Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Department of Electronics

Courses offered at UG level (B. Sc.)

Program : **B. Sc. with Electronics as 1 of the 3 optionals**

Program Outcomes:

The learners can be employed as Electronic Instrument operator, Electronic Circuit Designer, Electronic Consultant, can be an Entrepreneur, or may pursue higher studies in Electronics to work as a Teacher at College or University level.Knowledge of fundamental Electronic Science, basic electronic components, semiconductor devices, basic digital technologies, and communication technologies.Application of knowledge, problem analysis, investigation of problems, use of modern tools and instruments, Environmental awareness, ethics, individual and team work, communication, and lifelong learning.

Program specific Outcomes:

- In-depth knowledge of basic concepts of electronic science, basic electronic components
- Confidence in identifying various components for specific work/circuit/project etc. and in handling of laboratory instruments for measurements.Analytical abilities.
- Understanding semiconductor devices'characteristics, dataconverters, data processors, and use of analogue and Digital ICs.
- Understanding working of frequently required circuits in electronics industry; such as amplifiers, oscillators, multivibrators, microprocessors, microcontrolers and their interfacing.
- Fundamentals of Communication Electronics and Power Electronics.

- Confidence building through practical skills with lot of hands on practice.

Course Title: I-Electronic Components & Circuit Analysis **Course Code: CCEI-A**

Course Units	Course Outcome
I: Passive Components	Identification, construction, characteristics and types of resistors, capacitors, inductors, and transformer
II: Circuit Analysis-I	Knowledge and application of Kirchhoff's laws, current and voltage formulae for series and parallel circuits, and trouble shooting
III: Circuit Analysis-II	Understanding of voltage source, current source application of Supper position theorem, Thevenin's theorem, Norton's theorem, and maximum power transfer theorem
IV: A.C. Fundamentals	Cycle, time period frequency, phase, and forms of ac quantity. R-L-C series circuit, resonance, bandwidth and Q factor

Course Title: III- Semiconductor Devices and Instrumentation Course Code: CCEII-A

Course Units	Course Outcome
I: Semiconductor Diodes	Construction, working and V-I characteristics of various semiconductor diodes
II: Transistors	Construction and working of bipolar transistors, JFET, characteristics and parameters
III: Rectifiers and Voltage Regulators	Knowledge of rectifiers, regulator power supply, load regulation and line regulation
IV: CRO and Multi-meter	Understanding of working principles of analogue and multi-meter, CRO and their applications

Course Title: V-Practical Paper P-V (based on Papers I, II, III, IV)

Course Code: CCEPI

Course Experiments	Course Outcome
1. Identification of electronic components: Resistors, Capacitors, Inductors, transformers,diodes & transistors. 2. Study of electronic instruments: Voltmeter, Ammeter and Multimeter. 3. Study of Electronic instruments: Power supply, signal generator and CRO. 4. Determination of value of given resistors by using colour code method &verificationof it by multimeter. 5. Determination of amplitude, frequency and time period of observed voltage waveformby using CRO. 6. Verification of Thevenin's theorem. 7. Study of Maximum power transfer theorem and determination of internal resistance ofa source. 8. Study of P-N junction diode characteristics and determination of bulk resistance. 9. LED characteristics. 10. Photo diode characteristics. 11. Study of Zener diode characteristics and determination of breakdown voltage. 12. Study of Common-Emitter transistor characteristics and determination of β_{dc}. 13. JFET characteristics. 14. Study of Series resonance circuit and determination of its bandwidth and Q-factor. 15. Study of Half wave rectifier and determination of ripple factor and efficiency (η) 16. Study of Full wave rectifier and determination of ripple factor and efficiency (η) 17. Study of Zener shunt regulator, line and load regulation characteristics.	Identification of components, Draw circuits, construct circuit, record input and output voltages, draw graphs and perform calculations wherever necessary, write result and conclusions

Group II : 1. Study of basic gates (verification of truth table) using ICs. 2. Construction of basic gates using NAND gates. 3. Construction and study of half adder using NAND gates. 4. Construction and study of full adder using NAND gates. 5. Implementation of Boolean expression from the given truth table using K-map. 6. Verification of De Morgan's First theorem. 7. Verification of De Morgan's Second theorem. 8. Construction and study of JK, T-type and D-type flip-flops using IC 7476. 9. Study of decade counter using IC 7490. 10.Construction and study of Serial in – Serial out shift register using IC 7495. 11.Mod-16 asynchronous counter using IC 7493. 12. 4-bit binary to Gray converter using IC 7486.	Identification of components, Draw circuits, construct circuit, record input and output voltages, draw graphs and perform calculations wherever necessary, write results and conclusions

Course Title: VII-Fundamentals of Microprocessors **Course Code: CCEIII-B**

Course Units	Course Outcome
I: Introduction to Microprocessor 8085	Knowledge of features, functional pin diagram, internal blocks and their functions, and semiconductor memories
II: Instruction set of INTEL 8085	Understanding of complete instruction set of 8085, their format and addressing modes
III: Programming and Interrupts of 8085	Understanding of instructions through ALP examples, ALP programming skill, hardware and software interrupts with 8085
IV: Introduction to Microprocessor INTEL 8086	Functional pin diagram, internal block diagram and features of 8086

Course Title: IX-Microprocessor Interfacing **Course Code: CCEIV-B**

Course Units	Course Outcome
I: Basic Interfacing Concepts	Understanding of memory mapped I/O scheme, I/O mapped I/O scheme, data transfer scheme
II: Interfacing Chips	Knowledge of functional block diagram, operating modes and application of interfacing ICs 8253, 8255, 8259 and 8257
III: Microprocessor Applications	Understanding of interfacing of I/O devices using decoder 74138, buffer 74244 and latch 74373 chips. Interfacing of switches, LED and relays and programming
IV: Data Converters	Knowledge of interfacing ADC 0808 DAC 0808 with microprocessor 8085

Skill Enhancement Course: SEC-II

Course Title: Electrical Circuits and Network Skills **Course Code: CCEPIII**

Course Units	Course Outcome
I: Basic Electricity Principles	Soldering skills, practical verification of Ohm's law, troubleshooting given circuit, series and parallel combination of components, designing of low voltage power supply, handling of digital LCR meter
II: Solid state Devices	Understanding of characteristics of diodes, rectifiers, recording response of L, C to DC/AC, determine Op-Amp parameters

Course Title: XIII-Power Electronics – I **Course Code: DECE-I**

Course Units	Course Outcome
I: Thyristor: Principles and characteristics	In-depth knowledge of SCR construction, V-I characteristics, gate characteristic and turn ON methods
II: Power Semiconductor Devices	Understanding DIAC, TRIAC, Power MOSFET and IGBT characteristics. Characteristics of SUS, SBS, SCS and LASCR
III: Gate Triggering Circuits	Illustrate gate trigger circuit, use of pulse transformer, R, R-C, full wave trigger circuit,
IV: Series and parallel operation of Thyristors	Understanding need and connection of thyristors in series and parallel, problems associated and solution to such connections

Course Title: XV-Power Electronics - II **Course Code: DECE-II**

Course Units	Course Outcome
I: Phase controlled Convertors	Construct full wave controlled rectifier with R, R and L, RL with freewheeling diode. Illustrate Bridge configuration, half controlled bridge rectifier
II: Thyristor Control Circuits	Drawing and understanding of various control circuits using DIAC, TRIAC, LDR used in industry and domestic appliances
III: Choppers	Illustrate step down and step up choppers, power control strategies in choppers
IV: Inverters	Understanding of series and parallel invertors

Course Title: Practical Paper P-XVI (based on Papers XII and XIV)

Course Code: DECEPI

Course Experiments	Course Outcome
1. Study of Class–C Amplitude Modulation and Measurement of Efficiency, Percentage 1. Modulation Index 2. Study of Linear Diode Detector and Measurement of Detection Efficiency 3. Study of Frequency Response of Two Stage IF Amplifier 4. Study of Frequency Response of Audio Amplifier. 5. Study of Class B Push–Pull Amplifier using Complimentary Symmetry and Determination of Efficiency 6. Study of RF Mixer using BF 194 Transistor 7. Study of FM Modulation using IC 566 8. Study of FM Demodulator. 9. Study of Pulse Amplitude Modulation 10. Study of Pulse Position Modulation 11. Study of Pulse Width Modulation 12. Study of Pulse Code Modulation 13. Measurement of Numerical Aperture of Optical Fiber 14. Study the Bending Loss of an Optical Fiber 15. Study of the Characteristics of Laser LED 16. Study of Photo-Diode Detector Characteristics (Use Avalanche Photo Diode) 17. Study of Transmission and Reception through Optical Fiber	Identification of components, Draw circuits, construct circuit, record input and output voltages, draw graphs and perform calculations wherever necessary, write results and conclusions

Course Title: Practical Paper P-XVII (based on Papers XIII and XV)

Course Code: DECEPII

Course Experiments	Course Outcome
1. Uni-junction Transistor Characteristics 2. UJT relaxation oscillator 3. Firing characteristics of SCR. 4. Half wave gate controlled rectifier using one SCR 5. Firing of single SCR using UJT 6. Firing of two SCRs by a UJT. 7. Phase control circuit using SCR 8. Characteristics of DIAC. 9. Firing characteristics of a TRIAC 10. Illumination control using DIAC and TRIAC 11. Light activated turnoff circuit using LDR and SCR 12. Light activated turn off circuit using DIAC-TRIAC and LDR 13. Inverter using SCR and measurement of frequency, output power. 14. Study of simple Chopper circuit/step-up chopper circuit and measurement of on-time, off-time, output voltage.	Identification of components, Draw circuits, construct circuit, record input and output voltages, draw graphs and perform calculations wherever necessary, write results and conclusions

Skill Enhancement Course: SEC-III

Course Title: Linear Circuit Designing **Course Code: DCEPII**

Course Units	Course Outcome
I: Designing of simple circuits	Designing buffer circuit to interface LED with computer/microprocessor or to any instrument, waveform clipper, waveform clamper, single stage CE amplifier
II: Regulated Power Supply	Designing and construction of regulated power supply of given rating, use of fixed voltage regulator chips, determination of load regulation and line regulation of given power supply, Colpitt's oscillator, Phase-shift oscillator

Paper Title: Basic Digital Electronics P:II **Course Code**: **CCEI-B**

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Number Systems and Codes**	Decimal, Binary Octal and Hexadecimal number systems, inter conversions of number systems, Binary arithmetic (addition, subtraction, multiplication, division), 1's compliment, 2's compliment, binary subtraction using 1's and 2's compliments, Codes: BCD, Gray code, Conversion of BCD to Binary, Binary to Gray code and vice versa, ASCII code	Perform inter conversion of number systems, binary arithmetic and inter conversion of codes
II	**Logic Gates**	Positive logic, Negative logic, Definition, symbol and truth table of NOT, OR, AND, NOR, EX-OR,EX-NOR gates. De-Morgan's theorem, Universal properties of NAND and NOR gates, bubbled ORgate, bubbled AND gate, gate propagation delay time, power dissipation	Identify different types of Logic Gates along with their properties
III	**Boolean Algebra and K-Map**	Boolean operations, logic expressions, rules and laws of Boolean algebra, Simplification of Boolean expression, SOP & POS form of Boolean expressions for logic network minterms, maxterms, Simplification of Boolean expression using K-map up to 4 variables for SOP.	Simplify Boolean Expression
IV	**Arithmetic Circuits**	Half Adder, full adder, realization of half and full adder using gates, parallel binary adder, half and full subtractor.	Construct Arithmetic Circuits

Paper:Digital Logic Circuits P:IV **Course Code: CCE-IIB**

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Data Processing Circuits**	Introduction to multiplexers, designing of 2:1 MUX, 4:1 MUX, and 8:1 MUX, introduction to demultiplexers, designing of 2:1 DMUX, 4:1 DMUX, and 8:1 DMUX, Encoders: decimal to BCD encoder, priority encoder, Decoders: BCD to decimal decoder, BCD to seven segment decoder.	Construct Data Processing circuits
II	**Flip- Flops**	1-bit memory cell, S-R flip-flop, clocked S-R flip-flop, preset and clear facility in flip–flop, J–K flipflop, race around condition, master-slave JK Flip Flop, D-type and T-type flip flop.	Identify and use different types of Flip Flops
III	**Sequential logic circuit**	Concept of counters, types of counters, modulo of counter, 2-bit, 3-bit and 4-bit asynchronous counters, 2-bit, 3-bit and 4-bit synchronous counters, mod-5counter, decade counter using IC 7490, ring counter, shift registers: SISO, SIPO, PISO, PIPO.	Construct sequential logic circuits
IV	**Data Converters**	D to A converters: R-2R Ladder DAC, characteristics of DAC, resolution, linearity, accuracy, settling time. A to D converters: parallel comparator ADC, successive approximation ADC, Characteristics of ADC: resolution, conversion time,	Construct Data Converter Circuits

		quantization error	

Paper Title:Amplifiers, Oscillators &Multivibrators (P-VI)Course Code: CCE III (Section A)

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Load Lines And DC Bias Circuits**	DC Load line, Q-Point and Maximum Undistorted Output, Need for Biasing a Transistor, Factors Affecting Bias Variations, Stability factor, Beta Sensitivity, Stability Factor for CB and CE Circuits, Base Bias with Emitter Feedback, Base Bias with Collector Feedback, Base Bias with Collector and Emitter Feedback, Voltage Divider Bias, Load Line and output Characteristics, AC Load line, (Numerical Problems)	Identify different Biasing circuits along with their parameters
II	**Small Signal Amplifiers**	h-parameters, An equivalent circuit for the BJT, Transconductance Model, Analysis of CE Amplifier, CB Amplifier, CC Amplifier using h-parameters, Gain in decibels (Numerical Problems)	Construct different configurations of Transistor Amplifier
III	**Sine Wave Oscillators**	Introduction to Positive and Negative Feedback, Requirement of an Oscillator, Barkhausen Criterion, Hartley Oscillator, Colpitt's Oscillator, R-C Network, Phase Shift Oscillator, Wien Bridge Oscillator (Circuit diagram, Working, Expression of Frequency and Condition for Oscillations) (Numerical Problems)	Identify and Classify Oscillators
IV	**Multivibrators And Sweep Circuits**	Transistor as a Switch, Transistorized AstableMultivibrator, Transistorized MonostableMultivibrator, Transistorized BistableMultivibrator (working and waveforms), Introduction to Sweep Circuits, Sweep Voltage Waveforms, Exponential Sweep, RC Ramp Generator, (Numerical Problems)	Construct Multi-Vibrator and Sweep Circuits

Paper Title:Op-Amp, It's Applications & Some specialized ICs (P-VIII)

Course Code:CCE IV (Section A)

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Operational Amplifier**	Theory of Differential Amplifier, Block Diagram of Op-Amp, Schematic Symbol, Ideal Characteristics, Input Offset Voltage, Input Offset Current, Input Bias Current, Input Impedance, Output Impedance, Open Loop Gain, CMRR, Slew Rate, Numerical Problems	Identify and List different Parameters of Operational Amplifier
II	**Applications of Operational Amplifier**	Inverting Amplifier, Non-inverting Amplifier, Op-Amp as Adder, Op-amp as Subtractor, OpAmp as Integrator, Op-Amp as Differentiator, Op-Amp as Comparator, Op-Amp as Schmitt's Trigger, Solving Differential Equation, Numerical Problems	Construct Arithmetic Circuits Using OP-Amp
III	**Active Filters**	Introduction, First Order Low-Pass Butterworth Filter, Second Order Low-Pass Butterworth Filter, First Order High-Pass Butterworth Filter, Second Order High-Pass Butterworth Filter, Numerical Problems	Identify Use of Op-Amp in Active Filters
IV	**Specialized ICs**	Block Diagram of IC555, IC 555 as AstableMultivibrator, IC555 as MonostableMultivibrator, IC566 (Pin Diagram, Block Diagram and Use as VCO), Numerical Problems	Construct Multi-vibrators Using IC 555 and 566

Paper Title:X- Practical Practical's based on P-VI & P-VIII

Course Code:CCEP II

Unit Number	Unit Name	Topics/Experiment	Unit-wise Outcome
I	**Group I** **Op-Amp Experiments**	1. Op-Amp as Inverting Amplifier (DC Gain Verification) 2. Op-Amp as Non-inverting Amplifier(DC Gain Verification) 3. Op-Amp as Inverting Amplifier (Study of Frequency Response, Gain & -3db Band Width) 4. Op-Amp as Non-inverting Amplifier (Study of Frequency Response, Gain & -3db Band Width) 5. Op-Amp as Adder 6. Op-Amp as Subtractor 7. Op-Amp as Integrator 8. Op-Amp as Schmitt's Trigger 9. Op-Amp as Comparator 10. Op-amp as Analog Computer 11. IC555 Timer as AstableMultivibrator (Measurement of Pulse Width , Space Width, Time Period, Frequency and Mark to Space Ratio) 12. VCO using IC566 (	Draw circuit diagram, Construct the circuit and record input and output voltages

		Measurement of Frequency with Change in Control Voltage)	
II	**Group II** **Amplifier and Oscillator Experiments**	13. Study of Transistorized CE Amplifier (Frequency Response, Gain & -3db Band Width) 14. TranstorizedHartely oscillator (Measurement of Frequency and Amplitude of Waveforms) 15. TranstorizedColpitt's Oscillator (Measurement of Frequency and Amplitude of Waveforms) 16. Transtorized Phase Shift Oscillator (Measurement of Frequency and Amplitude of Waveforms) 17. Wein Bridge Oscillator using Op-Amp (Measurement of Frequency and Amplitude of Waveforms) 7 18. Transistorized AstableMultivibrator.(Measurement of Pulse Width, Space Width, Time Period, Frequency and Duty Cycle) 19. Transistorized Mono stable multivibrator (Measurement of Gate Width) 20. Transistorized BistableMultivibrator 21. RC Ramp Generator using Transistor. (Measurement of Rise Time, Fall Time and Frequency)	Draw circuit diagram, Construct the circuit and record input and output waveforms

Paper Title:XI- Practical Based On Papers VII And IX **Course Code: CCEP III**

Unit Number	Unit Name	Topics/Experiment	Unit-wise Outcome
I	**Microprocessor Coding Experiments**	1. ALP to Transfer a block of data from one location to another location 2. ALP for addition of two byte and result 8-bit 3. ALP for addition of two byte and result 16-bit numbers 4. ALP for subtraction of two bytes 5. ALP for decimal addition of 8 bit numbers 6. ALP for 1's complement of 8-bit and 16-bit numbers 7. ALP to find 2's complement of 8-bit and 16-bit numbers 8. ALP for shifting of 8-bit number: a. Left by one bit position b. Left by two bit position 9. ALP to find sum of series of 8-bit numbers 10. ALP to find multiplication of two 8-bit numbers 11. ALP to find division of two 8-bit numbers 12. ALP for masking off: a. Four LSBs of 8-bit numbers	Draw Flow Chart, write Assembly Language Program, and Execute it using Microprocessor Trainer Kit

		b. Four MSBs of 8-bit numbers 13. ALP to find smallest number of the series 14. ALP to find largest number of the series 15. ALP to generate square wave using IC 8255. Determine frequency 16. Interfacing of 7-segment display with 8085 using IC 8255	

Paper Title: Physics Workshop SkillSEC I **Course Code:CCESI (Section A)**

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Measurement Skill**	Measuring units, conversion to SI and CGS. Familiarization with meter scale, verniercaliper, Screw gauge and their utility. Measure the dimension of solid bulk, volume of cylindrical beaker / glass, diameter of thin wire, thickness of metal sheet etc.	Determine Least Count of VernierCaliper, Screw Guage and volume of glass.
II	**Electric and Electronic Skill**	Use of multi-meter, soldering of electrical circuits having discrete components (R, L, C, diode) and ICS on PCB. Operation of oscilloscope. Making regulated power supply. Timer circuit, electronic switch using transistor and relay.	Measure time period, frequency using CRO and Construct regulated poer supply.

Paper Title:Communication Electronics-I (P-XII) **Course Code:DECE-I (Section A)**

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Basics of Communication Systems**	Introduction, Block diagram of Communication System, Classification of Communication Systems: Direction, Nature of signal and Technique of transmission, Need for Modulation, Types of Modulation, Bandwidth. (Numerical Problems)	Classify modulation and Communication System
II	**Amplitude Modulation**	Amplitude Modulation Theory, Mathematical representation of AM wave, Modulation index, Frequency spectrum of AM wave, Bandwidth of AM, Power relations in AM wave, AM circuits: Basic circuit for BJT Collector modulation, Amplitude demodulator circuit. (Numerical Problems)	Illustrate Amplitude Modulation
III	**Frequency Modulation**	Theory of Frequency modulation, Mathematical Representation of FM wave, Band width,Generation of FM, Direct method for FM generation, Transistor reactance modulator, Varactor reactance modulator. (Numerical Problems)	Illustrate Frequency Modulation
IV	**Pulse Modulation**	Introduction, Classification of Pulse modulation systems, Sampling theorem, Nyquist criteria, Basic principles of Pulse-Amplitude modulation (PAM), Pulse-Width modulation(PWM), Pulse-Position modulation (PPM),Generation and detection of PAM only, Digital pulse modulation: Pulse-Code modulation (PCM) PCM transmitter, PCM receiver and quantization process, quantization error, application, advantages and disadvantages of PCM. (Numerical	Illustrate Pulse Modulation

		Problems)	

Paper Title:Communication Electronics-II (P-XIV) **Course Code: DECE-II (Section A)**

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Radio Receivers**	Introduction, Basic block diagram of communication receiver, Tuned Radio Frequency (TRF) Receiver, Super Heterodyne Receiver, Characteristics of Radio receivers, Sensitivity, Selectivity, Fidelity, Image frequency and its rejection, Double spotting. (Numerical Problems)	Illustrate Radio Receiver and its characteristics
II	**Microwaves & Radar Systems**	Introduction to microwave properties and applications of microwaves, Basic principles of radar system, Block diagram of basic pulsed radar system, Radar range equation, Moving target indication, CW Doppler radar. (Numerical Problems)	Identify properties of microwaves and Radar System
III	**Introduction to Mobile Communication**	Historical perspectives, Cellular Systems, Third Generation (3G) Systems, Fourth-Generation (4G) Systems.	Illustrate Generations of Mobile Communication
IV	**Introduction to Optical Fibres**	Fibre Optics, Structure of Optical Fibres, Classification of Optical Fibres, Propagation of Light, Refraction and Snell's law, Total Internal Reflection, Light Propagation through an Optical Fibre, Acceptance Angle and Numerical Aperture, Dispersion, Intermodal Dispersion, Fibre Characteristics, Fibre Losses, Calculation of Losses, Choice of Wavelength, Fibre Optic Communications, Applications of Fibre Optic Communication, Advantages of Optic Fibres, Disadvantages of Optic Fibres.(Numerical Problems)	Illustrate Fibre Optic Communication

Paper Title:Programming Skill in 'C' **Course Code:SEC-IV(B)**

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Fundamentals of C**	Introduction, Character set, 'C' Tokens, Keywords & Identifiers, Data types, Constant, Variables, Operators- Arithmetic, logical, relational, assignment, increment, decrement, conditional. Input/Output Statement, Structure of C program. Decision & looping, control structure: Statements - If, If-Else statement, Nested If-Else, Switch. Entry and exit controlled loops – While, Do-While and For loop.	Write simple programs in C using control structures
II	**Arrays and Functions**	Introduction to Array, One-dimensional arrays: Declaration & Initialization, Two dimensional arrays: Declaration & Initialization, Functions: Definition of function, function with arguments and without arguments, Strings in 'C', Standard Library string functions: strlen(), strcpy(),strcmp(), strcat().	Write simple programs in C using Arrays and Functions