B.Sc. ELECTRONICS 3rd SEMESTER

(CBCS)

Courses of Study

SNo.	Course Code	Title	Credits
1	**UELTC301**	**DIGITAL ELECTRONICS**	4
2	**UELPC302**	**DIGITAL CIRCUIT LAB**	2
3	**UELTS303**	**RENEWABLE ENERGY AND ENERGY HARVESTING (Skill Enhancement Course)**	4

B.Sc. ELECTRONICS 4th SEMESTER

(CBCS)

Courses of Study

SNo.	Course Code	Title	Credits
1	**UELTC401**	**LINEAR INTEGRATED CIRCUITS**	4
2	**UELPC402**	**LINEAR INTEGRATED CIRCUIT LAB**	2
3	**UELTS403**	**ELECTRICAL CIRCUITS AND NETWORK SKILLS (Skill Enhancement Course)**	4

SEMESTER III

COURSE CODE:-UELTC301 COURSE TITLE:-DIGITAL ELECTRONICS

Validity: Examinations to be held: December 2017, 2018, 2019

Theory Credits: 04 Hours: 60

External Exam: 80 Marks Internal marks: 20 Total Marks: 100 Duration: 2 ½ hours

Unit I: Number System and Codes: Decimal, Binary, Octal and Hexadecimal number systems, base conversions, representation of signed and unsigned numbers, BCD code, binary, octal and hexadecimal arithmetic; addition, subtraction by 2's complement method, multiplication, logic gates and Boolean algebra: Truth Tables of OR, AND, NOT, NOR, NAND, XOR and XNOR, Universal gates, basic postulates and fundamental theorems of Boolean algebra.

Unit II: Combinational Logic Analysis and Design: Standard representation of logic functions (SOP and POS), minimization techniques (Karnaugh map minimization up to 4-variables for SOP), half and full (adders & subtractors), 4-bit binary adder/subtractor, multiplexers, de-multiplexers, decoders, encoders.

Unit III: Sequential Circuits: SR, D, and JK Flip-Flops, Clocked (Level and Edge Triggered) Flip-Flops, Race-around conditions in JK Flip-Flop Master-slave JK Flip-Flop. Counters: asynchronous and synchronous counters, decade and ring counters

Unit IV Registers and Memories: Registers: serial-in-serial out, serial-in-parallel out, parallel-in-serial out, and parallel-in-parallel out, shift registers: unidirectional and bidirectional; serial addition; ROM, PROM, EPROM, and EEPROM; RAM: static and dynamic.

Unit V: D-A and A-D Converters: 4 bit binary weighted and R-2R D-A converters, accuracy and resolution. A-D conversion characteristics, successive approximation, Dual Slop, Single Slope and Flash ADCs, Counter Method.

Reference Books:

- Digital Principles and Applications, A.P. Malvino, D. P. Leach and Saha, Tata McGraw
- Fundamentals of Digital Circuits, Anand Kumar, PHI Learning Pvt. Ltd.
- Digital Circuits and systems, Venugopal, Tata McGraw Hill.
- Digital Systems: Principles & Applications, R. J. Tocci, N. S. Widmer, PHI Learning.
- Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia
- R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill

NOTE FOR PAPER SETTER

- Each theory paper/ course shall be of 100 marks.
- 20 % of which shall be reserved for internal assessment.
- 80 % of which shall be reserved for external examinations to be conducted by the University/ Colleges.
- The external examinations in theory shall consist of the following:
- Five (5) short answers questions representing all units/syllabi i.e. at least one from each unit (without detailed explanation having 70 to 80 words in approximately 6 minutes and having 3 marks for each answer to the question (**All compulsory**).
- Five (5) medium answers to the questions representing all units/syllabi i.e. at least one from each unit (with explanation having 250 to 300 words in approximately 12 minutes and having 7 marks for each answer to the question (**All compulsory**).
- Four/Five (4/5) long answers to the questions (**two to be attempted**) representing whole of syllabi with detailed analysis/explanation/critical evaluation /solution to the stated problems within 500-600 words in approximately 30 minutes and having 15 marks for each answer to the question.

  Duration of the External Examination: 2 ½ hours only.

DIGITAL CIRCUIT LAB **COURSE CODE:-UELPC302**

Practical Credits: 02 **Hours: 60**

Validity: Examinations to be held: December 2017, 2018, 2019

External Exam: 25 Marks Internal marks: 25 Total Marks: 50 Duration: 2 ½ hours

1. (a) To design a combinational logic system for a specified Truth Table.
   (b) To convert Boolean expression into logic circuit & design it using logic gate ICs.
   (c) To minimize a given logic circuit.
2. Half Adder and Full Adder.
3. Half Subtractor and Full Subtractor.
4. 4 bit binary adder and adder-subtractor using Full adder IC.
5. Encoder/ Decoder
6. Code converter (Binary to Grey code)
7. To design a seven segment decoder.
8. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
9. To build JK Master-slave flip-flop using Flip-Flop ICs
10. To build a Counter using D-type/JK Flip-Flop ICs and study timing diagram.
11. To make a Shift Register (serial-in and serial-out) using D-type/JK Flip-Flop ICs.
12. Two bit binary counter

SEMESTER III

Skill Enhancement Course **COURSE CODE:-UELTS303**

COURSE TITLE:-RENEWABLE ENERGY AND ENERGY HARVESTING

Validity: Examinations to be held: December 2017, 2018, 2019

Theory Credits: 04 **Hours: 60**

External Exam: 80 Marks Internal marks: 20 Total Marks: 100 Duration: 2 ½ hours

The aim of this course is not just to impart theoretical knowledge to the students but to provide them with exposure and hands-on learning wherever possible

Unit I: Fossil fuels and Alternate Sources of energy: Fossil fuels and nuclear energy, their limitations, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.

Unit II: Solar energy: Solar energy, its importance, storage of solar energy, solar pond, non convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PVmodels and equivalent circuits, sun tracking systems.

Unit III: Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies, Ocean Energy Potential against Wind and Solar, Wave Characteristics and statistics, Wave Energy Devices, Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass, Geothermal Resources, Geothermal Technologies, Hydropower resources, hydropower technologies, environmental impact of hydro power sources.

Unit IV: Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modelling piezoelectric generators, Piezoelectric energy harvesting applications, Human power

Unit V: Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent applications, Carbon captured technologies, cell, batteries, power consumption, Environmental issues and Renewable sources of energy, sustainability.

Reference Books:

- Non-conventional energy sources, B.H. Khan, McGraw Hill
- Solar energy, Suhas P Sukhative, Tata McGraw - Hill Publishing Company Ltd.

- Renewable Energy, Power for a sustainable future, Godfrey Boyle, Oxford Univ Press.
- Renewable Energy Sources and Emerging Technologies, Kothari, PHI Learning.
- Solar Energy: Resource Assesment Handbook, P Jayakumar
- J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).

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- Four/Five (4/5) long answers to the questions (**two to be attempted**) representing whole of syllabi with detailed analysis/explanation/critical evaluation /solution to the stated problems within 500-600 words in approximately 30 minutes and having 15 marks for each answer to the question.

  Duration of the External Examination: 2 ½ hours only.

SEMESTER IV

COURSE CODE:-UELTC401 COURSE TITLE:-LINEAR INTEGRATED CIRCUITS

Validity: Examinations to be held: May 2018, 2019, 2020

Theory Credits: 04 Hours: 60

External Exam: 80 Marks Internal marks: 20 Total Marks: 100 Duration: 2 ½ hours

Unit I: Basic information about op-amps, Ideal characteristics Op-amp, General operational amplifier stages, Concept of differential amplifiers, block diagram of an operational amplifier (IC 741), DC and AC performance characteristics, Slew rate, open and closed loop configuration, open loop voltage gain, unity-gain frequency, input resistance, output resistance, input bias current, input offset current, input offset voltage, common mode rejection ratio.

Unit II: Block diagram of feedback configuration, Voltage series feedback amplifier: Closed loop voltage gain, bandwidth, I/P and O/P resistance with feedback; Voltage shunt feedback amplifier: Closed loop voltage gain, bandwidth, I/P and O/P resistance with feedback.

Unit III: Basic application of op-amp: Summing, scaling and averaging amplifier, Subtractor, Instrumentation amplifier, differential input and differential output amplifier, Voltage to Current and Current to Voltage converters, differentiator, integrator.

Unit IV: Comparators: zero crossing detector, Schmitt trigger; Logarithmic amplifier, Antilogarithmic amplifier, Schmitt trigger, Precision Rectifier, clipper and clamper, Peak detector, S/H circuits. Timer 555; Astable and Monostable mode

Unit V: Introduction to active filters, First order filters: low pass, high pass, band pass, band rejection, all pass; Oscillators: Principle, types, frequency stability; Phase shift oscillator, Wien bridge, quadrature oscillator; Wave generator: square, triangular, saw tooth.

Books:

1. R. A. Gayakwad, Op-Amps and Linear IC's, Pearson Education
2. S. Franco, Design with operational amplifiers and analog integrated circuits, Tata McGraw Hill
3. R. F. Coughlin and F. F. Driscoll, Operational amplifiers and Linear Integrated circuits, Pearson Education

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Duration of the External Examination: 2 ½ hours only.

TITLE: LINEAR INTEGRATED CIRCUIT LAB COURSE CODE:-UELPC402

Practical Credits: 02 Hour: 60

Validity: Examinations to be held: May 2018, 2019, 2020

External Exam: 25 Marks Internal marks: 25 Total Marks: 50 Duration: 2 ½ hours

1. To design an inverting amplifier using Op-amp (741, 351) for dc voltage of given gain
2. (a) To design inverting amplifier using Op-amp (741, 351) & study its frequency response
   (b) To design non-inverting amplifier using Op-amp (741,351) & study frequency response
3. (a) To add two dc voltages using Op-amp in inverting and non-inverting mode
   (b) To study the zero-crossing detector and comparator.
4. To design a precision Differential amplifier of given I/O specification using Op-amp.
5. To investigate the use of an op-amp as an Integrator.
6. To investigate the use of an op-amp as a Differentiator.
7. Square wave generator
8. Triangular wave generator
9. Precision rectifier
10. RC phase shift oscillator

SEMESTER IV

Skill Enhancement Course **COURSE CODE:-UELTS403**

COURSE CODE:-ELECTRICAL CIRCUITS AND NETWORK SKILLS

Validity: Examinations to be held: May 2018, 2019, 2020

External Exam: 80 Marks Internal marks: 20 Total Marks: 100 Duration: 2 ½ hours

Theory Credits: 04 **Hours: 60**

The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode

Unit I: Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations.AC and DC Electricity. Familiarization with multimeter, voltmeter and ammeter.

Unit II: Electrical Circuits: Basic electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and three-phase alternating current sources, Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source. Power factor. Saving energy and money.

Unit III: Electrical Drawing and Symbols: Drawing symbols. Blueprints, Reading Schematics. Ladder diagrams. Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identify current flow and voltage drop. DC Power sources.AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers. Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor.

Unit IV: Solid-State Devices: Resistors, inductors and capacitors. Diode and rectifiers. Components in Series or in shunt. Response of inductors and capacitors with DC or AC sources, Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection. Relay protection device.

Unit V: Electrical Wiring: Different types of conductors and cables. Basics of wiring-Star and delta connection. Voltage drop and losses across cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays. Splices: wirenuts, crimps, terminal blocks, and solder. Preparation of extension board.

Reference Books:

- Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press
- A text book in Electrical Technology - B L Theraja - S Chand & Co.
- A text book of Electrical Technology - A K Theraja
- Performance and design of AC machines - M G Say ELBS Edn.

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  Duration of the External Examination: 2 ½ hours only.