VIVEKANANDA COLLEGE
OF ARTS, SCIENCE & COMMERCE
(AUTONOMOUS)

ವಿವೇಕಾನಂದ ಕಲಾ, ವಿಜ್ಞಾನ
ಮತ್ತು ವಾಣಿಜ್ಯ ಮಹಾವಿದ್ಯಾಲಯ
(ಸ್ವಾಯತ್ತ)

(A unit of Vivekananda Vidyavardhaka Sangha Puttur ®)
(Re-accredited at 'A' Grade by NAAC) | Recognised as College with Potential for Excellence(CPE) by the UGC, New Delhi

No : VCP/AC/BSC/2022-23

Date : 30-11-2022

NOTIFICATION

Sub : Approved Syllabus of I and II Sem B.Sc. Electronics for UG Degree Programme under NEP-2020 Choice Based Credit System – reg.

Ref : Decision of the Academic Council at its meeting held on 26-11-2022 vide Agenda No : 3 (2022-23)

Pursuant to the above, the Syllabus of I and II Sem B.Sc. Electronics for UG Degree Programme under NEP-2020 Choice Based Credit System which was approved by the Academic Council at its meeting held on 26-11-2022 is hereby notified for implementation with effect from the academic year 2022-23 (BSCE 2022/101, BSCE 2022/201)

VIVEKANANDA COLLEGE OF ARTS, SCIENCE & COMMERCE (AUTONOMOUS) NEHRU NAGARA PUTTUR, D. K. 574 203

Principal / President
Academic Council

To:
1) The Chairman/Dean/HOD
2) Controller of Examination
3) Office Copy

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VIVEKANANDA COLLEGE OF ARTS, SCIENCE & COMMERCE (AUTONOMOUS)
PUTTUR-574203, D.K. KARNATAKA

SYLLABI FOR UNDERGRADUATE PROGRAM (UG) ELECTRONICS CURRICULUM FRAMEWORK

(FACULTY OF SCIENCE)

FRAMED ACCORDING TO THE NATIONAL EDUCATION POLICY (NEP 2020)

I & II SEMESTERS

ABILITY ENHANCEMENT COMPULSORY COURSE (L+T)
TO BE IMPLEMENTED FROM THE ACADEMIC YEAR 2022-23

BOARD OF STUDIES IN ELECTRONICS
VIVEKANANDA COLLEGE OF ARTS, SCIENCE & COMMERCE (AUTONOMOUS)
PUTTUR-574203, D.K. KARNATAKA

VIVEKANANDA COLLEGE OF ARTS, SCIENCE & COMMERCE

(AUTONOMOUS) PUTTUR-574203, D.K. KARNATAKA

SYLLABI
FOR THE YEAR 2022-23 AND ONWARDS

FRAMED UNDER NATIONAL EDUCATION POLICY-2020

ELECTRONICS

ABILITY ENHANCEMENT COMPULSORY COURSE

I & II SEMESTERS

COURSE PATTERNS AND SCHEME OF EXAMINATION B.Sc. UG COURSE

SMT. SUPRABHA A
CHAIRPERSON
BOARD OF STUDIES IN ELECTRONICS
VIVEKANANDA COLLEGE OF ARTS, SCIENCE & COMMERCE (AUTONOMOUS)
PUTTUR-574203, D.K. KARNATAKA

Preamble

This model curriculum content for B.Sc (Honours) Electronics as per NEP-2020, is intended to enable the graduates to respond to the current needs of the industry and equip them with skills relevant for national and global standards. The framework encourages innovation in teaching- learning process and appropriate assessment of student learning levels.

Introduction

B.Sc (Honours) Electronics is a program which needs to develop a specialized skill set amongthe graduates to cater to the need of industries.

The curriculum is designed to help learners to analyze, appreciate, understand and critically engage with learning of the subject and also to provide better learning experience to the graduates. Apart from imparting disciplinary knowledge, the curriculum is aimed to equip the graduates with competencies like problem solving and analytical reasoning which provide them high professional competence.

The Department/Institute/University is expected to encourage its faculty concerned to make suitable pedagogical innovations, in addition to teaching/learning processes suggested in the model curriculum, so that the Course/Programme learning outcomes can be achieved.

Significance of Electronics

In recent years, Electronics has made unprecedented growth in terms of new technologies, new ideas and principles. The research organizations and industries that work in this frontier area are in need of highly skilled and scientifically oriented manpower. This manpower can be available only with flexible, adaptive and progressive training programs and a cohesive interaction among the institutions, universities, and industries. The key areas of study within subject area of Electronics comprise of Semiconductor Devices, analog and digital circuit design, microprocessors & Microcontroller systems, computer coding/programming in high level languages etc. and also modern applied fields such as embedded systems, data communication, robotics, control systems, etc.

Eligibility criteria

Students who have passed PUC Science of Karnataka Pre University Education Board or equivalent 10+2, ITI or Diploma in any stream are eligible for the B.Sc. / B.Sc. (Hons.) UG programme in Electronics.

Program Objectives

The overall Objectives of the B.Sc (Honours) Electronics programme are to:

1. Provide students with learning experiences that develop broad knowledge and understanding of key concepts of electronics and equip students with advanced scientific / technological capabilities for analyzing and tackling the issues and problems in the field of electronics.
2. Develop ability in students to apply knowledge and skills they have acquired to solve specifictheoretical and applied problems in electronics.
3. Develop abilities in students to design and develop innovative solutions for benefits of society.
4. Provide students with skills that enable them to get employment in industries or pursuehigher studies or research assignments or become entrepreneurs.

Program outcome

1. Ability to apply knowledge of Logic thinking and basic Science for solving electronicsrelated problems
2. Ability to perform electronics experiments, as well as to analyse and interpret data.
3. Ability to design and manage electronic systems or processes that conforms to a givenspecification within ethical and economic constraints.
4. Ability to identify, formulate, solve and analyze the problems in various sub disciplinesof electronics.
5. Ability to use Modern Tools / Techniques.

Tentative Program Structure (Major Discipline: ELECTRONICS)

Semester	Discipline Core(DSC)	Title of the Paper	Open Elective(OE)
1	DSC1	Electronic Devices and Circuits	OE1.1:Domestic Equipment Maintenance OE1.2: Renewable Energy and Energy Harvesting OE1.3:Power Systems and E-Vehicles OE 1.4: PCB Design and Fabrication
2	DSC2	Analog and Digital Electronics	OE 2.1: Consumer Electronics OE2.2: Electronics for everyone OE2.3: Mobile communication OE2.4:Mobile Application Programming
3	DSC3	Digital Design Using Verilog and Programming in C	OE3.1: Robotics OE 3.2: Introduction to Nano Science & Nano Electronics OE3.3: Medical Electronics OE3.4: Solar Energy, Devices and Applications OE 3.5: IC Fabrication Techniques
4	DSC4	Electronic Communications –I	OE 4.1:App Developments OE 4.2: MEMS and Sensors OE4.3:IoT and Applications OE4.4:Virtual Reality & Real Time Applications
			Discipline Specific Elective (DSE)
5	DSC5 DSC6	Microcontroller 8051 and PIC Electronic Communications - II	DSE 1: Computer organization DSE2:RFIDTechnology DSE3: Photonics

6	DSC7 DSC8	Power Electronics, PLCs, Sensors, Transducers, and Instrumentation IOT and 5G communications	DSE 4: Cryptography DSE5:ControlSystems DSE6: Project work(0+1+2)
7	DSC9 DSC10 DSC11	Signal sand Systems Embedded Systems Microwave Communications	DSE7:Wireless communication DSE 8: Python Programming DSE9:Mechatronics
8	DSC12 DSC 13 DSC14	Digital Signal Processing VLSI Designing Image Processing	DSE 10: ARM Processor DSE 11: Computer Network DSE 12: AI, ML and Python Research Project

Proposed Curriculum Frame work for Multidisciplinary Four-Year Under graduateProgramme / Five-year Integrated Master's Degree Programme

YEAR	OBJECTIVES	NATURE OF COURSES	OUT COME	NO. OF COURSES
1st year– **(1st and 2nd Semesters)**	Understanding the basic concepts	1.Major Core Courses 2. Minor/Related Discipline 3. Languages 4. Ability Enhancement Compulsory Courses 5.SkillEnhancement / Development Courses	Understanding of Disciplines Language Competency Gaining perspective of context/Generic skills Basic skills sets to pursue any certificate level jobs	1+1 1+1 2+2 1+1 1+1
EXIT OPTION WITH CERTIFICATE				
2ndYear **(3rd and 4th Semesters)**	Focus and Immersion	1. Major Core Courses 2. Minor/Related Discipline 3.AbilityEnhancement 4.SkillbasedVocational 5.Extra-curricularActivities	Understanding of disciplines Gaining perspective of context Skill sets to pursue vocation Development of various Domains of mind & Personality	2+2 1+1 1+1 1+1 1+1
EXIT OPTION WITH DIPLOMA				
3rdYear **(5th & 6th Semesters)**	Real time Learning	1. Major Discipline Core and Elective Courses 2. Minor Discipline/ Generic or Vocational Electives/ Field based Learning / Research Project	In depth learning of major and minor disciplines, Skill Sets for employability. Exposure to discipline beyond the chosen Subject Experiential learning/Research.	2+2 1+1 1+1
EXIT OPTION WITH BACHELOR DEGREE				

4thYear (7th & 8th Semesters)	Deeper Concen tration	Major Discipline Core and Elective Courses Research/Project Work with Dissertation	Deeper and Advanced Learning of Major Discipline Foundation to pursue Doctoral Studies & Developing Research competencies	4+4 4+4
EXIT OPTION WITH HONOURS DEGREE				
5thYear (9th&10th Semesters)	Master of the subject	Major Discipline Core and Elective course / Research / Project Work with Dissertation	Deeper and Advanced Learning of the Major Discipline towards Gaining proficiency over the subject	4+4 /6+6
MASTERS DEGREE				

COURSE PATTERN AND SCHEME OF EXAMINATION for B.Sc. / B.Sc. (Hons.) as per NEP (2021-22 and onwards)SUBJECT: ELECTRONICS

Sl No	Semester	Title of the Paper	Teaching Hours	Hours /week		Examination Pattern Max.Marks /Paper				Duration of Exam (hours)		Total Marks / paper	Theory Credits	Practical Credits
						Theory		Practical						
				Theory	Practical/ Demo	Exam	IA	Exam	IA	Theory	Practical			
1	I	**ELE-CT1:**Electronic Devices and Circuits	**56**	**4**	**4**	**60**	**40**	**25**	**25**	**2**	**4**	**150**	**4**	**2**
		ELE-OE 1.1/1.2/1.3	**45**	**3**	**0**	**30**	**20**	**-**	**-**	**2 ***	**-**	**50**	**2**	**1**
2	II	**ELE-CT2:** Analog and Digital Electronics	**56**	**4**	**4**	**60**	**40**	**25**	**25**	**2**	**4**	**150**	**4**	**2**
		ELE-OE 2.1/2.2/2.3/2.4	**45**	**3**	**0**	**30**	**20**	**-**	**-**	**2***	**-**	**50**	**2**	**1**

***Questions from practicals have to be included in theory examinations of Open Electives (Since electronics is a practical oriented subject)**

Question Paper Pattern for Theory examination for <u>DSC course</u>

Time: 2 Hrs **Max. Marks=60**

Part-A

Answer anySIX of the following 6X2=12

(Note: Short Answer type questions. Two questions from each unit.)

1. **a)**

   b)

   c)

   d)

   e)

   f)

   g)

   h)

PART B

Answer any ONE full question from each unit – 12 marks each 12X4=48

(Minimum of 2 sub questions in each question.)

UNIT-I

2.

OR

3.

UNIT-II

4.

OR

5.

UNIT-III

6.

OR

7.

UNIT-IV

8.

OR

9.

Question Paper Pattern for Theory examination for<u>OE course</u>

Time: 2 Hrs **Max. Marks=60**

Part-A

Answer anyNINE of the following 9X2=18

(Note: Short Answer type questions. Four questions from each unit.)

1. **a)**

   b)

   c)

   d)

   e)

   f)

   g)

   h)

   i)

   j)

   k)

   l)

PART B

Answer any ONE full question from each unit – 14 marks each 14X3=42

(Minimum of 3sub questions in each question.)

UNIT-I

2.

OR

3.

UNIT-II

4.

OR

5.

UNIT-III

6.

OR

7.

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Basis for Awarding Theory Internal Assessment Marks:

Sl No	Particulars	IA Marks
1	Minimum of Two internal Tests	**20**
2	Seminar / Case Study / Project work / Reports on - visits to industries/exhibitions/science centres / active participation in Electronics competitions, etc.	**10**
3	Assignments	**10**
TOTAL Theory IA Marks		**40**

Basis for Awarding Practical Internal Assessment Marks:

Sl No	Particulars	IA Marks
1	Practical Test	**10**
2	Report on datasheet of electronic devices / Seminar on electronics experiments, etc.	**08**
3	Active participation in practical classes	**07**
TOTAL Practical IA Marks		**25**

Basis for Awarding Practical Marks:

Sl No	Particulars	IA Marks
1	Records	**05**
2	Circuit Diagram/ Porgram	**05**
3	Conduct of Practical	**05**
4	Results and Graphs	**05**
5	Viva	**05**
TOTAL Practical Marks		**25**

Syllabus
Semester-I
ELECTRONIC DEVICES AND CIRCUITS
SUBJECT CODE : BSCELC101

(Credits: Theory – 04, Practical – 02) Total Teaching hours: 56

Course Objectives

Upon completing the course, ELE-CT1, 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.

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 and Maximum Power Transfer theorems. DC analysis of RC and RL circuits.AC analysis of 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 breakdowns . **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), Biased Clippers (shunt type) and clampers (Qualitative analysis only), **Bipolar Junction Transistor:** Construction, types, CE,CB and CC configurations (mention only), VI characteristics of a transistor in CE 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 a 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 CE amplifier using h-parameters. Input and Output impedances, Current and Voltage gains. Advantages of CE 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, 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 (8421code), 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).

Course Outcomes: At the end of this course, students will be able to
1. Study and analyze basic networks using network theorems in a systematic manner.
2. Build simple electronic circuits used in various applications.
3. Describe the behaviour of basic semiconductor devices
4. Reproduce the I-V characteristics of diode/BJT devices
5. Describe the frequency response of BJT amplifiers.
6. Explain the behaviour, characteristics and applications of Varactor diode, LED, LCD and solarcells.
7. Apply standard device models to explain/calculate critical internal parameters ofsemiconductor devices.
8. Understand and represent numbers in powers of base and converting one from the other, carryout simple arithmetic operations.
9. Understand the basic knowledge of Digital system building blocks, effectively can constructsimple digital designs with the knowledge of Boolean algebra.

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 andcircuit theory by Boylestad, Robert Nashelsky
4. David A. Bell " Electronic Devices and Circuits", 5th Edition, Oxford Uni. Press, 2015
5. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994) 7

6. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, TataMcGraw
7. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
8. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
9. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
10. M. Nahvi& J. Edminister, "Electrical Circuits", Schaum‟s Outline SeriesTMGH2005
11. S. A. Nasar," Electrical Circuits", Schaum‟s outline series, Tata McGraw Hill, 2004.
12. J. Millman and C. C. Halkias, "Integrated Electronics", Tata McGraw Hill, 2001
13. A.S. Sedra, K.C. Smith, A.N. Chandorkar "Microelectronic circuits", 6th Edn., OxfordUniversity Press, 2014
14. J. J. Cathey, "2000 Solved Problems in Electronics", Schaum‟s outline Series, TMG1991

ELE-CP1: Electronic Devices and Circuits – Lab
SUBJECT CODE : **BSCELP102**
(Hardware and Circuit Simulation Software)

Minimum of TEN Experiments to be performed 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

2. Verification of Thevenin's and Maximum Power Transfer Theorem.

3. Verification of SuperpositionTheorem.

4. Study of the I-V Characteristics of (a) p-n junction Diode, and (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 differentvalues of filter capacitors.

7. Study of full wave bridge rectifier without and with shunt capacitor filter – ripple factor fordifferent 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 fixedpositive and negative voltage regulators using 78xx and 79xxseries ICs (Using bridge rectifier and shunt capacitor filter).

11. Designing and testing of variable voltage regulator using IC LM317 (Using bridge rectifierand shunt capacitor filter).

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 β values.

14. Study of single stage CE 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 usingrespective 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 IC7486.

ELE-OE1.2:RENEWABLE ENERGY AND ENERGY HARVESTING

SUBJECT CODE : **BSCELOE101**

Course Outcomes(COs):

At the end of the course the student should beableto:

1. Aptitude to apply Logic thinking and Basic Science knowledge for problem solving in various fields of electronics both in industries and research.
2. To acquire experimental skills, analyzing the results and interpretdata.
3. Ability to design / develop / manage / operation and maintenance of sophisticated electronic gadgets / systems / processes that conforms to a given specification within ethical and economic constraints.
4. Capacity to identify and implementation of the formula to solve the electronicrelated issues and analyze the problems in various sub disciplines of electronics.
5. Capability to use the Modern Tools / Techniques of the energy demands

UNIT – 1 **15 Hrs**

Fossil fuels and Alternate Sources of energy: Fossil fuels and nuclear energy, their limitation, 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.

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, PV models, equivalent circuits, and sun tracking systems.

UNIT – 2 **15 Hrs**

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid inter connection topologies.

Demonstration Experiments: 1.Demonstration of training modules on solar energy, wind energy etc.

Ocean Energy: 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.

Geo thermal Energy: Geo thermal Resources, Geothermal Technologies.

UNIT – 3 **15 Hrs**

Hydro Energy: Hydro power resources, hydro power technologies, environmental impact of hydro power sources.

Piezo electric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezo electricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power.

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.

1.

References

1. Non-conventional energy sources, B.H. Khan, McGraw Hill., 3rdEdition,2017
2. Solar energy-Principles of Thermal collection and Storage. Suhas P Sukhatme, 15th Edition,TMH., 2006
3. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press. 3rd edition, 2012
4. Renewable Energy Source sand Emerging Technologies, Kothari D P, Singhal K C, RanjanRakesh,2nd Edition, PHI Learning, New Delhi,2011
5. Solar Energy: Resource Assessment Handbook, P.Jayakumar, e-book.,2009.

Semester II

ELECT2: ANALOG AND DIGITAL ELECTRONICS
SUBJECT CODE : BSCELC201

(Credits: Theory – 04, Practical – 02) Total

Teaching hours: 56Course Objectives :

Upon completing the syllabus contents of ELE-CT2, 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 appearin competitive examinations.

UNIT-1 **14 HOURS**

JFET–Types - p-channel and n-channel, working and I-V characteristics - n-channel JFET, parameters and their relationships, Comparison of BJT and JFET. MOSFET:E – MOSFET, D – MOSFET – n-channel and p-channel, Construction, working, symbols, biasing, drain and transfer characteristics, CMOS logic, CMOS – inverter, circuit and working, CMOS characteristics.

UJT - basic construction, working, equivalent circuit and I-V 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 PracticalOp-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 andDifference Amplifier, Differentiator, Integrator, Comparator and Zero-crossing detector,

Filters: First and second order active low pass, high pass Butterworth filters. Oscillators: Barkhausen criterion for sustained oscillations, Colpitt‟s oscillator and crystal oscillators using transistor, Phase Shift oscillator,Wien-bridge oscillator – (no derivation for each)

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

UNIT-3 **14 HOURS**

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

Combinational Logic Circuits: Minimisation techniques using K-maps - SOP and POS, Minterm, Maxterm, SSOP, SPOS, Simplification of Boolean expressions, K-Map 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 methodperformance characteristic

Design of Arithmetic logic circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor.

4- bit parallel binary adder, Encoder, decimal to BCD priority encoder. Decoder, 2:4 decoder using AND gates, 3:8 decoder using NAND gates, 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 14 HOURS

Sequential Logic Circuits: Flip-Flops - SR Latch, RS, D and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around 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, 4bit Up-Down counter, Synchronous Counter: 4-bit counter, Design of decade Counters using K-maps.

Course Outcomes

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

1. Reproduce the I-V characteristics of various MOSFET devices,
2. Apply standard device models to explain/calculate critical internal parametersof semiconductor devices.
3. Explain the behavior and characteristics of power devices such as UJT, SCR, Diac, Triac etc.
4. Perform experiments for studying the behavior of semiconductor devices.
5. Calculate various device parameters‟ values from their IV characteristics.
6. Interpret the experimental data for better understanding the device behaviour.
7. Understandbasic logic gates, concepts of Boolean algebra and techniques toreduce/simplify Boolean expressions
8. Analyze combinatorial and sequential circuits

Reference Books:

1. Electronic devices and circuit theory by Boylestad, Robert Nashelsky
2. Electronic Devices Conventional Current Version by Thomas L. Floyd 15 (3) David A. Bell “
3. 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 UniversityPress.
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, TataMcGraw
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 McGraw- Hill (1994)
13. Digital Electronics, S.K. Mandal, 2010, 1st edition, McGraw Hill ELE-

ELE-CP2: ANALOG AND DIGITAL ELECTRONICS – Lab

SUBJECT CODE :: BSCELP202

(Hardware and Circuit Simulation Software)

PART A (Any FIVE)

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 Colpitt's and crystal oscillator using transistor.
12. Astablemultivibrator using IC555 timer.
13. Monostablemultivibrator using IC555 timer.

PART B (Any SEVEN)

14. Half Adderand Full Adder using (a) logic gates (b) using only NAND gates.
15. HalfSubtractor 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 JKFlip-Flops using NAND gates.
22. Study of 4-bit asynchronous counter using JK Flip-Flop IC7476, modify to decade counterand 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 ofresolution, accuracy and linearity error.

ELE-OE 2.1: Mobile Communication

SUBJECT CODE :: BSCELOE201

(Credits: Theory – 02, Demonstration Lab– 01) Total Teaching hours: 45

Course Outcomes(COs):

At the end of the course the student should be able to:

1. Aptitude to apply Logic thinking and Basic Science knowledge for problem solving invariousfields of electronics both in industries and research.
2. To acquire experimental skills, analyzing the results and interpretdata.
3. Abilitytodesign/develop/manage/operationandmaintenanceofsophisticatedelectronic gadgets / systems / processes that conforms to a given specification within ethicaland economic constraints.
4. Capacity to identify and implementation of the formulate to solve the electronic related issues and analyze the problems in various sub disciplines of electronics.
5. Capability to understand the modern communication devices and technology.

Unit 1

Evolution of mobile radio communication-Examples of wireless communication system: paging systems, cordless telephone system, cellular telephone system- Trends in cellular radio and personal communication systems

Unit 2

Frequencies for radio transmission- Basics of multiplexing and multiple access techniques-CDMA-Cellular system concepts- Frequency reuse- Channel assignment and handoff strategies- Improving capacity in cellular system: cell splitting, sectoring, repeaters for range extension, a microcell zone concept.

Unit 3

Introduction to telecommunicating system- GSM: mobile services (Bearer services, tele-services, supplementary services), system architecture (radio subsystem, network and switching subsystem, operation sub system)

Unit 4

Satellite system: history, application, basics, routing, localization and handover- Broadcast system: digital audio broadcasting, digital video broadcasting (basic concepts).

Unit 5

Wireless LAN-Infrared vs radio transmission- Bluetooth: user scenarios and architecture-Wimax: basic concepts and features- Wi-Fi - basic concepts.

Reference Book

1. Rapapport T. S, ’Wireless Communication Principles and Practices’, Pearson EducationAsia, New Delhi, 3rd Ed.2003.
2. JochenSchiller,’Mobile communication ‘Pearson Education,Asia.
3. Vijay K Garg, Joseph E Wilkes,’ Principles and Applications of GSM’, Pearson Edu.