# Kurukshetra University, Kurukshetra

**Scheme of Examination and Syllabus for Undergraduate Programme**
**Under**
**(Multiple Entry-Exit, Internship and CBCS-LOCF) NEP w.e.f 2023-24**

## Course: Electronics

| Semester | Course | Paper No. | Nomenclature of paper | Credits | Internal marks | End Term Marks | Total | Duration of Exam. |
|---|---|---|---|---|---|---|---|---|
| III | CC-3 | B-ELE-N301 | Op-amp and Linear Integrated Circuits | 2 | 25 | 25 | 50 | 3 hours |
| | | B-ELE-N302 | Combinational and Sequential Circuits | 2 | 25 | 25 | 50 | 3 hours |
| | | B-ELE-N303 | Practical -III | 2 | 25 | 25 | 50 | 3 hours |
| IV | CC-4 | B-ELE-N401 | Sinusoidal Oscillators and Multivibrators | 2 | 25 | 25 | 50 | 3 hours |
| | | B-ELE-N402 | Advanced Digital Electronics | 2 | 25 | 25 | 50 | 3 hours |
| | | B-ELE-N403 | Practical -IV | 2 | 25 | 25 | 50 | 3 hours |
| | | | | | | | | |

**Instructions for the Examiners**

1. Syllabus in each Theory Paper in each semester is divided in 4 units.
   i. A student is required to attempt 5 questions in all.
   ii. Question No 1 is compulsory, consisting of short answer type questions based on all the 4 units.
   iii. Two questions will be set from each unit. A student is required to attempt one question from each unit.
   iv. All questions carry equal marks.
2. Use of scientific calculator is permissible.
   i. Instructions should be imparted using SI system of units. Familiarity with CGS system of units should also be ensured.
3. Distribution of Marks: 25*+25*.
   Each theory question paper will be of 25 marks of 3 hours duration and 25 marks in each theory paper are to be awarded through internal assessment in each semester.
4. Work load – two hours per week per theory paper.
5. Practical classes to be conducted during odd as well as even semester.
6. The Practical examination will be held at the end of each semester in one sitting of 3 hours.
7. A candidate is required to perform minimum 6 experiments out of the list provided during course of study in each semester.
8. Distribution of Marks: 25*+25*
   Each practical examination in each semester will be of 25marks of 3 hours duration and 25 marks in each practical paper are to be awarded through internal assessment in each semester.
9. Maximum 10 students in one group of practical during course of study and also in examination.

**Note: Each credit equals one hour/week for theory teaching load.**

**Each credit equals two hours/week for practical teaching load.**

## Programme Outcomes (POs) for UG Programme

## (Course: Electronics)

| | | |
|---|---|---|
| PO1 | Knowledge | Capable of demonstrating comprehensive disciplinary knowledge gained during course of study |
| PO2 | Communication | Ability to communicate effectively on general and scientific topics with the scientific community and with society at large |
| PO3 | Problem Solving | Capability of applying knowledge to solve scientific and other problems |
| PO4 | Individual and Team Work | Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings' |
| PO5 | Investigation of Problems | Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions |
| PO6 | Modern Tool usage | Ability to use and learn techniques, skills and modern tools for scientific practices |
| PO7 | Science and Society | Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices |
| PO8 | Life-Long Learning | Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life |
| PO9 | Environment and Sustainability | Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development. |
| PO10 | Ethics | Apply ethical principles and professional responsibilities in scientific practices |
| PO11 | Project Management | Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects |

## Programme Specific Outcomes (PSOs) for UG Programme

## (Course: Electronics)

| | |
|---|---|
| PSO1 | Students will be able to acquire the basic understanding of the electronic components, principles, working and applications of the electronic devices. |
| PSO2 | Explore technical knowledge in diverse areas of Electronics and experience an environment conducive in cultivating skills for successful career, entrepreneurship and higher studies. |
| PSO3 | Students will acquire experimental skills, research aptitude in the area of electronics that will make them capable of contributing to the academic as well as industrial growth of the country. |

# Semester-III
# CC-3
# Paper No: -B-ELE-N301
# Op-amp and Linear Integrated Circuits

**Credits: 2**
**Total Marks: 50**
**Internal Assessment: 25**
**End Term Exam: 25**
**End term examination time: 3 hours**

**Course Objective:** The objectives of teaching this paper are

1. To make the students familiar with operational amplifier.
2. To acquaint the students with basic differential amplifier and their applications.
3. To make the students familiar with instrumentation amplifier and active filters.
4. To understand the working principle of various regulated power supplies and their applications.

**Course Outcome**: After the end of this paper, the students will be able

1. To know internal circuit of operational amplifier and its different configurations.
2. To know the applications of operational amplifier to perform different operations.
3. To understand applications of operational amplifier and active filters using op-amp.
4. To understand the principle of regulated power supply and various regulated power supply used in electronic equipments.

**Mapping of Course Outcomes to Program Outcomes:**

| *CO's* | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |

## Unit-I

**Operational Amplifier- I:**

Ideal operational amplifier, Op-amp internal circuit (Emitter Coupled Differential amplifier, level translator, output stage), Use of Current Mirror as Constant Current Source, Op-amp as Inverting Amplifier, Non-inverting amplifier, Differential Amplifier, CMRR, Voltage follower.

## Unit-II

**Operational Amplifier- II:**

Practical Op-Amp : Input Offset Voltages, input bias Current, input offset current, thermal drift, effect of error sources, summing amplifier, subtractor, Integrator, Differentiator circuit, Log and Antilog Amplifier, Divider and Multiplier.

## Unit-III

**Operational Amplifier- III:**

Instrumentation Amplifier, current to Voltage converter, Voltage to current converter, sample & hold circuit, First-Order Active Filters: Low-pass, High-pass, Bandpass, Band reject.

## Unit-IV

**Regulated Power Supply:**

Principle of voltage regulation, Zener diode shunt regulator, BJT shunt regulator and BJT series voltage regulator, power supply regulation using op-amp, load regulation, short circuit protection, current regulation using operational amplifier, Block Diagram of three terminal IC regulator (78xx, 79xx), Boosted power supply.

**Reference Books:**


1. Electronics for Scientist & Engineers by Vishwanathan, Mehta
2. Op-amp and Linear Integrated Circuit by Ramakant A Gayakward
3. Integrated Electronics by Millman & Halkias
4. Electronic Devices and Circuits Discrete and Integrated by Y N Bapat.
5. Linear Integrated Circuits by D. Roy Choudhury, Shail B. Jain.

# Semester-III
# CC-3
# B-ELE-N302
# Combinational and Sequential Circuits

**Credits: 2**
**Total Marks: 50**
**Internal Assessment: 25**
**End Term Exam: 25**
**End term examination time: 3 hours**

**Course Objective:** The objectives of teaching this paper are

1. To make the students familiar with various combinational and sequential circuits.
2. To acquaint the students with various types of counters and registers.

**Course Outcome**: After the end of this paper, the students will be able

1. To design various combinational circuits used for many applications in digital system.
2. To understand various sequential circuits used for many applications in digital system.
3. To design any counter circuit for a specific use.
4. To understand various types of registers and the applications of registers to store the digital data.

**Mapping of Course Outcomes to Program Outcomes:**

| *CO's* | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |

**UNIT -I**

**Combinational Circuits**: Multiplexers, De multiplexer, Decoder, Encoder, Parity bit generator and checker, Code Converter: BCD to Seven Segment, BCD to Cyclic Code, Binary to Decimal, Binary to Gray, Binary to Excess-3, Application of combinational circuit: adder circuit using Multiplexers, Boolean expression implementation using Multiplexer, Boolean expression implementation using Demultiplexer

**UNIT -II**

**Sequential Circuits**: Basic Sequential circuit, Asynchronous and Synchronous circuits, RS FF and JK Flip Flop, Race Around Condition, Master Slave JK flip flop, T and D Flip Flop, Excitation Table, Conversion of Flip Flop, State Diagram.

**UNIT -III**

**Counters:** Asynchronous Binary Counters, Asynchronous Mod-N Counter, Synchronous counter: Design principle of Modulo- N Counters, UP-Down counters, Decade Counter, BCD Counter.

**Unit IV**

**Registers:** Shift Registers, Serial-in serial out (SISO), Serial-in-parallel out (SIPO), parallel-in-serial-out (PISO) parallel-in-parallel-out (PIPO), Bi-directional shift register, Applications of shift register :Ring counter, Johnson Counter, Time delay, Sequence Generator

**Reference Books:**


1. Digital E1ectronics & Micro computers - R. K. Gaur (4th edition)
2. Modern Digital Electronics - R.P. Jain (4th edition)
3. Digital Principles and Applications by Leach Donald, Malvino AP (6th Edition)
4. Digital fundamentals by R.P. Jain & Floyd.

# Semester-III
# CC-3
# B-ELE-N303
# Practical-III

**Credits: 2**
**Total Marks: 50**
**Internal Assessment: 25**
**End Term Exam: 25**
**End term examination time: 3 hours**

## Course Objectives

The objective of teaching this practical paper is

1. To learn the use of various ICs used in digital and analog circuits.
2. To design various combinational and sequential circuits on bread board using ICs.
3. To learn the functioning of operational amplifier.
4. To Analyze and interpret experimental data.

## Course Outcome

After the end of this paper, the students will be able

1. To implement various combinational and sequential circuits.
2. To implement application oriented circuits using Op-amp IC 741.
3. To present the experimental results and conclusions in the form of written report in clear and concise manner.

**Mapping of Course Outcomes to Program Outcomes:**

| *CO's* | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | 2 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | 2 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | 3 | 3 | 3 | 3 | 2 |

**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.

1. Study of different type of analog and digital IC's: functions, pin diagram, block diagram of 741, 7400, 7402, 7404,7408,7432,7474,7476,7490,74153,74155.
2. Operational amplifier as (1) Unity gain buffer (2) Inverting amplifier (3) Non-inverting amplifier.
3. Operational amplifier as: (1) Summing amplifier (2) Difference amplifier.
4. Measurement of offset voltage, bias currents & CMRR of an operational amplifier.
5. To design a Schmitt Trigger circuit using Operational Amplifier.
6. Study and design of an integrating circuit using op-amp IC 741.
7. To study a 4:1 Multiplexer.
8. To study a 1:4 De- Multiplexer.
9. Code Converter.
10. To verify the functionality of J-K , D and T Flip-Flops using 7400 and 7476 ICs.
11. Ripple Binary Counter
12. MOD-N Counter (Synch/Asynch)
13. Up-Down Counter (Synch/Asynch)

# Semester-IV
# CC-4
# B-ELE-N401
# Sinusoidal Oscillators and Multivibrators

**Credits: 2**
**Total Marks: 50**
**Internal Assessment: 25**
**End Term Exam: 25**
**End term examination time: 3 hours**

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with classification of amplifiers and feedback concept.
2. To make the students familiar with various amplifiers and their efficiency.
3. To acquaint the students with the design concepts of oscillators and multivibrators.

**Course Outcome**: After the end of this paper, the students will be able

1. To use the feedback concept as per the requirement of the circuit.
2. To understand various types of amplifiers and their applications.
3. To use oscillators in various applications depending on frequency.
4. To use multivibrators in various applications depending on frequency and shape of waveforms.

**Mapping of Course Outcomes to Program Outcomes:**

| *CO's* | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |

## Unit-I

**Amplifiers & Feedback:** Classification of Amplifiers (voltage, current, Transconductance, Transresistance amplifier), Feedback concept, calculation of transfer gain in degenerative and regenerative feedbacks, Feedback topologies, Effect of negative feedback on gain, Non-linear distortion, Frequency response, Effect of negative voltage shunt feedback on in put and output resistance, Effect of negative voltage series feedback on input and output resistance, Effect of negative current shunt feedback on input and output resistance, Effect of negative current series feedback on input and output resistance.

## Unit-II

**Power Amplifiers**: Basic Circuit and working only of: Class A large scale amplifier, push pull amplifier, transformer coupled amplifier, Class B amplifier, Class AB amplifier, Darlington-pair, efficiency.

## Unit-III

**Oscillators:** Principle of oscillations, condition for sustained oscillation (Barkhausen criterion), stability of oscillator, Principle, working and frequency calculation of RF oscillators (Hartley oscillator, Colpitts oscillator, crystal oscillator) and AF Oscillators (Wien Bridge oscillator, R-C Phase-shift oscillator)

## Unit- IV

**Multivibrators:** Astable Multivibrator, Bistable Multivibrator, Monostable Multivibrator using BJT, Silicon controlled Rectifier (SCR), Triac, Diac, Triangular waveform generator, Schmitt Trigger, 555 Timer: Block diagram of 555 and its application as Astable&MonostableMultivibrator.

**Reference Books:**


1. Basic Electronics Solid state by B.L. Theraja.
2. Opamp and linear circuits by Ramakant A Gayakward.
3. Electronics for Scientist & Engineers by Vishvanathan& Mehta.

# Semester-IV
# CC-4
# B-ELE-N402
# Advance Digital Electronics

**Credits: 2**
**Total Marks: 50**
**Internal Assessment: 25**
**End Term Exam: 25**
**End term examination time: 3 hours**

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with Digital to analog conversion and analog to digital conversion.
2. To make the students familiar with various memory and their parameters.
3. To acquaint the students with the design concepts of Programmable Logic devices.

**Course Outcome**: After the end of this paper, the students will be able

1. To use the DAC as per the requirement of the circuit.
2. To use the ADC as per the requirement of the circuit.
3. To understand various types of memory and their applications.
4. To understand and implement different types of digital electronic circuits using programmable logic devices and FPGA.

**Mapping of Course Outcomes to Program Outcomes:**

| *CO's* | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | -- | 3 | 3 | 3 | 2 |

**Unit -I**

**Digital to Analog conversion:** DAC conversion, Types of DAC conversion, Weighted Resistor Type DAC, R-2R Ladder Type DAC, The Switched Current source type DAC, The Switched Capacitor type DAC, DAC accuracy and resolution

**Unit II**

**Analog to Digital Conversion:** ADC conversion, Types of ADC conversion, The Counter Type ADC, The Tracking type ADC, Flash type ADC, The Successive Approximation ADC, ADC accuracy and resolution

**Unit III**

**Memories:** Parameters of memory**,** Volatile and non volatile memories, Memory organization & operation, ROM, PROM, EPROM, EEPROM, RAM (Static and dynamic), Expanding the size of memory, Content addressable memory/ associative memory,

**Unit IV**

**Programmable Logic Devices (PLDs):**Introduction, ROM as a PLD, Programmable Logic Array(PLA), Programmable Array Logic(PAL), Features of PLD, Complex Programmable Logic Devices(CPLDs), Field Programmable Gate Array(FPGA).

**Reference Books:**


1. Modern Digital Electronics - R.P. Jain
2. Digital Principles and Applications by Leach Donald, Malvino AP (6 th Edition)

# Semester-IV

## CC-4

### B-ELE-N403

### Practical-IV

**Credits: 2**
**Total Marks: 50**
**Internal Assessment: 25**
**End Term Exam: 25**
**End term examination time: 3 hours**

**Course Objectives**

The objective of teaching this practical paper is

1. To learn the use of various ICs used in digital and analog circuits.
2. To design various oscillators and DAC circuits on bread board using ICs.
3. To learn the functioning of oscillators and multivibrators.
4. To Analyze and interpret experimental data.

**Course Outcome**

After the end of this paper, the students will be able

1. To design various low frequency and high frequency oscillator circuits.
2. To implement application oriented circuits using timer IC 555.
3. To implement DAC and analyse its characteristics.
4. To present the experimental results and conclusions in the form of written report in clear and concise manner.

**Mapping of Course Outcomes to Program Outcomes:**

| *CO's* | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | 2 | 3 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | 2 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | -- | -- | 2 | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 2 | 3 | 3 | | | 3 | 3 | 3 | 3 | 3 |

**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.

**1.** Study of different type of analog and digital IC's: functions, pin diagram, block diagram of 555, 7476,4001,4011,4081,4071,4077,4009.
2. To study the design of Hartley oscillator & measure its frequency.
3. To study the design of Colpitt's oscillator & measure its frequency.
4. To study the design of Phase shift oscillator & measure its frequency.
5. To study the design of Wein bridge oscillator & measure its frequency.
6. To study and design Astablemultivibrator using IC 555.
7. To study and design Monostable multi vibrator using IC 555.
8. To design a transistorized astablemultivibrator and measure its frequency.
9. Study of characteristic of UJT.
10. To design saw tooth wave generator using UJT.
11. To design a 4-bit weighted type DAC and measure its resolution.
12. To design a 4-bit ladder type DAC and measure its resolution.