

**Department of Physics  
Osmania University  
Hyderabad**



**Scheme of instructions and syllabus  
(Choice Based Credit System)  
*of*  
**B.Sc. Electronics****

With effect from: 2019-2020

**B.Sc. ELECTRONICS SYLLABUS  
SCHEME OF INSTRUCTIONS  
UNDER CBCS (w.e.f 2019-2020 academic year onwards)**

Year	Semester	Title of the Paper [ Theory and Practical ]	Instructions Hrs/week	Number of Credits	Marks
1 <sup>st</sup> Year	I Sem	Paper – I : Circuit Analysis	4	4	100
		Practical – I : Circuit Analysis Lab	3	1	50
	II Sem	Paper – II : Electronic Devices	4	4	100
		Practical – II : Electronic Devices Lab	3	1	50
2 <sup>nd</sup> Year	III Sem	Paper – III : Analog Circuits	4	4	100
		Practical – III : Analog Circuits Lab	3	1	50
	IV Sem	Paper – IV : Linear Integrated circuits and Basics of Communication	4	4	100
		Practical – IV : Linear Integrated Circuits and Basics of Communication Lab	3	1	50
3 <sup>rd</sup> Year	V Sem	Paper –V : <u>Discipline Specific Elective – I</u> Digital Electronics (OR) Electronic & Instrumentation	4	4	100
		Practical – V : <u>Discipline Specific Elective – I</u> Digital Electronics Lab (OR) Electronics & Instrumentation Lab	3	1	50
	VI Sem	Paper – VI : <u>Discipline Specific Elective – II</u> Digital Communication (OR) 8051 Microcontroller & Applications	4	4	100
		Practical – VI : <u>Discipline Specific Elective – II</u> Digital Communication Lab (OR) 8051 Microcontroller & Applications Lab	3	1	50

**Total Credits: 30**

**Skill Enhancement Courses:**

1. Electronic hardware and networking
  2. Mat-lab and Applications
  3. Basic Instrumentation
  4. Digital Photography
- Generic Elective (GE): Basic Electronics
  - Project work (OR) Optional Paper (Digital System Design using VHDL)

## **B.Sc. ELECTRONICS SYLLABUS**

**B.Sc. I YEAR**

**Semester – I**

### **DSC- Paper –I : Circuit Analysis**

**Total number of hours: 60**

**No of hours per week:4**

**Credits:4**

#### **UNIT - I**

**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.

#### **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) and its working, electron gun focusing, deflection sensitivity, florescent screen. Measurement of Time period, Frequency, Phase and amplitude.

#### **Reference 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)

**B.Sc. I Year, Semester – I : Electronics Practical**

**Paper – I : Circuit Analysis Lab**

**No. of hours per week : 3**

1. Measurement of peak voltage, frequency using CRO.
2. Measurement of phase using CRO.
3. Thevenin's theorem and Norton's theorem – verification.
4. Maximum power transfer theorem – verification.
5. CR circuit – Frequency response - (Low pass and High pass)
6. CR and LR circuits – Differentiation and integration – tracing of waveforms.
7. LCR – Series resonance circuit – frequency response – Determination of  $f_0$ , Q and band width.
8. Simulation: i) verification of KVL and KCL.  
ii) study of network theorems.  
iii) study of frequency response ( LR ).

**Note: Student has to perform minimum of Six experiments.**

Reference Books:

- 1) Lab manual for Electronic Devices and Circuits – 4<sup>th</sup> 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**  
**DSC- Paper –II : 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, iii) Tunnel diode and iv) Varactor 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).

**Reference Books:**

- 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, Semester – II : Electronics Practical**

**Paper – II : Electronic Devices Lab**

**No. of hours per week: 3**

1. To draw volt- ampere characteristics of Junction diode and determine the cut – in voltage, forward and reverse resistances.
2. Zener diode V – I Characteristics – Determination of Zener breakdown voltage.
3. Voltage regulator (line and load) using Zener diode.
4. BJT input and output characteristics (CE configuration) and determination of ‘h’ parameters.
5. FET – Characteristics and determination of FET parameters.
6. UJT characteristics – determination of intrinsic standoff ratio.
7. UJT as relaxation oscillator.
8. Characteristics of LDR/Photo diode/Photo transistor/Solar cell.

**Note: Student has to perform minimum of Six experiments.**

**Reference Books:**

- 1) Lab manual for Electronic Devices and Circuits – 4<sup>th</sup> Edition. By David A Bell - PHI



## **B.Sc. ELECTRONICS SYLLABUS**

### **B.Sc. II YEAR**

### **Semester - III**

### **DSC- Paper - III : Analog 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  $\pi$  section filters.

#### **UNIT – II**

**Regulated Power Supplies:** Block diagram of regulated power supply, Transistor Voltage Regulators – series and shunt type, 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  $\pi$  model of a transistor, Single stage 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 only)

#### **Reference 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, Semester – III : Electronics Practical**

**Paper - III: Analog Circuits Lab**

**No. of hours per week : 3**

1. Study of HWR, FWR and bridge rectifier, determination of ripple factor.
2. Series inductor, shunt capacitor, L-section and  $\pi$ -section filters; determination of ripple factor using Full wave Rectifier.
3. Study of voltage regulator using IC's - 78XX & 79XX.
4. Colpitt oscillator – determination of frequency.
5. RC Phase shift oscillator- determination of frequency
6. Astable multi-vibrator – determination of time period and duty cycle.

**Simulation experiments:**

- i) Rectifiers
- ii) RC coupled amplifier
- iii) Wein bridge oscillator
- iv) Colpitt oscillator
- v) RC phase shift oscillator
- vi) Astable multi-vibrator

**Note: Student has to perform minimum of Six experiments**

**Reference Books:**

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



## B.Sc. ELECTRONICS SYLLABUS

### B.Sc. II YEAR, Semester - IV

#### DSC- Paper - IV: Linear Integrated Circuits and Basics of 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 Op.amp. Characteristics of Op.amp, Op.amp parameters-Input resistance, Output resistance, Common mode rejection ratio (CMMR), Slew rate, offset voltages, Input bias current, Basic Op-Amp circuits- Inverting Op-Amp, Non-inverting Op-Amp, Op Amp as: Summing amplifier, subtractor, Comparator, Voltage follower, Integrator, and Differentiator and : logarithmic amplifier

#### UNIT- II

**Applications of Op-Amps:** Sine wave [Wien Bridge] generator and square wave [Astable] generator, Triangular wave generator, Mono stable multi-vibrator, 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 ,**  
**Semester – IV: Electronics Practical**  
**Paper - IV: Linear Integrated Circuits and Basics of Communication Lab**

**Total number of hours per week: 3**

**Practical : Using IC 741OpAmp and IC 555 Timer :**

1. Op amp as inverting Amplifier- determination of gain (with AC and DC).
2. Op amp as non- inverting Amplifier- determination of gain (with AC and DC).
3. OP Amp as Summing amplifier and comparator( Zero crossing detector)
4. Astable multi-vibrator – determination of time period and duty cycle.
5. Mono stable multi-vibrator- determination of gate width.
6. Integrator/ Differentiator – study of wave forms.
7. Astable multi-vibrator using IC 555
8. Mono stable multi-vibrator using IC 555.
9. AM modulator and detector
10. FM modulator and detector

**Simulation of all the above experiments:**

1. Inverting and Non-inverting amplifiers and comparator
2. Integrator/ Differentiator using op amp
3. Wein bridge oscillator
4. Astable multi-vibrator using Op Amp
5. Astable multi-vibrator using IC 555

**Note: Student has to perform minimum of Six experiments**

**Reference Books:**

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

## B.Sc. ELECTRONICS SYLLABUS

B.Sc. III YEAR, Semester - V

Paper - V: Digital Electronics (DSE - I)

Total number of hours : 60

No of hours per week: 4

Credits :4

### UNIT-I

**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, Full adder and parallel adder logic circuits. Logic families and their characteristics – TTL, CMOS and ECL logic circuits.

### UNIT-II

**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) representation (up to four variables). Multiplexer, De-Multiplexer, Decoder (3 to 8) and Encoder (8 to 3).

### UNIT-III

**Sequential logic circuits:** Flip-flops - SR, D, JK, T and Master-Slave JK; Registers - Shift Registers- SISO, SIPO, PISO and PIPO Registers.

**Counters:** 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

**Introduction to 8085 Microprocessor & its architecture:** 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

### Reference Books:

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
6. Digital Electronics Principles and Integrated circuits – Maini – Wiley India.
7. Digital Electronics - Gothman

**B.Sc. ELECTRONICS SYLLABUS**  
**B.Sc. III YEAR , Semester – V Practical**  
**Paper –V : Digital Electronics Lab**

**No. of hour per week :3**

- Verification of truth tables of AND, OR, NOT, NAND, NOR, EXOR Gates using IC 74XX series.
- Construction of basic gates using NAND and NOR gates.
- Construction of Half Adder using gates. Verification of truth table.
- Construction of Full Adder using gates and verification of truth table.
- Verification of truth tables of flip flops: RS, D, and JK using IC's.
- Construction of binary counters 7493

**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.

**Note: Student has to perform minimum of Six experiments**

**Reference Books:**

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

## **B.Sc. ELECTRONICS SYLLABUS**

**B.Sc. III YEAR, Semester - V**

**Paper - V (Elective)**

### **ELECTRONIC INSTRUMENTATION (DSE - I)**

**Total number of hours : 60**

**No of hours per week: 4**

**Credits :4**

#### **Unit – I: CHARACTERISTICS OF AN INSTRUMENT**

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**

Transducer: Transducers, Factors for selection of a transducer, Definition of transducer and sensor – Classification of transducers – Pressure (strain gauge, piezoelectric transducer), displacement (potentiometric, LVDT), Ultra Sonic Transducers (ultrasonic sensors)

Microphones: Microphones and their types, Temperature measurement, resistance wires thermometers, semiconductor thermometers and thermocouples, temperature (thermistor) and photosensitive (Vacuum and Gas filled phototubes, photoconductive cell, photovoltaic cell, photo emissive) transducers. Flow Transducers – Flow Transducers – Flow Meter, Force Transducers – Dynamometer, Acceleration Transducer – accelerometer. Application of Transducers.

**Unit –III: BRIDGE MEASUREMENTS:** 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:** 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 Voltmeters and Current Meters, Ohmmeters, Multimeters, Meterprotection, Extension of range, True RMS Responding Voltmeters, 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 and Instrumentation, *Dhanpat Rai & Sons*.

### **Books for Reference:**

1. E. O. Doebelin, 1983, Measurement Systems Application and Design, *International Edition, 3<sup>rd</sup> Ed., McGraw-Hill, NY*.
2. D. V. S. Moorthy, 1995, Transducer and Instrumentation, *Prentice-Hall of India, New Delhi*.
3. J. W. Dalley, W. F. Riley and K. G. McConnel, 1993, Instrumentation for Measurements, *Wiley, NY*.
3. B. C. Nakre and K. K. Chaudry, Instrumentation Measurements and Analysis, *Tata McGraw-Hill, New Delhi*.
5. D. A. Skoog, Principles of Instrumental Analysis, *3<sup>rd</sup> Ed., Saunders College Publishing*.

**B.Sc. ELECTRONICS SYLLABUS**  
**B.Sc. III YEAR, Semester – V**

**ELECTRONIC INSTRUMENTATION LAB**

**No. of hours per week: 3**

**Experiments:**

1. Temperature Transducer – (Thermocouple/ Thermistor)
2. Pressure Transducer – Strain Gauge
3. Displacement Transducer – LVDT (Linear Variable Differential Transformer)
4. Ultrasonic Transducer (Ultrasonic sensor)
5. Flow Transducer - Flow Meter
6. Force Transducer – Dynamometer
7. Acceleration Transducer – Accelerometer
8. Photovoltaic (Solar cell)
9. Passive Transducer photo cell (LDR)
10. CRO characteristics
11. DC Voltmeter / DC Current meter
12. AC Voltmeter / AC Current meter
13. Multi meter

**B.Sc. ELECTRONICS SYLLABUS**  
**B.Sc. III YEAR, Semester - VI**  
**Paper – VI (Elective)**  
**DIGITAL COMMUNICATION (DSE- II)**

**Total number of hours : 45**  
**No of hours per week: 3**  
**Credits :4**

**Unit – I:**

**Introduction:** Need and Necessity of Digitalization, Advantages of Digital communication, Elements of Digital Communication.

**Signal analysis:** 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:**

**Digital Communication Systems:** Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Position Amplitude (PPM), Pulse Code Modulation (PCM), Delta modulation, Adaptive delta modulation, Quantization and Noise consideration

**Digital Transmission and Reception:** Timing, base band systems, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase shift Keying (PSK), Quadrature Amplitude Modulation (QAM).

**Unit - III:**

**Error detection and coding:** Parity check, CRC, Hamming distance, Hamming codes, cyclic codes, line synchronization codes, Manchester code, NRZ coding, Walsh codes.

**Unit -IV:**

**Case studies:** cellular concepts, global positioning (GPS), Facsimile, Video text, Wifi, Bluetooth, IOT, Cognitive radio.

**Reference Books:**

1. Analog and Digital Communication – Simon Haykin, John Wiley, 2005
2. Electronics Communication System-Fundamental through Advanced-Wayne Tomasi, 5<sup>th</sup> Edition, PHI, 2009.
3. Principles of Communication Systems – Herbert TAub, Donald L Schiling, Goutam Ssha, 3<sup>rd</sup> Edition, Mcgraw-Hill, 2008.
4. Electronic Communications – Dennis Roddy and John Coolean, 4<sup>th</sup> Edition, PEA, 2004
5. Electronics & Communication System – George Kennedy and Bernard Davis, TMH, 2004.
6. Analog and Digital Communication – K.Sam Shanmugam, Wiley, 2005
7. John G. Proakis, “Digital Communication”, 4<sup>th</sup> Edition, Tata McGraw-Hill publishing company Limited, New Delhi, 2003.
8. P Ramakrishna Rao, “Digital Communication”, Tata McGraw-Hill Education Private Limited, New Delhi, 2011.
9. Analog and Digital Communication Systems – M.S. Roden, 3<sup>rd</sup> Edition, Prentice Hall of India
10. Modern Digital and Analog Communication Systems-B.P. Lathi.
11. Communication Techniques for digital and Analog signals – M. Kanefsky, John Wiley and Son.
12. Telecommunication – T.H. Brewster, McGraw Hill.
13. Principles of Digital communication, Das Chatterjee and Mallic, Wiley Eastern Ltd.



**B.Sc. ELECTRONICS SYLLABUS**  
**B.Sc. III YEAR, Semester – VI Practical**

**DSE - Paper – VI : DIGITAL COMMUNICATION Lab**

**No. of hours per week :3**

**I Experiments in Internetworking:**

1. Pulse Amplitude Modulation
2. Pulse Code Modulation
3. Pulse Width Modulation
4. Pulse Phase Modulation
5. Amplitude Shift Keying
6. Frequency Shift Keying
7. Delta modulation
8. Phase shift Keying

**II Experiments in Data Communication.**

- 1) Study of serial communication.
- 2) Study of wireless communications.
- 3) Study of parallel communication.

**B.Sc. ELECTRONICS SYLLABUS**  
**B.Sc. III YEAR, Semester – VI ( Elective )**

**8051 Microcontroller and Applications (DSE-II)**

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

**UNIT-I**

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

**UNIT-II**

**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**

**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**

**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, R-2R ladder Interfacing of DAC 0808 to microcontroller, successive approximation ADC, Dual slope ADC Interfacing of ADC 0804 to microcontroller, Seven segment LED.

**Reference Books:**

- 1) The 8051 Microcontrollers and Embedded Systems – Muhammad Ali Mazidi and Janice gillipsie Mazidi – Pearson Education Asia, 4<sup>th</sup> Reprint, 2002.
- 2) Text book of Electronics Bsc III year (vol.III)-Telugu Akademi.
- 3) Fundamentals of Microprocessors and Microcontrollers – B.Ram.
- 4) The 8051 Microcontroller – architecture, programming and applications KennethJ. Ayala- Penram International Publishing, 1995.
- 5) Micro controllers-Theory and Applications-Ajay V.Deshmukh.
- 6) Micro-controller 8051, D. Karuna Sagar, Narosa Publications (2011)

**B.Sc. ELECTRONICS SYLLABUS**  
**B.Sc. III YEAR, Semester VI – Practical (Elective)**

**8051 Microcontroller and applications Lab**

**No. of hours per week:3**

**Experiments using 8051 microcontroller:**

1. ADD, SUB, DAA, 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 Six Experiment**

## (SKILL ENHANCEMENT COURSE)

### **Electronics Hardware and Networking**

#### **Unit-I:**

**Electronics Hardware:** Active and passive components, transducers, classification of transducers based on electrical principle involved.

**Power supplies:** - DC regulated power supplies (Block diagram approach), SMPS, UPS.  
Integrated Circuit (IC's) – advantages and Limitations of IC's, scale of integration, classification of IC's by structure.

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

#### **Unit-II :**

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

**Protocol:** Need for protocol architecture, OSI reference model, TCP/IP model.

**Internet protocol:** IP addresses and classification, architecture of IPV4 and IPV6.

**Network Devices:** Switches, Bridges, Hubs, Router, Wi-Fi, Bluetooth (Architecture).

#### **Reference books:**

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

(SKILL ENHANCEMENT COURSE)

**MATLAB and its Applications**

**Unit – I:**

**Introduction** to MATLAB – Characteristic-understanding MATLAB-how does MATLAB make work so easy- MATLAB used as calculator –need of MATLAB-features of MATLAB-5-major parts of MATLAB-desktop tools and development environment-current folder-command window- workspace-command history- MATLAB version – MATLAB compiler-Advantages-disadvantages of MATLAB-uses of MATLAB

**Unit – II:**

**Application of MATLAB** Basic MATLAB commands-introduction to vector-matrix-vector matrix operations MATLAB code for-inverse of Matrix-Determinant of Matrix-transpose of matrix.

**Plotting** basic plotting commands-different types of plots-2-D plotting-xlabel-y-label-linewidth-Application of MATLAB in various fields.

**Reference Books:**

1. Getting started with MATLAB: A Quick Introduction for Scientist & Engineers by Rudra Pratap
2. MATLAB Programming for Engineers by Stephen J Champ
3. A concise introduction to matlab by William j Palm
4. MATLAB and its Applications in Engineering by Bansal Goel Sharma
5. A Textbook on MATLAB Programming for Engineering and Science by Ray Dipankar

## (SKILL ENHANCEMENT COURSE)

### **BASIC INSTRUMENTATION SKILLS**

#### **(Credits: 02)**

This course is to get exposure with various aspects of instruments and their usage through hands-on-mode. Experiments listed below are to be in communication of the topics

#### **UNIT : I**

**Basic of Measurement:** Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects.

**Multimeter:** Principles of measurement dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

**Electronic Voltmeter:** Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance.

**AC millivoltmeter:** Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance.

**Cathode Ray Oscilloscope:** Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only- no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition, Time base operation, synchronization, front panel controls. Specification of a CRO and their significance.

Use of CRO for the measurement of voltage dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage

**Oscilloscope:** Block diagram and principle of working.

#### **UNIT : II**

**Signal Generators and Analysis Instruments:** Block diagram, explanation and specifications of low frequency signal generators. Pulse generator, and function generator. Brief idea for testing specifications. Distortion factor meter, wave analysis.

**Impedance Bridges & Q-Meters:** Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges.

**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 an oscilloscope.
2. CRO as a versatile measuring device.
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 receiver circuit.
8. Trouble shooting a circuit
9. Balancing of bridges

(SKILL ENHANCEMENT COURSE)

**DIGITAL PHOTOGRAPHY**

**Unit-I:**

**Introduction** of digital photography-the past and future, types of digital cameras, jump start-taking photos with full auto mode, camera control, composing images, capturing images, continuous photography, playback mode.

**Image sensors** – introduction types image size and aspects ratios, sensitivity and noise, cleaning.

**Introduction:** understanding the terminology used for digital camera CCD, ISO, DSLR camera.

**Using different methods in accordance with various situations:** Taking photos of people. Taking photos of landscape, Taking close-up photos, Taking photos at night

**Unit-II:**

**Acquiring basic knowledge of taking a picture with the digital camera:** Push the shutter, Good composition of photos, White balance setting, Exposure compensation. Flash control, Shutter speed priority mode, Selective focus.

**Photo Shop Software:** Introduction – features – masking – images framing – cloning – photo repairing

**Reference Books:**

1. The text book of digital photography – Dennis P. Curtin
2. Shoot like a Pro Digital photography techniques-juile aadir king
3. The digital photograph book scott kelby
4. Freeman Patterson “The Art of Seeing” by Key Porter books. Tim Fitzharris  
“Landscape Photography” Firefly books.

**Recommended Websites:**

Articles, Pictures, Videos, online learning – [www.canadiannaturephotographer.com](http://www.canadiannaturephotographer.com)  
Articles on composition – photoinf.com, The place to go and read before you buy a camera – [www.dpreview.com](http://www.dpreview.com)

## GENERIC ELECTIVE

### **Basic Electronics**

Course Objective:

- To analyze the behavior of semiconductor diodes in Forward and Reverse bias
- To design of Half wave and Full wave rectifiers
- To explore V-I characteristics of Bipolar Junction Transistors in CB, CE and CC configuration.

Course Outcomes: Students will be

- Able to learn about forward biased and reversed biased circuits
- Able to plot V-I Characteristics of diode and transmission
- Able to design combinational logic circuits and PLDs.

#### **Unit – I:**

**Units and Definitions:** SI units, Electric charge, Electric field, Electric potential, Potential difference, Voltage, EMF.

**Resistors:** Concept of resistance, V-I relation in resistor, ohm's law and its limitations, types of resistors and their properties and applications, Color Codes, Combination of resistors in series and parallel.

**Capacitors:** concept of capacitance, V-I relation in capacitor, energy stored in capacitance, types of capacitors & their properties and applications, Color Codes, Combination of capacitors in series and parallel.

**Inductors:** Concept of inductance, V-I relation in inductor, energy stored in inductors. Mutual inductance and coefficient of coupling, types of inductors and applications, Colour Codes, Combination of inductors in series and parallel.

#### **Unit-II:**

**Simple Circuits:** Concepts of impedance and admittance, network definition. Circuit elements, branch, lumped and distributed network, mesh and node, concepts of voltage and current both ideal and practical.

**Passive networks:** Krichoff's Voltage Law (KVL), Krichoff's Current Law (KCL).

#### **Unit-III:**

**The concept of basic semiconductor:** P-Material, N-Material, formation of PN junction, Formation of 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, iii) Tunnel diode and iv) Varactor diode. Zener diode as voltage regulator.

**Rectifiers:** Rectifiers— half wave, full wave and bridge rectifiers, Efficiency, Ripple factor, regulation, harmonic components in rectified output.

#### **UNIT-IV:**

**Bipolar Junction Transistor (BJT) :** PNP and NPN transistors, current components inBJT (  $I_E$  ,  $I_B$ ,  $I_C$ ,  $I_{CO}$  ), BJT static characteristics ( Input and Output ), Early effect, CB, CC, CE configurations of transistor and bias conditions (cut off, active and saturation regions).



### **Reference 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

**B.Sc. ELECTRONICS – III YEAR**  
Semester – VI Generic Elective (GE)  
**Optional Paper: Digital System Design Using VHDL**

**Total No. of hours : 60**  
**No. of hours per week : 4**  
**Credits : 4**

**UNIT – I:**

**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:**

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:**

**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:**

**Generic Constants:** Parameterizing Behavior, Parameterizing Structure.

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

**Reference Books:**

1. The Designer's Guide to VHDL -By Peter J. Ashenden, 2nd Ed., 1st Indian 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 ., Pearson Education Asia, 11th Indian Reprint, 2004.
5. Fundamentals of Digital Logic with VHDL Design - By Stephen Brown & Zvonko Vranesic., 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.

## Question paper pattern

Faculty of Science  
Electronics

Title of the paper:

Paper:

Duration: 3Hrs]

[Max. Marks : 80

### Section-A: Short Answer Questions

(8 x 4 = 32)

Answer any EIGHT questions

1. Unit – I
2. Unit – I
3. Unit – I (Problem)
4. Unit – II
5. Unit – II
6. Unit – II (Problem)
7. Unit – III
8. Unit – III
9. Unit – III (Problem)
10. Unit – IV
11. Unit – IV
12. Unit – IV (Problem)

### Section B: Essay Answer Questions

(4 x 12 = 48)

- 13 (a) Unit – I  
OR  
(b) Unit – I
- 14 (a) Unit – II  
OR  
(b) Unit – II
- 15 (a) Unit – III  
OR  
(b) Unit – III
- 16 (a) Unit – IV  
OR  
(b) Unit – IV

**Department of Physics  
Osmania University, Hyderabad**

**Proposed Scheme for B.Sc.,(Electronics)III-Year, Semester-VI under choice based credit system  
Project Guidelines**

**Title: Project**

**5HPW-Credits- 4**

1. Number of students who will be offered the project work will vary from batch to batch depending upon the infrastructural facilities and may vary each year (Not exceeding 5 students per group)
2. Project work will involve Experimental work related to Electronics or any topic with allied subjects like Microcontroller based projects, IoT, Electronic Instrumentation, Medical Electronics, Communications etc., The student will have to complete this in the stipulated time.
3. The final evaluation of the project work will be assessed by a panel involving internal and external examiners as per the instructions the Examination branch, Osmania University.
4. Students will be asked their choice for project work at the beginning of 6<sup>th</sup> semester and all formalities of topic and Guide selection will be completed within a week.
5. Project work will be offered in lieu of expertise and infrastructural facilities of the department and will be evaluated for 4 credits
6. The distribution of marks for the project work will be:  
Project work: 100 Marks (50 Marks for dissertation+ 25 Marks for research skills+25 Marks for research work Presentation)

**Distribution of Hours**

**PROJECT PHASE - I 20 Hours**

**1. Project Group**

Divide the students in to groups based on the project work. Each group should not have more than 5 students.

## **2. Guide Allocation**

Any fulltime Physics/Electronics/Applied Electronics faculty (**Ratified by OU**) working in Osmania University Constituent/ Affiliated is eligible to guide the students. The number of students under a guide should not exceed 40 (8 batches). Guide can be from the same college or from different college. The faculty who are interested in guiding the students for projects should obtain formal approval from BoS, Electronics, Dept. of Physics, Osmania University.

For each group one guide is allocated and project topic should be selected based on the student interest and facilities available.

## **3. Weekly review of project work**

Discussion with guide maintained in Project log book and project booklet.

## **4. Progress Monitoring**

Pre-Seminar/s & Reviewing of First stage of Project work by Departmental Project Evaluation & Review committee (PERC)

## **PROJECT PHASE – II 30 Hours**

### **5. Feedback & Suggestions**

Given by Examiners are taken into account by Student

### **6. Participation in Project Based Events (Optional)**

Project Exhibition, Poster Presentation, Paper Publication in Journals and Conferences etc.,

### **7. Pre-Exam Project Evaluation**

Demonstration of working model in front of Internal Project Evaluation Committee (IPEC)

### **8. Submission of Project Report**

Report in Prescribed format containing all event participation certificates

### **9. University Semester-VI Exam**

Final evaluation of the project work will be through a panel involving internal and external examiners

