DEPARTMENT OF PHYSICS

MAHATMA GANDHI UNIVERSITY-NALGONDA

B.Sc. SYLLABUS

PHYSICS & ELECTRONICS

(W.E.F. 2019-20)

DEPARTMENT OF PHYSICS
MAHATMA GANDHI UNIVERSITY-NALGONDA

Board of Studies in Physics Meeting Resolutions

The members of Board of Studies in Physics for UG met on 31.01.2022 from 2.30 pm to 3.00 pm (Virtual mode through google meet: **http://meet.google.com/etv-roes-wff**) and discussed various issues pertaining to approve the Physics and Electronics Syllabus of all semesters of B.Sc. Course w.e.f 2019 - 20 onwards.

Members Present:

1. Prof. D. Karuna Sagar
2. Prof. M. Srinivas
3. Prof.M. Prasad
4. Prof.M.Laxman Naik
5. Dr. Md. Shareefuddin
6. Dr.N. V. Prasad

Resolutions:

1. Resolved to adopt the B.Sc. Physics and B.Sc. Electronics syllabi of Osmania University as per the suggestion of Telangana State Council of Higher Education.
2. Resolved to approve the above said syllabi as it is without any modification and in force w.e.f2019-20 onwards.
3. It is to be noted here that there is revision of B.Sc. I Sem Physics syllabus – Unit IV (Special Theory of Relativity) Syllabus is adjusted in Unit III and new chapter Oscillations is named as Unit IV. The theory paper title is changed from Mechanics to Mechanics and Oscillations and similarly the Practical paper title is changed from Mechanics to Mechanics & Oscillations Lab.

(Prof. D. Karuna Sagar)

(Prof. M. Srinivas)

(Prof.M. Prasad)

(Prof.M.Laxman Naik)

(Dr. Md. Shareefuddin)

(Dr.N. V. Prasad)

MAHATMA GANDHI UNIVERSITY
B.Sc. (Electronics)
SCHEME FOR CHOICE BASED CREDIT SYSTEM
(YEAR- & SEMESTER-WISE SCHEME OF HPW, CREDITS & MARKS)

YR	SEM	COURSE/PAPER (THEORY & PRACTIAL)	COURSE TYPE*	HRS/ WEEK	No. of CREDITS	MARKS		
						Internal	SEM End	Total
FIRST	I	Circuit Analysis	DSC-1	4	4	20	80	100
		Circuit Analysis Lab (Pr)	DSC-1(Pr)	3	1	-	25	25
	II	Electronic Devices	DSC-2	4	4	20	80	100
		Electronic Devices Lab (Pr)	DSC-2(Pr)	3	1	-	25	25
SECOND	III	Analog Circuits	DSC-3	4	4	20	80	100
		Analog Circuits Lab (Pr)	DSC-3(Pr)	3	1	-	25	25
		1) Electronic hardware & Networking 2) MATLAB and Applications	SEC-1 SEC-2	2 2	2 2	10 10	40 40	50 50
	IV	Linear Integrated Circuits & Basics of Communication	DSC-4	4	4	20	80	100
		Linear Integrated Circuits & Basics of Communication Lab (Pr)	DSC-4(Pr)	3	1	-	25	25
		1) Basic Instrumentation 2) Digital Photography	SEC-3 SEC-4	2 2	2 2	10 10	40 40	50 50
THIRD	V	(A) Digital Electronics & Microprocessor Or (B) Electronic Instrumentation	DSE-1	4	4	20	80	100
		(A) Digital Electronics & Microprocessor Lab (Pr) Or (B) Electronic Instrumentation Lab (Pr)	DSE-1 (Pr)	3	1	-	25	25
		Basic Electronics	GE	4	4	20	80	100
	VI	(A) Digital Communication Or (B) Microcontroller & Applications	DSE-2	4	4	20	80	100
		(A) Digital Communication Lab (Pr) Or (B)Microcontroller &Applications Lab(Pr)	DSE-2 (Pr)	3	1	-	25	25
		Digital system design using VHDL	Project / Course in lieu of project	4	4	20	80	100
		Total			**30 + 16**	**120 + 80**	**630 + 320**	**750 + 400**

*DSC: Discipline Specific Course (Core);
DSE: Discipline Specific Elective (Elective);
Pr: Practical
SEC: Skill Enhancement Course;
GE: Generic Elective

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B.Sc. (Electronics) - I Year
Semester – I
Paper – I: Circuit Analysis
(DSC-1: Compulsory)

Total: 56 Hrs
(4 Hrs / week)

Unit I: (14 Hrs)

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: (14 Hrs)

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: (14 Hrs)

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: (14 Hrs)

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.

Suggested Books:

1) Basic Electronics – Grob, 10th Edn (TMH)
2) Circuit Analysis - P. Gnanaswamy, Pearson Education.
3) Circuit and Networks - A. Sudhakar & S. Pallri (TMH)
4) Pulse, digital & switching waveforms - Millman & Taub.
5) Networks, Lines and Fields - John Ryder (PHI)
6) Network theory - Samrajit Ghosh (PHI)

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B.Sc. (Electronics) - I Year
Semester – I
Paper – I: Circuit Analysis Lab
(DSC-1: Compulsory)

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 passes and high passes).
6. CR and LR circuits – Differentiation and integration – tracing of waveforms.
7. LCR – Series resonance circuit – frequency response – Determination of f_o, 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.

Suggested Books

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

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B.Sc. (Electronics) - I Year
Semester – II
Paper – II: Electronic Devices
(DSC-2: Compulsory)

Total: 56 Hrs
(4 Hrs / week)

UNIT- I (14 Hrs)

PN Junction: Formation of PN junction, Depletion region, Junction capacitance, Diode equation (Qualitative only - 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 (14 Hrs)

Bipolar Junction Transistor (BJT): PNP and NPN transistors, current components in BJT, BJT static characteristics (Input and Output), Early effect, CB, CC and 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 (14 Hrs)

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 (14 Hrs)

Silicon Controlled Rectifier (SCR): Construction and working of SCR, Two transistor representations, 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).

Books suggested:

1) Electronic Devices and circuits - Millman and Halkias, TMH
2) Principles of Electronics - V. K. Mehta & Rohit Mehta
3) Electronic Devices and Circuits - Allen Mottershed (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.
8) First Year Electronics - Telugu Academy

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B.Sc. (Electronics) - I Year
Semester – II
Paper – II:: Electronic Devices Practicals
(DSC-2: Compulsory)

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.

Suggested Book:

1) Lab manual for Electronic Devices and Circuits – David A Bell – 4th Edition, PHI

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B.Sc. (Electronics) - II Year
Semester – III
Paper – III: Analog Circuits
(DSC-3: Compulsory)

Total: 56 Hrs
(4 Hrs / week)

UNIT – I **(14 Hrs)**

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

UNIT – II **(14 Hrs)**

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 **(14 Hrs)**

Transistor amplifier: Classification of amplifiers (Based on type of coupling and frequency range), Hybrid π-model of a transistor, RC-coupled CE amplifier – frequency response, 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 **(14 Hrs)**

Oscillators:: Barkhausen criterion for sustained oscillations, RC oscillators: RC phase shift and Wien's bridge oscillators and derivation for frequency oscillations, LC oscillators: Hartley and Colpits Oscillators, derivation for frequency oscillation.

Multivibrators: Astable, Monostable and Bistable multivibrators – Qualitative treatment only.

Suggested 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 - Milliman and Taub

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B.Sc. (Electronics) - II Year
Semester – III
Paper – III: Analog Circuits Practicals
(DSC-3: Compulsory)

1. Study of Half-wave, full-wave and bridge rectifier and determination of ripple factor.
2. Series inductor, shunt capacitor, L-section and π-section filters: Determination of ripple factor using Full wave Rectifier.
3. Study of voltage regulator using ICs: 78XX & 79XX.
4. Colpitt's oscillator – determination of frequency.
5. RC Phase shift oscillator - determination of frequency
6. Astable multivibrator – determination of time period and duty cycle.
7. RC-coupled amplifier – Study of frequency response
8. **Simulation experiments:**
   - i) Rectifiers
   - ii) RC-coupled amplifier
   - iii) Wein bridge oscillator
   - iv) Colpitt's oscillator
   - v) RC phase shift oscillator
   - vi) Astable multivibrator

Note: Student has to perform minimum of six experiments

Suggested Books:

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

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B.Sc. (Electronics) - II Year
Semester – IV
Paper – IV: Linear Integrated Circuits & Basics of Communication
(DSC-4: Compulsory)

Total: 56 Hrs
(4 Hrs / week)

UNIT – I (14 Hrs)

Operational Amplifiers (Op-Amp): 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, Virtual ground, Non-inverting Op-Amp, Frequency response of Op-Amp, Op-Amp as: summing amplifier, subtractor, comparator, voltage follower, integrator and differentiator. Logarithmic amplifier.

UNIT – II (14 Hrs)

Applications of Op-Amps: Sine wave (Wien Bridge) generator and square wave (Astable) generator, Triangular wave generator, Monostable multivibrator, 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 monostable and astable multivibrator.

UNIT – III (14 Hrs)

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 (14 Hrs)

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, PCM, Delta modulation.

Suggested Books:

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

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NALGONDA-508 254 (T.S.)

B.Sc. (Electronics) - II Year
Semester – IV
Paper – IV: Linear Integrated Circuits & Basics of Communication Practicals
(DSC-4: Compulsory)

Using IC 741 Op-Amps and IC 555 Timers:

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 multivibrator – determination of time period and duty cycle.
5. Monostable multivibrator- determination of gate width.
6. Integrator/ Differentiator – study of wave forms.
7. Astable multivibrator using IC 555
8. Monostable multivibrator 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's bridge oscillator
4. Astable multivibrator using Op Amp
5. Astable multivibrator using IC 555

Note: Student has to perform minimum of six 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.

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B.Sc. (Electronics) - III Year
Semester – V
Paper – V: (A) Digital Electronics
(DSE-1: Elective)

Total: 56 Hrs
(4 Hrs / week)

UNIT-I (12 Hrs)

Number system and Logic gates: Conversion 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 (12 Hrs)

Boolean algebra and Combinational logic circuits: Boolean algebra - Laws and identities, De Morgan'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 (16 Hrs)

Sequential logic circuits: Flip-flops: SR, D, JK, T, JK and JK Master-Slave, **Registers:** Shift registers, SISO, SIPO, PISO and PIPO registers, Universal shift register (IC 7496) Shift register **counters-** Ring counter, Johnson Counter-bit Asynchronous (Ripple) counter, Modulo-N counter, Synchronous counter,

Up/Down Counters - ripple counter IC 7493 - Decade counter IC 7490 - working, Truth-table and timing diagrams.

UNIT-IV (16 Hrs)

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

Suggested 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
5. Fundamentals of Digital Circuits – Anand Kumar – PHI
6. Digital Electronics Principles and Integrated circuits – Maini – Wiley India.
7. Digital Electronics – Gothman
8. Microprocessor Architecture and Programming – Ramesh S.Goanker – Penram.
9. Fundamentals of Microprocessors and Micro controllers – B.Ram, - Dhanpat rai & sons.
10. Introduction to Microprocessor – Aditya P.Mathur – TMH.

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NALGONDA-508 254. (T.S.)

B.Sc. (Electronics) - III Year
Semester – V
Paper – V: (A) Digital Electronics & Microprocessor Practicals
(DSE-1: Elective)

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

Simulation experiments:

1. 4 bit parallel adder using Full adders.
2. Decade counter using JK flip flops.
3. Up/Down counters using JK flip flops.
4. Multiplexer/De-Multiplexer.
5. Encoder.

Note: Student has to perform minimum of eight experiments

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

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B.Sc. (Electronics) - III Year
Semester – V
Paper – V: (B) Electronic Instrumentation
(DSE-1: Elective)

Total: 56 Hrs
(4 Hrs / week)

UNIT-I (14 Hrs)

Characteristics of an Instrument: Fundamental Elements of a measurement system- Static characteristics- Accuracy, precession, bias. Linearity, threshold, resolution, hysteresis, dead space, scale readability, span, static stiffness, input impedance, repeatability and reproductability- Errors and calculation of errors in overall system- dynamic characteristics- Zero, First and second order instrument- Responses for step, impulse, ramp and sinusoidal inputs, Classification of standards, IEEE standards of ISO9001, Quality of Management standards.

UNIT-II (16 Hrs)

Transducers and Sensors: Transducers, Factors for selection of Transducers, Definition of Transducer and sensor- Classification of transducers- Pressure (strain gauge, piezoelectric transducer), Displacement (potentiometric, LVDT) Ultrasonic Transducers (Ultrasonic Sensor).

Microphones: Microphones and their types, Temperature measurement, resistance wire thermometers, semiconductor thermo meters, and thermo couples, temperature (thermistor) and photosensitive (Vaccume and gas filled tubes, photocvonductivecells, photovoltaic cells, photoemmissive) Transducers. Flow transducers-flow meter, force transducer-Dynamometer, Acceleration Transducer-accelerometer, Applications of transducers.

UNIT-III (12 Hrs)

Bridge Measurements: Introduction- Wheatstone bridge, Kelvin Bridge, Guarded Wheatstone bridge, AC bridges and their applications: Maxwell bridge, Haybriodge, Schering bridge, Wien bridge.

UNIT-IV (14 Hrs)

Testing and Measuring Instruments: Oscilloscope, Block diagram, CRT circuits, Vertical and Horizontal Deflection Systems, Delay line, multiple trace, Probe, Special Oscilloscopes.

Measuring Instruments: DC Voltmeters, DC Current meters, AC Voltmeters and AC current meters, Ohmmeters, Multimeters, Meter protection, Extension of range, True RMS Responding Voltmeters, specifications of Instruments.

Suggested Books:

1. Instrumentation Devices and systems, CS Rangan., GR sharma and VSV mani, 1999 TataMcgrawh Hill, New Delhi.
2. Modern Electronics Instrumentation and Measurement techniques, A.D. Helfrick and W.D.Cooper, 1992 PHI New Delhi
3. A Course in Electrical and Electronic Measurement anmd Instrumentation, A.K. Sawhney, Dhanpat Ray and sons.
4. Measurement System applications and Design, E.O. Doebelin, 1983 International Edition, 3rd Edition McGraHills NY
5. Transducers and Instrumentation, DVS Murthy,1995 PHI New Delhi

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MJ.GONDA-508 254. (T.S.)

6. Instrumentation for measurements, JW Dalley, WF Riley and KG McConnel,1993 Wiley NY
7. Instrumentation Measurements and Analysis, BC Nakre and KK Chaudhary, TMC NewDelhi
8. Principles of Instrumental Analysis, DA Skoog, 3rd Ed, Saunders College Publishing.

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B.Sc. (Electronics) - III Year
Semester – V
Paper – V: (B) Electronic Instrumentation Practicals
(DSE-1: Elective)

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 cell (Solar cell)
9. Passive Transducers- Photocells (LDR)
10. CRO Characteristics
11. DC Voltmeter/ DC Current Meter
12. AC Voltmeter /AC current Meter
13. Multimeter

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B.Sc. (Electronics) - III Year
Semester – VI
Paper – VI: (A) Digital communication
(DSE-2: Elective)

Total: 56 Hrs
(4 Hrs / week)

Unit -I: (14 Hrs)

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 signal and noise, Correlation and Power spectrum.

Information Theory: Introduction, Information Entropy, Properties of Entropy, Information rate, Types of information sources, Channels, joint Entropy. Conditional entropy, Redundancy, mutual information, channel capacity.

Unit- II: (14 Hrs)

Digital Communication System: Pulse Modulation: PAM, PWM, PPM, PCM, delta modulation, adaptive delta modulation, quantization and noise consideration. Digital Transmission and Reception: Timing, base band systems, ASK, FSK, PSK, QAM.

Unit - III: (14 Hrs)

Error detection and coding: Introduction,, parity check, cyclic redundancy check (CRC), Hamming distance, Hamming codes, Cyclic codes, line synchronization codes, Manchester code, Non-Return to Zero (NRZ) coding, Walsh codes

Unit - IV: (14 Hrs)

Case Studies: Cellular concepts, global position system (GPS), Facsimile, Video text, Wifi, Bluetooth, IOT, cognitive radio.

Suggested Books:

1. Analog and Digital Communications- Simon Haykin, John Wiley,2005
2. Electronic Communication Systems-Fundamentals through Advanced- Wayne Tomasi, 5th Edition, PHI, 2009.
3. Principles of Communication Systems- Herbart Taub, Donald L Schilinh, Goutam Saha, 3rd Edition, Mcgraw-Hill, 2008.
4. Electronics Communications- Dennis Roddy and John Coolean, 4th edition, PEA,2004
5. Electronics &Communication Systems- George Kennedy and Benard Davis, TMH 2004
6. Analog and Digital Communication- K Sam Shanmugam, Willey, 2005
7. Digital Communications, P. Ramakrishna Rao, TataMcGraw hills publishing Company Limited, New Delhi.2011.
8. Analog and Digital Communication systems- M.S. Roden, 3rd Edition, Prentice Hall of India.
10. Modern Digital and Analog Communication Systems - B.P. Lathi.
12. Telecommunication – T.H. Brewster, McGraw Hill.
13. Principles of Digital communication, Das, Chatterjee and Mallick, Wiley Eastern ltd.

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NALGONDA-508 254 (T.S.)

B.Sc. (Electronics) - III Year
Semester – VI
Paper – VI: (A) Digital communication Practicals
(DSE-2: Elective)

I. Study of

1. Pulse Amplitude modulation
2. Pulse code modulation
3. pulse width modulation
4. Pulse Phase modulation
5. Amplitude Shift Key
6. Frequency shift key
7. Delta Modulation
8. Pulse shift keying

II. Experiments in Data Communication.

1) Study of serial communication.
2) Study of protocol in communications.
3) Study of Fiber optic communications.
4) Study of wireless communications.
5) Study of parallel communication.

Note: Minimum of 8 experiments to be performed.

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B.Sc. (Electronics) - III Year
Semester – VI
Paper – VI: (B) Microcontroller & Applications
(DSE-2: Elective)

Total: 56 Hrs
(4 Hrs / week)

UNIT-I (14 Hrs)

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 (14 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 (14 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: Timer 0, Timer 1 registers, TMOD register, TCON register, Timer modes – Mode 1, Mode 2 programming, Counter mode programming, Program to generate time delay.

Unit – IV (14 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.

Suggested Books:

1) The 8051 Microcontrollers and Embedded Systems – Muhammad Ali Mazidi and Janice Gillipsie Mazidi – 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, Kennth J. Ayala, Penram International Publishing, 1995.
5) Micro controllers-Theory and Applications- Ajay V. Deshmukh.
6) Micro-controller 8051, D. Karuna Sagar, Narosa B

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B.Sc. (Electronics) - III Year
Semester – VI
Paper – VI: (B) Microcontroller & Applications Practicals
(DSE-2: Elective)

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 Six Experiments

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B.Sc. (Electronics) - II Year
Semester – III
Electronic Hardware & Networking
(SEC - 1)

Total: 28 Hrs
(2 Hrs / week)

UNIT I (14 Hrs)

Electronic Hardware: Active and Passive Components, Transducers, Classification of transducer based on Electrical principle involved.

Power Supplies: DC Regulated Power supplies Dc Regulated Power supplies (Block diagram approach) SMPS, UPS.

Integrated Circuits: Advantages and limitations of ICs, Scale of integration, Classification of ICs by Structure.

Hardware Identification: Cables and connectors, motherboard, mother board components, CPU (processor), memory: RAM, ROM

UNIT II (14 Hrs)

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

Protocol: Need for protocol architectures reference model,TCP/IP model.

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

Network Devices: Switches, Bridges, Hubs, Router, Wifi, Blue tooth (Architecture)

Suggested Books:

1. Basic Electronics by BL Theraja, S. Chand company
2. Introduction to computers, Peter Nortons, Tata Mc Graw Hill, 5th edition
3. Data and computer communication by William Stallings - PH Publication, 7th edition
4. Data communication and networking by Behrouz A Forouzan, TMH 3rd edition

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B.Sc. (Electronics) - II Year
Semester – III
MATLAB and Applications
(SEC - 2)

Total: 28 Hrs
(2 Hrs / week)

UNIT I (14 Hrs)

Introduction to MATLAB: Characteristics understanding of MATLAB, How does MATLAB make work so easy as Calculator, Need of MATLAB, Features of MATLAB, Five major parts of MATLAB, Desktop tools and development environment, current folder command window, workspace, command history, MATLAB version, MATLAB compiler, Advantages and disadvantages of MATLAB, Uses of MATLAB.

UNIT II

Applications of MATLAB: Basic MATLAB commands, Introduction to vector matrix, vector matrix operation, MATLAB code for inverse matrix, determination of matrix, Transpose of Matrix.

Plotting: Basic plotting commands, different types of plots, 2Dplotting, X-label, Y-label line width marker Grid line colour, marker size,

Applications of MATLAB in various fields.

Suggested Books:

1. Getting started with MATLAB: A Quick introduction for Scientists and Engineers By Rudra Prathap.
2. MATLAB programming for Engineers by Stefen J Chapman.
3. Aconcise Introduction to MATLAB by William J Palm.
4. A Text Book of MATLAB Programming for Engineering and Science by Ray Dipankar

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B.Sc. (Electronics) - II Year
Semester – IV
Basic Instrumentation Skills
(SEC - 3)

Total: 28 Hrs
(2 Hrs / week)

UNIT-1 (14 Hrs)

Basics of measurement: Instruments accuracy, precision, sensitivity, resolution range etc, Errors in measurements and loading effects. **Multimeter:** Principles of measurement of dc voltage and dc current, ac voltage 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 milli voltmeter:** Type of AC millivoltmeters, Amplifier-rectifier, and rectifier-amplifier, Block diagram AC milli voltmeter, Specifications and their significance.

Cathode Ray Oscilloscope (CRO): 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, Specifications 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, probe, Digital storage

Oscilloscope: Block diagram and principle of working.

UNIT-II (14 Hrs)

Signal Generator 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 Bridge & Q-Meters: Block diagram of 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.

Note: *Problems should be solved at the end of every chapter of all units.*

Suggested Books:

1. A text book in electrical technology – B. L. Thereja – S. Chand & Co.
2. Performance and design of AC machines – M. G. Say – ELBS Edn
3. Digital circuits and systems – Venugopal, Tata McGraw Hill, 2011
4. Logic circuit design – Shimon P. Vingron, Springer, 2012
5. Digital electronics – Subrata Ghoshal, Cengage Learning, 2012
6. Electronic devices and circuits – S. Salivahanan & N. S. Kumar, 3rd Edn, 2012, Tata McGraw Hill
7. Electronic circuits: Hand Book of design and applications – U. Tietze & Ch. Schenk, Springer, 2012
8. Electronic devices – Thomas L. Floyd, 7th Edn., Pearson India, 2008

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B.Sc. (Electronics) - II Year
Semester – IV
Digital Photography
(SEC - 4)

Total: 28 Hrs
(2 Hrs / week)

UNIT-1 (14 Hrs)

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

Image sensors: introduction types image size sizes 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 landscapes, Taking close-up photos, Taking photos at night

UNIT-II (14 Hrs)

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.

PhotoShop Software: Introduction – features-masking- images framing –cloning-photo repairing.

Suggested 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. The Art of Seeing by key porter books - Freeman Patterson
5. Landscape photography by Firefly books. - Tim Fitzharris

Recommended Web sites:

Articles, Pictures, Video, online learning- www.canadiannaturephotographer.com Articles on composition- photoinf.com .The place to go and read before you buy a camera – www.dpreview.com

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B.Sc. (Electronics) - III Year
Semester – V
Basic Electronics
(GE)

Total: 56 Hrs
(4 Hrs / week)

UNIT-I (16 Hrs)

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 & its limitations, types of resistors & their properties and uses, 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 & uses, Color Codes, Combination of resistors in series and parallel.

Inductors: Concept of inductance, V-I relation in inductor, energy stored in inductors, mutual inductance &coefficient of coupling, types of inductors & uses, Color Codes, Combination of inductors in series and parallel.

UNIT-II (12 Hrs)

Simple Circuits: Concept of impedance & admittance, network definition, circuit elements, branch, lumped & distributed network, mesh & node, concepts of voltage & current both ideal & practical.

Passive networks: Kirchoff's voltage (KVL), Kirchoff's current law (KCL).

UNIT-III (16 Hrs)

The concept of basic semi conductor, 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 (12 Hrs)

Bipolar Junction Transistor (BJT): PNP and NPN transistors, current components in BJT (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 (cutoff, active and saturation regions).

Suggested Books:

1. Basic Elecronics - Bernard Grob 10th edition (TMH)
2. Circuit Aanalysis- P.Gnanasivam Pearson Education
3. Circuit and Networks- A.Sudhakar & S.Pallri (TMH)
4. Electronic Devices and circuits- Millman and Halkias, (TMH)
5. Principles of Electronics- V.K.Mehta & Rohit Mehta.
6. Basic Electronics for B.Sc (Physics) III Yr, 2019, Telugu Akademi
7. Basic Electronics and Linear Circuits- U. Bharghava
8. Electronic Devices and Circuits – Y.N. Bapat
9. Electronic Devices and Circuits – Mithal

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B.Sc. (Physics)- III Year
Semester – VI
Digital system design using VHDL
(Paper in lieu of project)

Total: 56 Hrs
(4 Hrs / week)

UNIT- I (14 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 Type and Operations: Constants and Variables, Scalar Type, 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 (14 Hrs)

Composite Data Type 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 (14 Hrs)

Packages and Use Clauses: Packages 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 (14 hrs)

Generic Constants: Parameterizing Behaviour, Parameterizing Structure.

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

Suggested 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 Printer – 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 ZainalabedinNavabi, 2nd Ed, MH, 1998

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