KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ

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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No.KU/Aca(S&T)/RPH-394A/2021-22/ 954 Date: 30 SEP 2021

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2021–22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮೆಸ್ಟರ್ NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ–1), ದಿ:7.8.2021.

2. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 19.08.2021

3. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/18 ದಿ:21.08.2021.

4. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂಖ್ಯೆ ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ–1), ಬೆಂಗಳೂರು ದಿನಾಂಕ: 15.9.2021.

5. ಎಲ್ಲ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಸಭೆಗಳ ನಡವಳಿಗಳು

6. ಎಲ್ಲ ನಿಖಾಯಗಳ ಸಭೆಗಳು ಜರುಗಿದ ದಿನಾಂಕ: 24,25–09–2021.

7. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 28.9.2021.

8. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 30.09.2021

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2021–22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music)/BVA/ BTTM/ BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P./ B.Com/ B.Com (CS)/ & BBA ಸ್ನಾತಕ ಕೋರ್ಸಗಳ 1 ಮತ್ತು 2ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020 ರಂತೆ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಕೋರ್ಸಿನ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನಲೋಡ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

30/09/21

(ಡಾ. ಹನುಮಂತಪ್ಪ ಕೆ.ಟಿ.)
ಕುಲಸಚಿವರು.

ಗೆ,
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

KARNATAK UNIVERSITY, DHARWAD

B.Sc. (Hons.) Program

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SYLLABUS

ELECTRONICS

[Effective from 2021-22]

DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM I & II,

OPEN ELECTIVE COURSE (OEC) FOR SEM I & II and

SKILL ENHANCEMENT COURSE (SEC) FOR SEM I

AS PER N E P - 2020

Karnatak University, Dharwad

Four Years Under Graduate Program in **Electronics** for B.Sc. (Hons.)

Effective from 2021-22

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Internal Assessment Marks	Sem End Exam. Marks	Total Marks	Credits
I	DSCC-1T	Theory	04 hrs	56	03 hrs	30	70	100	04
	DSCC-1P	Practical	04 hrs	52	03 hrs	15	35	50	02
	OEC-1	Theory	03 hrs	42	03 hrs	30	70	100	03
	SEC-1	Practical	02 hrs	22-30	03 hrs	15	35	50	02
II	DSCC-2T	Theory	04 hrs	56	03 hrs	30	70	100	04
	DSCC-2P	Practical	04 hrs	52	03 hrs	15	35	50	02
	OEC-2	Theory	03 hrs	42	03 hrs	30	70	100	03
	Details of the other Semesters will be given later								

***Student can opt digital fluency as SEC or the SEC of his/ her any one DSCC selected it will be evaluated as pr the guidelines issued by the University time to time.**

Program Objectives:

The overall objective of B.Sc (Honors) Electronics Program is to:

1. Provide students with learning experiences that provide broad knowledge and understanding of key concepts of Electronics and equip students with advanced scientific / technological capabilities for analysing and tackling then issues and problems in the field od Electronics.
2. Develop ability in students to apply knowledge and skills they have acquired to solve specific theoretical and applied problems in Electronics
3. Develop abilities in students to design and develop innovative solutions for the benefit of society.
4. Provide students with skills that enable them to get employment in industries or pursue higher studies or research assignments or turn as enterpreneurs.

Course outcome:

1. Ability to apply knowledge of logical thinking and basic science for solving Electronic related issues.
2. Ability to perform Electronic experiments , as well as to analyse and interpret data.
3. Ability to design and manage electronic system or processes that conform to a given specification within ethical and economic constraints.
4. Ability to identify, formulate, solve and analyse the problems in various sub-disciplines of Electronics.
5. Ability to use modern tools / techniques.

Semester – I

Course Objectives

Upon completion of the course, ELE-DSSCT1.1, the student will be able to understand various fundamental principles of network analysis, number systems and Boolean algebra and become familiar with the basic operation of electronic devices and circuits which are the building blocks of all electronic circuits, devices and gadgets.

Electronics as Discipline Specific Core Course (DSCC)
B.Sc. Semester – I
ELECTRONICS: ELE -1

Type of Course	Theory / Practical	Credits	No. of Classes/Week	Total No. of Lectures/Hours	Duration of Exam in hrs	Internal Assessment Marks	Semester End Exam Marks	Total Marks
DSCC-1T	Theory	04	04	56	3	30	70	100
DSCC-1P	Practical	02	04	52	3	15	35	50

UNIT-1 **14 Hours**

Electronic Components: Electronic passive and active components, types and their properties, Concept of Voltage and Current Sources, electric energy and power. (Qualitative only)

Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, and Reciprocity Theorems. DC and AC analysis of RC and RL circuits, RLC series and parallel Resonant Circuits.

PN junction diode: Ideal and practical diodes, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, Zener diode, Reverse saturation current, Zener and avalanche breakdown.

Rectifiers-Half wave and Full wave (center tap and bridge) rectifiers, expressions for output voltage, ripple factor and efficiency (mention only), Shunt capacitor filter. (Numerical examples wherever applicable

UNIT-2 **14 Hours**

Voltage regulator: Block diagram of regulated power supply, Line and Load regulation, Zener diode as voltage regulator – circuit diagram, load and line regulation, disadvantages. Fixed and Variable IC Voltage Regulators (78xx, 79xx, LM317), Clippers (shunt type) and clampers(Qualitative analysis only), Voltage Multipliers.

Bipolar Junction Transistor: Construction, types, C-E,C-B and C-C configurations (mention only), VI characteristics of a transistor in C-E mode, Regions of operation (active, cut off and saturation), leakage currents (mention only), Current gains α , β and and their inter-relations, dc load line and Q point. Applications of transistor as amplifier and switch - circuit and working. (Numerical examples wherever applicable).

UNIT-3 **14 Hours**

Transistor Biasing and Stabilization Circuits: Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor. Transistor as a two-port network, h-parameter equivalent circuit. Amplifier: Small signal analysis of single stage C-E amplifier using h-parameters. Input and Output impedances, Current and Voltage gains. Advantages of C-C amplifier. Class A, B and C Amplifiers (qualitative).Types of coupling, Two stage RC Coupled Amplifier – circuit, working and its Frequency Response, loading effect, GBW product, Darlington transistor, Current gain.

Special Semiconductor Diodes: Varactor diode, Schottky diode, Tunnel diode, - construction, characteristics, working, symbol, and applications for each.LED, LCD and solar cell – construction, operation and applications, 7-segment display, concept of common anode and common cathode types.(Numerical problems, wherever applicable)

UNIT-4 **14 Hours**

Number System: Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, Binary arithmetic; addition, subtraction by 1's and 2's complement method, BCD code (8421, 2421, Excess-3), Gray code, error checking and correction codes (Only parity check). **Boolean Algebra:** Constants, variables, operators, basic logic gates-AND, OR, NOT, Positive and negative logic, Boolean laws, Duality Theorem, De Morgan's Theorem, simplification of Boolean expressions-SOP and POS. Derived logic gates (NAND, NOR, XOR & XNOR). Universal property of NOR and NAND gates. (Numerical examples wherever applicable).

Reference Books:

1. Robert L Boylestad, "Introductory circuit analysis", 5th edition., Universal Book 2003.
2. R.S.Sedha, "A Text book of Applied Electronics", 7th edition., S. Chand and Company Ltd. 2011
3. A.P. Malvino, "Principles of Electronics", 7th edition .TMH, 2011.
4. Electronic devices and circuit theory by Boylestad, Robert Nashelsky
5. David A. Bell " Electronic Devices and Circuits", 5th Edition, Oxford Uni. Press, 2015
6. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)
7. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
8. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI

Learning Pvt. Ltd.
9. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
10. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001,PHI Learning.
11. M. Nahvi& J. Edminister, "Electrical Circuits", Schaum's Outline SeriesTMGH2005
12. S. A. Nasar," Electrical Circuits", Schaum's outline series, Tata McGraw Hill, 2004
13. J. Millman and C. C. Halkias, "Integrated Electronics", Tata McGraw Hill, 2001
14. A.S. Sedra, K.C. Smith, A.N. Chandorkar "Microelectronic circuits", 6th Edn., Oxford University Press, 2014
15. J. J. Cathey, "2000 Solved Problems in Electronics", Schaum's outline Series, TMG1991

Outcome of the Course

At the end of this course, students will be able to

- Study and analyze basic networks using network theoremsin a systematic manner.
- Build simple electronic circuits used in various applications.
- Describe the behaviour of basic semiconductor devices
- Reproduce the VI characteristics of diode/BJT devices
- Describe the frequency response of BJT amplifiers.
- Explain the behaviour, characteristics and applications of Varactor diode, Schottky diode, Tunnel diode, LED, LCD and solar cells.
- Apply standard device models to explain/calculate critical internal parameters of semiconductor devices.
- Understand and represent numbers in powers of base and converting one from the other, carry out simple arithmetic operations.
- Understand the basic knowledge of Digital system building blocks, effectively can construct simple digital designs with the knowledge of Boolean algebra.

Practicals: ELEDSCCP1.1: Electronic Devices and Circuits

(Hardware implementation and Analysis of Circuit using Simulation Software)
Minimum Four Experiments to be performed in each Part excluding demonstration experiments

1. **Demonstration Experiment: Familiarization with**
   a) Electronic components
   b) Resistance in series, parallel and series-parallel
   c) Capacitors and inductors in series and parallel
   d) Multimeter and LCR meter – checking of components / measurements.
   e) Voltage sources in series, parallel and series-parallel
   f) Voltage and current dividers
   g) Measurement of Amplitude, Frequency & Phase difference using Oscilloscope

Part A (Any Four)

2. Verification of Thevenin's and Maximum Power Transfer Theorem.
3. Verification of Superposition Theorem.
4. Study of the VI Characteristics of (a) P-N junction diode (b) Zener diode.
5. Study of the I-V Characteristics of LEDs of two different colours and 7-segment display.
6. Study of Half wave rectifier without and with shunt capacitor filter– ripple factor for different values of filter capacitors.
7. Study of full wave bridge rectifier without and with shunt capacitor filter – ripple factor for different values of filter capacitors.
8. Study of Zener diode as a Voltage Regulator using bridge rectifier with shunt capacitor filter [Load and line regulation].
9. Study of Clipping, Clamping and Voltage Multiplier circuits.
10. Designing and testing of fixed positive and negative voltage regulators using 78xx and 79xx series ICs (Using bridge rectifier and shunt capacitor filter).
11. Designing and testing of variable voltage regulator using IC LM317 (Using bridge rectifier and shunt capacitor filter).

Part B (Any Four experiments including Experiment No 14)

12. Study of Transistor characteristics in CE configuration – determination of h-parameters.
13. Study of Fixed Bias and Voltage divider bias circuits – comparison for different values of β.
14. Study of single stage RC coupled C-E amplifier (frequency response, input and output impedances in mid-band)
15. Study of two-stage RC-coupled CE amplifier (AV1, AV2, AV) at mid-band frequency.
16. Study of Series and Parallel Resonance circuits – determination of its (a) Resonant frequency (b) Impedance at resonance (c) Bandwidth (d) Quality Factor.
17. Verification of truth tables of OR, AND, NOT, NAND, NOR, XOR and XNOR gates using corresponding ICs. Realization of XOR and XNOR using basic gates.
18. Universal property of NAND and NOR gates.
19. Binary to Gray and Gray to Binary code conversion and parity checker using XOR gates IC 7486

B.Sc. Semester – I
Open Elective Course (OEC)-1
BASIC ELECTRONICS -I

Type of Course	Theory / Practical	Credits	No. of Classes/Week	Total No. of Lectures/Hours	Duration of Exam in hrs	Internal Assessment Marks	Semester End Exam Marks	Total Marks
OEC-I	Theory	03	03	42	3	30	70	100

Unit-1 **14 Hours**

Introduction to Electronics and Principles of Electricity:

Introduction to Electronics: Electronics and its scope: Development of vacuum tube devices, semiconductor devices, integrated circuits, microprocessors and microcontrollers. Applications of electronics–entertainment, communication, defense, industrial, medical Impact of electronics on quality of life

Principles of Electricity: Charge-positive and negative charges, properties of charges, charge of an electron, number of electrons in one Coulomb of charge, electric current-definition, its unit and direction of current - conventional current and the electronic current. Potential difference and its unit related to electric circuit, Ohm's law-statement and limitations, application to circuits. Resistance and its unit, electric power,electric energy. Combinations of resistors, open and short circuit. Kirchhoff's current law and Kirchhoff's voltage law, current and voltage division.

Sufficient number of numerical problems must be solved.

Unit-2 **14 Hours**

Passive Electronic components, Application of DC and AC to Passive components

Passive Electronic components: Introduction, resistors, types of resistors, capacitors, principle of capacitor, energy stored in a capacitor, types of capacitors, and combination of capacitors. Inductors, self-inductance, mutual-inductance, combination of inductors, energy stored in an inductor, choke, transformer, types of transformer, transducers, loudspeaker, microphone

Application of DC and AC to Passive components: RC time constant, charging of capacitor (growth voltage), discharging of capacitor through resistor (decay voltage),L/R time constant, growth and decay of current through R-L circuit. AC applied to passive component: LCR series , resonance circuit, quality factor, bandwidth, RC low pass and high pass filter.

Sufficient number of numerical problems must be solved.

Unit-3 **14 Hours**

Current and voltage sources and Network theorems:

Current and voltage sources: Sources of electric power, internal impedance of a source, Concept of voltage source: ideal voltage source, practical voltage source. Concept of current source: ideal current source, practical current source, equivalence between voltage source and current source, conversion of voltage source into current source and vice versa.

Network Theorems: Thevenin's, Norton's theorem statement and proof, Super position theorem, statement, analysis with two voltage sources and Maximum power transfer theorem- statement (derivation) all theorems with respect to DC circuit.

Sufficient number of numerical problems must be solved.

Reference Books:

1. Basics of Electronics (Solid State) – BL Theraja
2. Basics Electronics and linear circuits – N N Bhargava and others.
3. Electronic principles -- B. Basavaraja Vol-1
4. Handbook of Electronics—Gupta Kumar
5. Basic and applied Electronics – bandyopadhyay
6. Electronics-- Dr. R. K. Kar
7. Electronic Devices and Circuits – David A. Bell
8. Principles of Electronics – V. K. Mehta and Rohit Mehta

B.Sc. Semester - I

SKILL ENHANCEMENT COURSE (SEC)-I

Domestic Equipment Maintenance and measuring Instruments

ype of Course	Theory / Practical	Credits	No. of Classes/Week	Total No. of Lectures/Hours	Duration of Exam in hrs	Internal Assessment Marks	Semester End Exam Marks	Total Marks
SEC-I	Practical	02	03	22-30	3	15	35	50

Unit-1 **15 Hours**

Basics of Electronics: concept of Voltage, Current, Power, AC and DC sources. Ohms law.

Electronic Components: Passive components, resistors, imductors, capacitors, and their types. Series and parallel combination, semiconductor diode- ideal and practical diode, VI characteristics, Zener diode- Construction, working and its VI characteristics. application of semiconductor diode as full wave rectifier, ripple factor and its efficiency. Zener diode as voltage regulator. Block diagram of regulated power supply

Experiments.

1. Charging of Capacitors (Parallel combination, Series combination etc.,),
2. Measurement of Resistors using Ohm meter, Measurement of Capacity of a capacitor.
3. Semiconductor diode V-I Characteristics,
4.. Half Wave Rectifiers/ Full Wave Rectifier
5. Zener diode Charaacteristics
6. Zener as voltage regulator using full wave rectifier
7. Using Resistive network study of star to delta network conversion or vice-versa. Show that they are equivalent.

Unit-2 **15 Hours**

Measuring Instruments: Analog and digital instruments, permanent magnet moving mechanism, converting basic meter into DC multirange voltmeter and multirange ammeter. Ohmmeter-series and shunt type (qualitative), multimeter. CRO: application of CRO for measurement of voltage, and frequency. Lissajous figures.

Experiments:

1. Measurement of voltage, current using multimeter, construction of multirange voltmeter, current meter.
2. Conversting basic meter into D. C. Voltmeter/Ammeter
3. Measurement of voltage and frequency using CRO, Lissajous figures
4. Soldering and desoldering Tecnique: Students will acquire a skill of soldering discrite components of a given circuit on general PCB and check the working of the circuit.
5. Experimental study of KVL and KCL using DC source and resistive network.
6. Calibration of analog voltmeter and ammeter.
7. Basics and working of Battery Eliminators/ battery charger

References:

1. Electronic instruments and systems: Principles, maintenance and troubleshooting by R. G. Gupta Tata McGraw Hill.
2. Modern electronic equipment: Troubleshooting, repair and maintenance by Khandpur, Tata McGraw Hill
3. Electronic fault diagnosis by G. C. Loveday, A. H. Wheeler publishing Modern Electronics Instrumentation and measurement techniques- Helfrick Cooper
4. Basics of Electronics (Solid State) – BL Theraja

B.Sc. Semester - II
ELECTRONICS: ELE -2

Type of Course	Theory / Practical	Credits	No. of Classes/Week	Total No. of Lectures/Hours	Duration of Exam in hrs	Internal Assessment Marks	Semester End Exam Marks	Total Marks
DSCC-1T	Theory	04	04	56	3	30	70	100
DSCC-1P	Practical	02	04	52	3	15	35	50

Course Objective:

Upon completing the syllabus contents of ELE-DSSCT2.1, the student will become familiar with various working principles of widely used electronic devices, linear and digital ICs which help the students to build small projects and also be able to answer some basic questions that appear in competitive examinations.

Title of the Course: ELEDSSCT2.1: ANALOG AND DIGITAL ELECTRONICS

UNIT-1 **14 Hours**

JFET: Types - p-channel and n-channel, working and VI characteristics, n-channel JFET, parameters and their relationships, Comparison of BJT and JFET.

MOSFET: Depletion and enhancement type MOSFET, n-channel and p-channel, Construction, working, symbols, biasing, drain and transfer characteristics, VMOS, UMOS Power MOSFETs, handling, MOS logic, symbols and switching action of MOS, NMOS inverter, CMOS logic, CMOS – inverter, circuit and working, CMOS characteristics, IGBT construction and working.

UJT - construction, working, equivalent circuit and VI characteristics, intrinsic stand-off ratio, relaxation oscillator.

SCR - Construction, VI characteristics, working, symbol, and applications – HWR and FWR.

Diac and Triac-construction, working, characteristics, applications, (Numerical examples wherever applicable)

UNIT- 2 **14 Hours**

Op-Amp: Differential Amplifier, Block diagram of Op-Amp, Characteristics of an Ideal and Practical Op-Amp, Open and closed loop configuration, Frequency Response, CMRR, Slew Rate and concept of Virtual Ground.

Applications of op-amps: Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative Study). Inverting and non-inverting amplifiers, Summing

and Difference Amplifier, Differentiator, Integrator, Comparator and Zero-crossing detector

Filters: First and second order active low pass, high pass and band pass Butterworth filters.

Oscillators: Barkhausen criterion for sustained oscillations, Collpitt's oscillator and crystal oscillators using transistor, Phase Shift oscillator, Wien-bridge oscillator – (no derivation for each)

IC 555Timer: Introduction, Block diagram, Astable and Monostable multivibrator circuits. (Numerical Examples wherever applicable).

UNIT-3 **14 Hours**

Logic Families: Pulse characteristics, Logic Families-classification of digital ICs. Characteristics of logic families, circuit description of TTL NAND gate with totem pole and open collector. TTL IC terminology. CMOS NAND, comparison of TTL and CMOS families.

Combinational Logic Circuits: Minimisation techniques using K-maps - SOP and POS, Minterm, Maxterm, SSOP, SPOS, Simplification of Boolean expressions, KMap for 3 and 4 variable.

Digital to Analog converter: DAC with binary weighted resistor and R-2R resistor ladder network. Analog to Digital converter: Successive approximation method -performance characteristics.

Design of Arithmetic logic circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor, 4-bit parallel binary adder, 2-bit and 4-bit magnitude comparator. Encoder, decimal to BCD priority encoder. Decoder, 2:4 decoder using AND gates, 3:8 decoder using NAND gates, BCD to decimal decoder, BCD to 7-Segment decoder, Multiplexer - 4:1 and 8:1 multiplexer, Demultiplexer, 1:4 and 1:8 demultiplexer - logic diagram and truth table of each, Realization of Full adder and Full Subtractor using Mux and Decoder.

UNIT - 4 **14Hours**

Sequential Logic Circuits: Flip-Flops - SR Latch, RS, D and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Racearound conditions in JK Flip-Flop. Master- Slave JK and T Flip-Flops. Applications of Flip-Flops in semiconductor memories, RAM, ROM and types.

Registers and Counters: Types of Shift Registers, Serial-in-Serial-out, Serial-in Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits), applications. Ring counter, Johnson counter applications. Asynchronous Counters: Logic diagram, Truth table and timing diagrams of 4 bit ripple counter, modulo-n counters,4bit Up-Down counter, Synchronous Counter, 4-bit counter, Design of Mod 3, Mod 5 and decade Counters using K-maps.

Reference Books:

1. Electronic devices and circuit theory by Boylestad, Robert Nashelsky
2. Electronic Devices Conventional Current Version by Thomas L. Floyd
3. David A. Bell " Electronic Devices and Circuits", 5th Edition, Oxford Uni. Press, 2015.
4. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edn, 2000, Prentice Hall.
5. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, Oxford University Press.
6. R.S.Sedha, "A Text book of Applied Electronics", 7th edition.,S.Chand and Company Ltd. 2011.
7. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994))
8. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw.
9. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
10. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
11. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
12. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGrawHill (1994)
13. Digital Electronics, S.K. Mandal, 2010, 1st edition, McGraw Hill

Outcome of Course:

At the end of this course, students will be able to

- Reproduce the VI characteristics of various MOSFET devices,
- Apply standard device models to explain/calculate critical internal parameters of semiconductor devices.
- Explain the behavior and characteristics of power devices such as UJT, SCR, Diac, Triac etc.
- Perform experiments for studying the behavior of semiconductor devices.
- Calculate various device parameter values from their VI characteristics.
- Interpret the experimental data for better understanding the device behaviour.
- Understand basic logic gates, concepts of Boolean algebra and techniques to reduce/simplify Boolean expressions
- Analyze combinatorial and sequential circuits

Practicals ELE-CP 2.1: ANALOG AND DIGITAL ELECTRONICS

(Hardware and Circuit Simulation Software)

Minimum Four Experiments to be performed in each Part

PART- A (Any Four)

1. Study of JFET/MOSFET characteristics – determination of parameters.
2. Study of single stage JFET amplifier.(frequency response and band width)
3. UJT characteristics and relaxation oscillator
4. SCR characteristics – determination of IH and firing voltage for different gate currents.
5. Design of inverting and non-inverting amplifier using Op-amp & study of frequency response.
6. Op-amp inverting and non-inverting adder,subtractorand averaging amplifier.
7. Study of the zero-crossing detector and comparator.
8. Design and study of differentiator and integrator using op-amp for different input waveforms.
9. Design and study of Wien bridgeand RC phase shift oscillator using op-amp.
10. Design and study of first order high-pass and low-pass filters using op-amp.
11. Study of Collpitt's and crystal oscillator using transistor.
12. Astable multivibrator using IC555 timer.
13. Monostable multivibrator using IC555 timer

PART- B (Any Four)

14. Half Adder and Full Adder using (a) logic gates (b) using only NAND gates.
15. Half Subtractor and Full Subtractor(a) logic gates (b) using only NAND gates.
16. 4 bit parallel binary adder and Subtractor using IC7485.
17. Study of BCD to decimal decoder using IC7447
18. Study of the Encoders and priority encoders.
19. Study of Multiplexer and Demultiplexer using ICs.
20. Study of 2-bit and 4-bit magnitude comparators.
21. Study of Clocked RS, D and JK Flip-Flops using NAND gates.
22. Study of 4-bit asynchronous counter using JK Flip-Flop IC7476, modify to decade counter and study their timing diagrams.
23. Study of 4-bit Shift Register – SISO, modification to ring counter using IC 7495.
24. Digital to Analog converter using binary weighted resistor method, determination of resolution, accuracy and linearity error.

B.Sc. Semester – II
Open Elective Course (OEC)-II
Course Title: ELEOET 2.1: BASIC ELECTRONICS-II

Type of Course	Theory / Practical	Credits	No. of Classes/Week	Total No. of Lectures/Hours	Duration of Exam in hrs	Internal Assessment Marks	Semester End Exam Marks	Total Marks
OEC-II	Theory	03	03	42	3	30	70	100

UNIT-1 **14 Hours**

Semiconductor Theory: Semiconductors: Semiconductor materials,structure of an atom, atomic structure of some elements, electron energies, energy bands in solids, metals, insulators,semiconductors,hole formation and its movement, types of semiconductors,intrinsic semiconductors, extrinsic semconductors, electron current and hole current, N-type and P-type semiconductor, majority and minority charge carriers,effect of temperaure on extrinsic semiconductors.

Sufficient number of numerical problems must be solved.

UNIT-2 **14 Hours**

Semiconductor Diode and its application: P-N junction theory, effect of temperature on barrier potential,current components in an open circuited P-N junction, biasing P-N junction, forward bias P-N junction, reverse bias P- N junction. Ideal and practical diodes, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of static and dynamic resistance. Half- wave rectifier, PIV, average value voltage and load current, rms value, ripple factor, effciency of rectification. Full-wave rectifier, Peak Inverse Voltage,average values of output voltage and load current, rms value of load current, ripple factor, efficiency of rectification, Bridge rectifier working and comparision of rectifiers.

Sufficient number of numerical problems must be solved.

UNIT-3 **14Hours**

Power Supply: Block diagram of power supply, unregulated power supply, voltage regulation, load regulation, importance of filters in power supply, shunt capacitor filter, its ripple factor, LC-section filter ,CLC filter, ripple factor, and comparision of these filters. Zener diode : constructon working and its V-I characterstics, Zener diode as voltage regulator–circuit diagram, load and line regulation, disadvantages.

Sufficient number of numerical problems must be solved.

Reference Books:

1. Basics of Electronics (Solid State) – BL Theraja
2. Basics Electronics and linear circuits – N N Bhargava and others.
3. Electronic principles -- B. Basavaraja Vol-1
4. Handbook of Electronics—Gupta Kumar
5. Basic and applied Electronics – bandyopadhyay
6. Electronics-- Dr. R. K. Kar
7. Electronic Devices and Circuits – David A. Bell
8. Principles of Electronics – V. K. Mehta and Rohit Mehta

Faculty of Science & Technology
04 - Year UG Honors programme: 2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(70marks for semester end Examination with 3 hrs duration)
Part-A

1. Question number 1-6 carries 2 marks each. Answer any 05 questions : 10 marks

Part-B

2. Question number 7- 14 carries 05Marks each, Answer any 06 questions : 30 marks

Part-C

3. Question number 15-18 carries 10 Marks each, Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 70 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.