UNIT-IV

Silicon Controlled Rectifier (SCR): Construction and working of SCR. Two transistor representation, Characteristics of SCR. Application of SCR for power control.
Photo electronic Devices: Construction and Characteristics of Light Dependent Resistor (LDR), Photo voltaic Cell, Photo diode, Photo transistor and Light Emitting Diode (LED).

Note:

Solving related problems from all topics is compulsory.

The question paper contains about 75% theory and 25% problems.

Books Recommended:

1) Electronic Devices and circuits-Millman and Halkias,(TMH)
2) Principles of Electronics-V.K.Mehta & Rohit Mehta
3) Electronic Devices and Circuits-Allen Moltershed (PHI)
4) Basic Electronics and Linear Circuits-Bharghava U
5) Electronic Devices and Circuits-Y.N.Bapat
6) Electronic Devices and Circuits-Mithal.
7) Experiments in Electronics-S.V.Subramanyam.

B.Sc. I-Year-Electronics, Electronics Practical
II-Semester, Papar-II
DSC-IB: Electronic Devices Lab

No of hours per week: 3
Credits : 1

1. Volt -Ampere characteristics of Junction diode – To study the cut in voltage, forward and reverse resistances.
2.Zener diode characteristics (VI) - a) To study the Zener voltage (at least 2 sets).
3. Voltage regulator (Line and load) using Zener Diode.
4. BJT Input and output characteristics- Determination of 'h' parameters.
5. FET – Transfer and output characteristics.
6.UJT – a) Volt-Ampere Characteristics – Determination of its parameters,
b) AsanOscillator for two different frequencies.
7. SCR volt-ampere characteristics
8. Characteristics of LDR
9. Characteristics of photo diode/photo transistor

Note: *Minimum of eight experiments should be performed*

References

1.Electronics Laboratory manual – Zbar
2.Experiments in Electronics – S V Subramanyam
3.Lab manual for Electronic devices and circuits-4 th Edition David A Bell.

B.Sc. ELECTRONICS SYLLABUS
B.Sc. II YEAR
Semester – III, Paper - III
DSC-1C:Power supplies andAnalog Circuits

Total number of hours: 60
No of hours per week: 4
Credits:4

UNIT – I

Rectifiers and filters: Rectifiers– half wave, full wave and bridge rectifiers, Efficiency, Ripple factor, regulation, harmonic components in rectified output, **Filters** – choke input (inductor) filter, Shunt capacitor filter, L section and π section filters.

UNIT – II

Regulated Power Supplies: Block diagram of regulated power supply, Series and shunt transistor regulated power supplies, three terminal IC regulators (78XX and 79XX), Principle and working of switch mode power supply (SMPS). UPS –Principle and working.

UNIT – III

Transistor amplifier: Classification of amplifiers, Hybrid π model of a transistor, RC coupled amplifier – frequency response and analysis.

Feedback in amplifiers: Positive and negative feedback, Effect of negative feedback on gain, bandwidth, noise, input and output impedances. Emitter follower, Darlington pair and its advantages

UNIT – IV

Oscillators: Barkhausen criterion for sustained oscillations, RC oscillators- RC phase shift and Wien's bridge oscillators, LC oscillators- Hartley and Colpitt.

Multi-vibrators: Astable, Mono stable and Bi-stable multi-vibrators (Qualitative treatment using BJT's only)

Recommended Books:

1. Electronic Devices and Circuits-Millman and Halkias (TMH)
2. Basic Electronics and linear circuits - Bhargava, Kulshreshta & Gupta TMH
3. A first course in Electronics-AA Khan and KK Dey-PHI
4. Electronic Devices and Circuit Theory-Robert L Boylestad& Louis Nashelsky
5. Pulse, Digital and Switching circuits by Milliman and Taub

B.Sc. II-Year,Electronics Practical
III-Semester, Paper-III
DSC-IC : Power Supplies andAnalog Circuits Lab

No of hours per week: 3
Credits :1

1. Half wave rectifiers with capacitor filter.
2. Full wave rectifiers with L-C filter
3. Bridge rectifier with π-section filter
4. Regulated power supply with series transistor.
5. Frequency response of single stage RC-coupled amplifier.
6. Voltage regulator using IC- 78XXand IC-79XX.
7. Collector coupled Astablemulti-vibrator
8. Phase shift Oscillator
9. Wein bridge Oscilator.
10. Colpitts Oscillator

Simulation experiments using appropriate electronic circuit simulation Software.

11. RC Coupled amplifier.
12. AstableMultivibrator.
13. Phase shift Oscillator

Note: **Minimum of eight experiments should be performed**

B.Sc. ELECTRONICS SYLLABUS
B.Sc. II YEAR, Semester – IV, Paper - IV
DSC-1D:Operational Amplifiers and Communication

Total number of hours : 60
No of hours per week: 4
Credits:4

UNIT – I

Operational Amplifiers: Emitter Coupled Differential amplifier, Block diagram of Opamp. Characteristics of Opamp, Opamp parameters-Input resistance, Output resistance, Common mode rejection ratio (CMMR), Slew rate, offset voltages, Input bias current, Basic Op-Amp circuits-Inverting Op-Amp, Virtual ground, Non-inverting Op-Amp, Frequency response of Op-Amp. Op Amp as: Summing amplifier, subtractor, Comparator, Voltage follower, Integrator, and Differentiator.

UNIT- II

Applications of Op-Amps: Logarithmic amplifier, Sine wave [Wien Bridge] generator and square wave [Astable] generator, Triangular wave generator, Mono stable multi-vibrator, Solving of simple second order differential equations. Basic Op-Amp series regulator and shunt regulator, IC 555 Timer [Block diagram and its working], IC 555 as mono stable and astable multi-vibrators.

UNIT – III

Modulation: Need for modulation-Types of modulation- Amplitude, Frequency and Phase modulation.
Amplitude modulation: Analysis of Amplitude modulation, side bands, modulation index, AM modulator, Balanced modulator, Demodulation – diode detector.

UNIT – IV

Frequency modulation: Analysis of FM**,** Working of simple frequency modulator, - detection of FM waves – FM Discriminator. Advantages of frequency modulation.AM and FM Transmitters and radio receivers [block diagram approach]. Introduction to PAM, PPM, PWM, and PCM, Delta modulation.

Reference Books:

1. Op amps and linear Integrated Circuits – Ramakant Gayakwad, PHI
2. Linear Integrated Circuits- D Roy Choudhury and Shail B Jain
3. Electronic Communication Systems-George Kennedy & Bernard Davis
4. Principles of Electronic Communication Systems-Louis E Freznel, TMH

B.Sc., II Year, Electronics Lab
IV – Semester, Paper-IV
DSC-ID : Operational Amplifiers and Communication Lab

No of hours per week: 3
Credits :1

1. OP-Amp (IC 741) as
   a) Inverting amplifier (DC &AC).
   b) Non- inverting amplifier (DC & AC).
   c) Characteristics of Op-amp.
2. OP-Amp (IC 741) as
   a) Integrator.
   b) Differentiator
   c) Summing amplifier
3. Wien bridge oscillator, using op-amp.
4. Astable multivibrator – Determination of frequency using IC741.
5. Astablemultivibrator – Determination of frequency and duty cycle using IC 555.
6. Monostablemultivibrator–Determination of pulse width using IC 555.
7. AM modulator and Demodulator.
8. FM modulator and Demodulator.

Simulation experiments using appropriate electronic circuit simulation software.

9. Wien bridge oscillator.
10. Astablemultivibrator using Op-Amp
11. Inverting and Non-inverting amplifiers and comparator
12. Integrator/ Differentiator using op amp
13. Astable multi-vibrator using IC 555

Note: Student has to perform minimum of Eight experiments

1) Lab manual for Electronic Devices and Circuits – 4th Edition. By David A Bell – PHI
2) Basic Electronics – A Text Lab Manual –Zbar, Malvino, Miller.

B.Sc. (ELECTRONICS) – III year
Semester - V
DIGITAL ELECTRONICS
(DSE - Elective I)

No of hours per week: 4
Credits :4

UNIT-I (15 hrs)

Number system and Logic gates: Conversions of Binary, octal, Decimal & hexadecimal number systems, Binary addition and subtraction (1's and 2's complement methods).

Logic gates- OR, AND, NOT, XOR, NAND, NOR gates and their Truth tables – Design of basic gates using the Universal gates- NAND and NOR gates, Half adder, Half substractor, Full adder and parallel adder logic circuits. Logic families and their characteristics – TTL, CMOS and ECL logic circuits.

UNIT-II (15 hrs)

Boolean algebra and Combinational logic circuits: Boolean algebra- Laws and identities, DeMorgan's Theorems. Simplification of Boolean expressions using Boolean identities- Reduction of Boolean expressions using Karnaugh Maps-Sum of Products (SOP) and Product of Sum (POS) representation(up to four variables). Multiplexer, De-Multiplexer, Decoder (3 to 8) and Encoder(8 to 3).

UNIT-III (15 hrs)

Sequential logic circuits: Flip-flops - SR, D, JK, T and Master-Slave JK ; **Registers** - Shift Registers- SISO,SIPO, PISO and PIPO Registers, Universal shift register(IC 7496), **Shift register counters-** Ring counter , Johnson Counter.

Counters and Semiconductor memories:

4-bit Asynchronous (Ripple) counter, Modulo-N counter, synchronous counter. Up/down counters –ripple counter IC7493 - Decade counter IC7490 – working, truth tables and timing diagrams.

UNIT-IV (15 hrs)

Introduction to 8085 Microprocessor & its architecture: Introduction to Microcomputer, Intel 8085 Microprocessor – Architecture of 8085 microprocessor – CPU – Timing & Control Unit – Instruction cycle, Fetch Cycle, Execute cycle (Timing diagram), Machine cycle and clock states. Interrupts – Hardware and Software, Address space partitioning – Memory mapped I/O & I/O mapped I/O .

Instruction set of 8085 microprocessor: Classification - Data transfer operations, Arithmetic operations, logical operations, Branch control operations and stack, I/O and Machine control operations. Stack and Subroutines, Addressing modes

Books Recommended:

1. Digital Principles and Applications – Malvino& Leach - TMH.
2. Digital Principles and Applications-Ronald J.Tocci-– Pearson Education.
3. Text book of Electronics Bsc III year (vol.III)-Telugu Akademi
4. Digital Fundamentals – F.Loyd& Jain – Pearson Education.
5. Fundamentals of Digital Circuits – Anand Kumar – PHI
4. Digital Electronics Principles and Integrated circuits – Maini – Wiley India.
5. Digital Electronics – Gothman.

B.Sc. (ELECTRONICS) – III year
Semester - V

(DSE - Elective I) Digital Electronics Practicals

No. of hour per week :3
Credits :1

1. Verification of truth tables of AND, OR, NOT, NAND, NOR, EXOR Gates using IC 74XX series.
2. Construction of basic gates using NAND and NOR gates.
3. Construction of Half Adder using gates and verification of truth table.
4. Construction of Full Adder using gates and verification of truth table.
5. Demorgan's theorems - Verification.
6. Boolean laws – Verification.
7. Verification of truth tables of flip flops: RS, D, JK and MS-JK using IC's.
8. Construction of binary counter using 7493.
9. Construction of decade counter using 7490.
10. Addition programme using 8085.
11. Subtraction programme using 8085.
12. Multiplication programme using 8085.
13. Division Programme using 8065.
14. Finding smallest number using 8085.
15. Finding largest number using 8085.

Simulation experiments:

1. 4bit parallel adder using Full adders.
2. Decade counter using JK flip flops.
3. Up/Down counters using JK flip flops.
4. Up/down counter using 74193
5. Multiplexer/De-Multiplexer.
6. Encoder.
7. Addition programme using 8085
7. Subtraction programme using 8085.
8. Multiplication programme using 8085.
9. Finding smallest number using 8085.
10. Finding largest number using 8085.

Note: Student has to perform minimum of Eight experiments

1. Lab manual for Electronic Devices and Circuits – 4th Edition. By David A Bell – PHI
2. Basic Electronics – A Text Lab Manual –Zbar, Malvino, Miller.

B.Sc. ELECTRONICS – III year
Semester - V
ELECTRONIC INSTRUMENTATION
DSE - Elective II

No of hours per week: 4
Credits :4

Unit – I:CHARACTERISTICS OF AN INSTRUMENT (15 hrs)

Functional elements of a measurement system – Static characteristics – Accuracy, precision, bias, linearity, threshold, resolution, hysteresis, dead space, scale readability, span, static stiffness, input impedance, repeatability and reproducibility - Errors and calculation of errors in overall system – Dynamic characteristics – Zero, first and second order instruments - Responses for step, impulse, ramp and sinusoidal inputs. Classification of standards, IEEE Standards, Elements of ISO 9001, Quality of management Standards.

Unit –II:TRANSDUCERS AND SENSORS (15 hrs)

Definition of transducer and sensor – Classification of transducers – Pressure (strain gauge, piezoelectric transducer), displacement (potentiometric, LVDT), temperature (thermometer, thermistor, thermocouple) and photosensitive (Vacuum & gas filled phototubes, photomultiplier, photoconductive cell, photvoltaic cell) transducers. Flow transducer – Flow meter, Force transducer- Dynamo mater,
Applications of transducers.

Unit –III: BRIDGE MEASUREMENTS (15 hrs)

Introduction - Wheatstone bridge - Kelvin bridge – Guarded Wheatstone bridge - AC bridges and their applications – Maxwell bridge – Hay bridge - Schering bridge - Wien bridge.

Unit – IV:TESTING INSTRUMENTS (15 hrs)

Oscilloscopes – Block diagram – CRT Circuits – Vertical and horizontal deflection systems – Delay line, Multiple trace – Probes – Special oscilloscopes.
Measuring Instruments: Dc Voltmeters, DC Current Meters, AC Volt Meters, Ohmmeters, multi Meters, Meter protection, Extension of range, True RMS Responding Volt meters, Specification of instruments.

Books for Study:

1. C. S. Rangan, G. R. Sarma and V. S. V. Mani, 1999, Instrumentation Devices and Systems, *Tata McGraw-Hill, New Delhi.*
2. A. D. Helfrick and W. D. Copper, 1992, Modern Electronic Instrumentation and Measurement Techniques, *Prentice-Hall of India, New Delhi.*
3. A. K. Sawhney, A Course in Electrical and Electronic Measurement & Instr., *Dhanpat Rai & Sons.*

Books for Reference:

1. E. O. Doebelin, 1983, Measurement Systems Application and Design,International Edition, 3rd Ed., McGraw-Hill, NY.
2. D. V. S. Moorthy, 1995, Transducer and Instrumentation, Prentice-Hall of India,NewDelhi.
3. J. W. Dalley, W. F. Riley and K. G. McConnel, Instrumentation for Measurements,Wiley, NY.
4. B. C. Nakre and K. K. Chaudry, Instrumentation Measurements and Analysis, Tata McGraw-Hill, New Delhi.

B.Sc. (ELECTRONICS) – III year
Semester - V
(DSE - Elective II) ELECTRONIC INSTRUMENTATION Practicals

No. of hours per week:3
Credits :1

I Analog Experiments:

1.Power control by SCR using UJT.

2. PLL as FM detector using IC 565.

3.Active high pass filter.

4.Active low pass filter.

5.Calibration of Strain gauge.

6. LVDT.

7. Maxwell bridge.

8. Wien bridge.

II Analog Simulation Experiments (S/W):

1) Active filters using Op-Amp.

2) Frequency modulation and detection.

3) Amplitude modulation and detection.

4)Solution of differential equation using analog computation (using TUTSIM).

III Digital Experiments (H/W & S/W)

1. Construction of synchronous Up/Down Counter using IC 74192 and display using 7-segment display.

2. Implementation of Boolean functions using multiplexer.

3. Construction of shift registers using IC7495.

4. Construction of an 8-bit full adder using two 4-bit adders.

5. Given a four variable Boolean function design and simulate the circuit using gates.

6. Simulate a 4-bit binary/BCD decade counter.

7. Simulate a full adder circuit using Decoder/ Demodulator.

8. Simulate a 4-bit shift register.

9. Simulate a Johnson counter.

Note : Minimum 10 experiments to be studied

B.Sc. ELECTRONICS -III YEAR,
Semester – VI,
DIGITAL COMMUNICATION
(DSE - Elective I)

No of hours per week: 4
Credits :4

Unit -I: **(15 hrs)**

Introduction: Need and Necessity of Digitalization, Advantages of Digital communication, Elements of Digital Communication. **Signal analysis**: Classification of signals, Deterministic and Random signals, Periodic and Non periodic signals, Energy and Power signals, Impulse signals,Fourier series, Example of Fourier series, Complex Fourier Spectrum, Fourier transform, Properties of Fourier transform.Random signals and noise, Correlation and Power spectrum

Information Theory: Introduction, Information Entropy, Properties of Entropy, Information rate, Types of information Sources, Channels, Types of Channels, Joint entropy, Conditional entropy, Redundancy, Mutual information, Channel capacity.

Unit- II: **(15 hrs)**

Digital Communication Systems: Amplitude Modulation(AM), Pulse Width Modulation (PWM), Pulse Position Amplitude (PPM),Pulse Amplitude Modulation(PAM), Pulse Code Modulation(PCM), Delta modulation, Adaptivedelta modulation, Quantizationand Noise consideration,**Digital Transmission and Reception:**Timing and base band systems,Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase shift Keying(PSK) and Quadrature Amplitude Modulation(QAM).

Unit - III: **(15 hrs)**

Error detection and coding: Parity check, Basics of Parity- Check Codes, CRC,Hamming distance, Hamming codes, Cyclic codes, Cyclic encoder designing,Line synchronization codes-Unipolar codes, Polar codes and Bipolar codes, Manchester code, NRZ coding andWalsh codes.

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

Case studies: Paging system, **Cellular telephone:** A Basic cellular system, Operation of Cellular system, Planning a Cellular system, Analog and Digital Cellular system, global positioning satellite, Applications of GPS, Facsimile (fax) communication and applications, Videotext system examples and applications, Bluetooth, wi-fi, IOT and cognitive radio.

Reference Books:

1. Digital and Analog Communication systems- K. Sam Shanmugam, John Wiley and Sons.
2. Principle of Communication Systems- Taub and Schilling, Tata Mc Graw-Hill.
3. Digital Transmission Engineering- John B Anderson- S. Chand.
4. Digital and Analog Communication Systems-B.P. Lathi.
5. Communication Techniques for digital and Analog signals – M. Kanefsky, John Wiley and Son.
6. Telecommunication – T.H. Brewster, McGraw Hill.
7. Principles of Digital communication, Das, Chatterjee and Mallick, Wiley Eastern Ltd.
8. An introduction to Analog and digital communications, Simon Haykin- John Wiley and Sons.

ELECTRONICS -III YEAR,
Semester-VI
(DSE - Elective I)DIGITAL COMMUNICATION Practicals

No. of hours per week :3
Credits :1

I Experiments in Internetworking:

1. Amplitude Modulation (AM).
2. Pulse Width Modulation (PWM).
3. Pulse Position Modulation (PPM).
4. Pulse Amplitude Modulation (PAM).
5. Pulse Code Modulation (PCM).
6. Delta modulation.
7. Amplitude Shift Keying (ASK).
8. Frequency Shift Keying (FSK).
9. Phase shift Keying (PSK).
10. Frequency Modulation (FM).

Note : Minimum Eight experiments to be studied

B.Sc. ELECTRONICS -III YEAR
Semester – VI
Microcontroller and Applications
(DSE - Elective II)

No of hours per week: 4
Credits :4

UNIT-I **(15 hrs)**

The Microcontroller 8051: Overview and block diagram of 8051. Architecture and pin diagram of 8051. Data types and directives, Memory Organisation, register banks and Stack Pointer. PSW Register, other special function registers, I/O port organization.Interrupts and Timer/Counter modules.

UNIT-II **(15 hrs)**

Instruction set of 8051 microcontroller : Classification- Data transfer, Arithmetic, logical, Single Bit, Jump, Loop and CALL instructions and their usage. Addressing modes - Immediate, Register, Direct, Indirect, Absolute addressing, Relative addressing, Indexed Addressing and accessing memory using various addressing modes.

UNIT-III **(15 hrs)**

Programming examples of microcontroller 8051:

Addition, Subtraction, division, picking the smallest/largest number among a given set of numbers, arranging a given a set of numbers in ascending/descending order, Subroutines, I/O Programming, Bit manipulation. Accessing a specified port terminal and generating wave forms.

Timer/Counter Programming in 8051: Programming 8051 timers- basic registers of timers- Timer0, Timer1 registers. TMOD register, TCON register. Timer modes - Mode1, Mode2 programming. Counter mode programming. Program to generate time delay.

Unit – IV **(15 hrs)**

Serial communications: Serial communication, Types, modes and protocols, Data transfer rates, serial communication program- SBUF and SCON registers, RS232 standards,Programming timer Interrupts,

Applications of Micro controller: Displaying information on a LCD, Interfacing a keyboard, Interfacing a temperature sensor,Interfacing of DAC 0808 to microcontroller, Interfacing of ADC 0804 to microcontroller,Seven segment LED.

Books Recommended:

1) The 8051 Microcontrollers and Embedded Systems – Muhammad Ali Mazidi and Janice GillipsieMazidi – Pearson Education Asia, 4th Reprint, 2002.
2) Text book of Electonics BSc III year (vol.III)-Telugu Akademi.
3) Fundamentals of Microprocessors and Microcontrollers – B.Ram.
4) The 8051 Microcontroller – architecture, programming and applications KennthJ. Ayala-Penram International Publishing, 1995.
5) Micro controllers-Theory and Applications-Ajay V.Deshmukh.
6) Micro-controller 8051, D. Karuna Sagar, Narosa

B.Sc. ELECTRONICS-III YEAR,
(DSE - Elective II) MicrocontrollerPracticals

No. of hours per week:3
Credits :1

Experiments using 8051 Microcontroller:

1. Multiplication of two numbers using MUL command (later using counter method for repeated addition).
2. Division of two numbers using DIV command (later using counter method for repeated subtraction).
3. Pick out the largest/smallest number among a given set of numbers.
4. Arrange the given numbers in ascending/descending order.
5. Generate a specific time delay using timer/counter.
6. Interface ADC and a temperature sensor to measure temperature.
7. Interface DAC and generate a staircase wave form with a step duration and number of steps as variables.
8. Flash a LED connected at a specified out port terminal.
9. Interface stepper motor to rotate clock wise / anti clock wise through a given angle steps.

Experiments with Keil Software:

1. Write a program to pick out largest/smallest number among a given set of number.
2. Write a program to arrange a given set of numbers in ascending/descending order.
3. Write a program to generate a rectangular/square wave form at specified port.
4. Write a program to generate a time delay using timer registers.

Note: Student has to perform minimum of Eight Experiments

B.Sc. ELECTRONICS-III YEAR ,
Semester - VI
(General Elective)
Optional Paper: Digital System Design Using VHDL

No of hours per week: 4
Credits :4

UNIT – I **(15 hrs)**

Fundamental Concepts: Modeling Digital Systems, Domains and Levels of Modeling, Modeling Languages, VHDL Modeling Concepts, Learning a New Language: Lexical Elements and Syntax.

Scalar Data Types and Operations: Constants and Variables, Scalar Types, Type Classification, Attributes of Scalar Types, Expressions and Operators.

Sequential Statements: If Statements, Case Statements, Null Statements, Loop Statements, Assertion and Report Statements.

UNIT – II **(15 hrs)**

Composite Data Types and Operations: Arrays, Unconstrained Array Types, Array Operations and Referencing, Records.

Basic Modeling Constructs: Entity Declarations, Architecture Bodies, Behavioral Descriptions, Structural Descriptions, Design Processing.

Subprograms: Procedures, Procedure Parameters, Concurrent Procedure Call Statements, Functions, Overloading, Visibility of Declarations.

UNIT – III **(15 hrs)**

Packages and Use Clauses: Package Declarations, Package Bodies, Use Clauses, The Predefined Package Standard.

Resolved Signals: Basic Resolved Signals, IEEE Std_Logic_1164 Resolved Subtypes, Resolved Signals and Ports, Resolved Signal Parameters.

UNIT – IV **(15 hrs)**

Generic Constants: Parameterizing Behavior, Parameterizing Structure.

Case Study: A Pipelined Multiplier Accumulator: Algorithm Outline, A Behavioral Model, A Register-Transfer-Level Model.

Recommended Books:

1. The Designer's Guide to VHDL -By Peter J. Ashenden, 2nd Ed., 1stIndian Reprint, Harcourt India Pvt. Ltd., 2001.
2. VHDL Programming by Example – By Douglas L. Perry., 4th Ed., TMH., 2002.
3. Introductory VHDL : From Simulation to Synthesis –By Sudhakar Yalamanchili., Pearson Education Asia., 2001
4. A VHDL Primer - By J.Bhasker ., PearsonEducation Asia, 11th Indian Reprint, 2004.
5. Fundamentals of Digital Logic with VHDL Design - By Stephen Brown & ZvonkoVranesic., TMH. 2002
6. Digital Systems Design using VHDL by Charles H.Roth Jr., PWS Pub.,1998.
7. VHDL – Analysis & Modeling of Digital Systems – By Zainalabedin Navabi., 2nd Ed., MH., 1998.

B.Sc. ELECTRONICS-III YEAR,
Semester – VI
Digital System Design Using VHDL Practicals

Number of hour per week :3
Credits :1

VHDL – Program entry, simulation and Implementation (CPLD/FPGA) using appropriate HDL Software for the following circuits.

1. All types of logic gates (Data flow).
2. Half Adder (Data Flow, Structural and Schematic).
3. Full Adder (Data Flow, structural and Schematic).
4. Half Subtractor(Data Flow, Structural and Schematic).
5. Full Subtractor(Data Flow, Structural and Schematic).
6. Two control input Mux. Using case.
7. Two control input Mux. Using conditional signal assignment.
8. Two control input Mux. Using selected signal assignment.
9. Two control input Demux. Using case.
10. BCD to seven segment decoder.
11. Modeling a RSFF with assertion, report and different levels of severity (Behavioral).
12. Modeling a BCD counter (Top level behavioral)
13. Writing a test bench for a Half adder.
14. Writing a test bench for a Full adder.

Note: Student has to perform minimum of Eight experiments

ElectronicsHardware andNetworking

(SEC)

Unit-I

Electronics Hardware : Active and passive components, transducers, classification of transducersbased on electrical principleinvolved.

Powersupplies:- DCregulated power supplies (Block diagram approach), SMPS, UPS.

Integrated Circuit (IC's) -advantages and Limitations of IC's, scale of integration, classificationof lC's by structure.

Hardware Identification: Cables and Connectors, motherboard, mother board components, CPU (Processor), memory, RAM and ROM.

Unit-II

Network: Introduction to network,topo1opies and transmission media. Introduction to LAN,MAN and WAN(Architecture only).Ethernet,token ring.

Protocol: Need for protocol architecture,OSI reference mode1,TCP/IP model. Internet protocol: IP addresses and classification,architecture of IPV4 and IPV6. **Network Devices:** Switches, Bridges, Hubs, Router, wifi, Blue tooth (Architecture).

Reference books:

1 Basic Electronics by B.L.Theraja-S.Chand.
2. Peter Norton's Introduction to computers-TATA McGRAW-HILL 5th Edition.
3. Data and computer communication by William Stallings —PH Publications 7"'Edition.
4. Data communications and Networking by Behrouz A.Forouzan-TMH 3rd Edition.

BASIC INSTRUMENTATION SKKILLS

(Credits: 02)

UNIT : I

Basic of Measurement : Instruments accuracy, precision, sensitivity, resolution range etc·Errors inmeasurementsandloadingeffects.Multimeter:Principlesofmeasurement dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and theirsignificance.

Electronic Voltmeter: Advantage over conventional multimeter for voltage

measurementwithrespecttoinputimpedanceandsensitivity.Principlesofvoltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeterandtheir significance.

ACmillivoltmeter: TypeofACmillivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter,specifications and their significance.

Cathode RayOscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only- no mathematicaltreatment),briefdiscussiononscreenphosphor,visualpersistence&chemicalcomposition .Timebaseoperation,synchronization.Frontpanelcontrols. Specifications of a CRO and theirsignificance.

Use ofCRO for the measurement of voltage (dc and ac frequency, time period. Special

featuresofdualtrace,introduction todigitaloscilloscope,probes.Digitalstorage Oscilloscope: Block diagram and principle ofworking.

UNIT : II

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. Pulse generator, and function generator.Briefideafortestingspecifications.Distortionfactormeter,waveanalysis. Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic(balancingtype)RLCbridge.SpecificationsofRLCbridge.Blockdiagram&working principles of a Q-Meter. Digital LCRbridges.

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval. frequency and period measurement using universal counter/ frequency counter, time-base stability, accuracy and resolution.

The test of lab skills will be of the following test items:

1. Use of anoscilloscope.
2. CRO as a versatile measuringdevice.
3. Circuit tracing of Laboratory electronic equipment.
4. Use of Digital multimeter/VTV M for measuring voltages.
5. Circuit tracing of Laboratory electronic equipment.
6. Winding a coil /transformer.
7. Study the layout of receivercircuit.
8. Trouble shooting acircuit
9. Balancing ofbridges

GENERAL ELECTIVE

Basic Electronics

Unit-I:

UnitsandDefinitions:SIunits,Electriccharge,Electricfield,Electricpotential,Potentialdifference, Voltage,EMF.

Resistors: Conceptofresistance,V-Irelationinresistor,ohm'slaw&itslimitations,typesofresistors & their properties & uses, Color Codes, Combination of resistors in series andparallel.

Capacitors:conceptofcapacitance,V-Irelationincapacitor,energystoredincapacitance,typesof capacitors&theirproperties&uses,ColorCodes,Combinationofcapacitorsinseriesand parallel. Inductors: Concept of inductance, V-I relation in inductor, energy stored in inductors. mutual inductance & coefficient of coupling, types of inductors &uses, Colour Codes, Combination of inductors in series andparallel.

Unit-II:

SimpleCircuits:Conceptsofimpedance&admittance,networkdefinition.circuitelements,branch, lumped&distributednetwork,mesh&node,conceptsofvoltage&currentbothidea l&practical. Passivenetworks:Krichoff'svoltage(KVL),Krichoff'scurrentlaw (KCL).

Unit-III:

Theconceptofbasicsemiconductor,P-Material,N-material,formationofPNjunction,Formationof PN junction, Depletion region, Junction capacitance, forward bias, reverse bias, Diode equation (no derivation) and its interpretation, Effect of temperature on reverse saturation current, V-I characteristics and simple applications of i) Junction diode, ii) Zener diode, ii i) Tunnel diode and iv) Varactor diode.Zener diode as voltageregulator.

Rectifiers: Rectifiers— halfwave,fullwaveandbridgerectifiers,Efficiency,Ripplefactor,regulation, harmonic components in rectifiedoutput.

UNIT-IV:

Bipolar Junction Transistor(BJT) : PNP and NPN transistors, current components in BJT(I_E , I_B, I_C, Ico), BJT static characteristics (Input and Output), Earlyeffect, CB, CC, CE configurations of transistor and bias conditions (cut off, active, and saturation regions).

Text Books:

1) Basic Electronics-Benard grob10th edition(TMH)

2) Circuit analysis-P,Gnanasivam education

3) Circuit and networks-A.Sudhakar&s.Pallari(TMH)

4) Electronic devices and circuits-Milman and Halkias(TMH)

5) Principles of electronics-V.K.mehta&rohit Mehta

6) Electronic devices and circuits-Allen Moltershed(PHI)

7) Basic electronics and linear circuits-Bhargava U

8) Electronic devices and Circuits-Y.N.Bapat

9)Electronic devices and Circuits-Mithal