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 optional subjects**

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, data converters, 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 waveform by using CRO. 6. Verification of Thevenin's theorem. 7. Study of Maximum power transfer theorem and determination of internal resistance of a 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- Microprocessor and Its Applications **Course Code: CCEIII-B**

Course Units	Course Outcome
I: Architecture of 8085 Microprocessor	Knowledge of features, functional pin diagram, internal blocks and their functions.
II: Instruction set of 8085	Understanding of complete instruction set of 8085, their format and addressing modes
III: Programming of 8085	Understanding of instructions through ALP examples, ALP programming skill, hardware and software interrupts with 8085
IV: 8255 and Its Applications	Functional pin diagram, internal block diagram and features of 8255, control; word and operating modes

Course Title: IX-Introduction to Microcontroller Intel 8051 **Course Code: CCEIV-B**

Course Units	Course Outcome
I: Microcontroller Intel 8051	Knowledge of difference between microcontroller and microprocessor, features of 8051, pin diagram, internal block diagram, internal structure of RAM
II: Instruction set of Microcontroller 8051	Classification, syntax and addressing modes of 8051 instructions.
III: Assembly Language Programming	ALP, syntax, writing ALPs for a given task.
IV: SFRs, Timers & Interrupts of 8051	Structure and uses of SFRs, TMOD, TCON registers, programming of timers, interrupts with 8051.

Skill Enhancement Course: SEC-II

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

Course Units	Course Outcome
I: Simple Circuits	R, L, C in series and parallel, troubleshooting in series and parallel circuits, star/delta and delta/star transformations.
II: AC Circuits	Frequency response of RC, RL circuits, knowledge of LCR band pass filter, band reject filter, concept of band width.

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 OR gate, 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, quantization error	Construct Data Converter Circuits

Paper Title: Amplifiers (P-VI) **Course Code: CCE III (Section A)**

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Transistor Biasing**	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 (Numerical Problems)	Identify different Biasing circuits along with their parameters
II	**Signal Amplifiers**	h-parameters, An equivalent circuit for the BJT, Transconductance Model, Analysis of CE Amplifier, CB Amplifier, CC Amplifier using h-parameters (Numerical Problems)	Construct different configurations of Transistor Amplifier
III	**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, Inverting Amplifier, Non-inverting Amplifier, Numerical Problems	Identify and List different Parameters of Operational Amplifier
IV	**Applications of OpAmp**	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, voltage to current converter and current to voltage converter, Numerical Problems	Construct Arithmetic Circuits Using OP-Amp

Paper Title: Oscillators and Multivibrators (P-VIII) **Course Code: CCE IV (Section A)**

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Feedback Principles**	Concept of positive and negative feedback, advantages and disadvantages of negative feedback, gain stability, increased bandwidth, decreased distortion, decreased noise. (Numerical Examples)	Construct feedback circuits
II	**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
III	**Multivibrators**	Transistor as a Switch, Transistorized Astable Multivibrator, Transistorized Monostable Multivibrator, Transistorized Bistable Multivibrator (working and waveforms), Schmitts trigger, Block Diagram of IC555, IC555 as Monostable Multivibrator	Construct Multi-Vibrator and Sweep Circuits
IV	**Time base circuits**	Introduction, types of time base circuits, methods of generating time base waveforms, exponential sweep circuit, sweep circuit using transistor switch, sweep circuit using UJT, transistor constant current sweep, Miller sweep circuit, bootstrap sweep circuit. (Numerical Examples)	Construct time base circuits

Paper Title P-X: Practical's based on P-VI & P-VIII **Course Code: CCEP II**

Unit Number	Unit Name	Topics/Experiment	Unit-wise Outcome
I	**Group I**	1. Design voltage divider bias circuit for CE amplifier with centred-Q. Measure it gain at 2 KHz frequency signal. 2. Design single stage C-E amplifier with gain A = 20. Study its frequency response. 3. Design and study Emitter follower (CC amplifier) circuit and determine its output impedance. 4. Design and study inverting amplifier using Op-Amp. 5. Design and study non-inverting amplifier using Op-Amp. 6. Study frequency response of Op-Amp inverting/non-inverting amplifier. 7. Study OP-Amp as an Adder. 8. Study OP-Amp as an Integrator. 9. Study OP-Amp as Schmitt's Trigger 10. Study OP-Amp as Subtractor.	Draw circuit diagram, Construct the circuit and record input and output voltages
II	**Group II**	1. Construct and study transistorised Hartley oscillator. 2. Construct and study transistorised Colpitt's oscillator. 3. Construct and study transistorised Phase shift oscillator.	Draw circuit diagram, Construct the circuit and record input and output waveforms

		4. Construct and test Wein bridge oscillator using Op-Amp. 5. Design and build transistorised astable mutivibrator of given pulse width and space width. 6. Design and study transistorised monostable mutivibrator of given gate width. 7. Construct and study transistorised bistable mutivibrator. Use manual triggering to test. 8. Design and build transistorised monostable mutivibrator using IC 555. Measure its gate width. 9. Construct and study UJT time base circuit. 10. Construct and study constant current ramp generator. Measure its rise time and fall time	

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

Unit Number	Unit Name	Topics/Experiment	Unit-wise Outcome
I	**Group I** **Microprocessor Intel 8085**	1. ALP for addition of two bytes, result 8-bit. 2. ALP for addition of two bytes, result 16-bit. 3. ALP for subtraction of two bytes. 4. ALP to find 2's complement of 8-bit and 16-bit numbers 5. ALP for masking off: a) Four LSBs of given 8-bit number. b) Four MSBs of given 8-bit number. 6. ALP to transfer a block of data. 7. ALP to find sum of a series of 8-bit numbers. 8. ALP to find smallest/largest number of a given series. 9. ALP to generate square wave using IC 8255	Draw Flow Chart, write Assembly Language Program, and Execute it using Microprocessor Trainer Kit
II	**Group II : For Microcontroller Intel 8051**	1. ALP to add two 8-bit numbers. 2. ALP to add two 16-bit numbers. 3. ALP to subtract two 8-bit numbers. 4. ALP to multiply two 8-bit numbers. 5. ALP to divide two 8-bit numbers.	Draw Flow Chart, write Assembly Language Program, and Execute it using Microcontroller Trainer Kit

		6. ALP to find 2's complement of an 8-bit number. 7. ALP to find 1's complement of a 16-bit number. 8. ALP to logically AND/OR/XOR two 8-bit numbers. 9. ALP to convert an 8-bit Binary number to Gray. 10. ALP to convert an 8-bit Gray number to Binary. 11. ALP to determine sum of a series of 8-bit numbers. 12. ALP to move a block of data	

Paper Title: Electronics Lab Skill SEC I **Course Code: CCESI (Section A)**

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Study of Basic Components**	Study of resistor, capacitor, inductor, thermistor and LDR	Identify and measure values various components
II	**Meters & Instruments**	Analog multimeter: Front panel, functions, various ranges, sensitivity and handling precautions. Signal Generators: Front panel controls, functions, features, output impedance and handling precautions. CRO: Front panel controls, functions, features, maximum frequency limit, minimum and maximum voltage measurements and handling precautions. Digital LCR meter: Front panel controls, functions, features or ranges and handling precautions.	Measure resistance, voltage using analog meter Measure time period, frequency using CRO and digital LCR meter

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 Problems)	Illustrate Pulse Modulation

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: Digital Logic Design (DLD) **Course Code:SEC-IV(A)**

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Combinational and Sequential Logic Design**	Combinational Logic Design: Overview of Logic Gates and Boolean Algebra, Forms of logic representation: SOP form, POS form, Truth table, Minterm form, Maxterm form, Logic diagram and their interconversions, Methods Logic Implementation: AOI, NAND, and NOR and their interconversions, Techniques of Minimization of Logic Expressions: K-Map Technique, QuineMcCluskey method, Exercises of Combinational logic Design. Sequential Logic Design: Overview of Flip flops, Counters and Shift registers, Exercises of Sequential logic Design	Convert one form of logic into other forms Convert AOI implementation into NAND implementation Convert AOI implementation into NOR implementation Minimize a logic expression using K-Map techniques
II	**Programmable Logic Devices (PLDs)**	Introduction, Simple PLDs (SPLDs), Programmable Logic Array (PLA), Programmable Array Logic (PAL), Generic Array Logic (GAL), Complex PLDs (CPLDs), Field Programmable Gate Arrays (FPGAs)	Implement PLA and PAL