COURSE-WISE SYLLABUS
Semester I

Year	I	**Course Code: 21BSC1C1ELE1L**	**Credits**	**04**
Sem.	1	**Course Title: ELECTRONIC DEVICES AND CIRCUITS**	**Hours**	**52**

Course Pre-requisites, if any	NA	
Formative Assessment Marks: 40	Summative Assessment Marks: 60	Duration of ESA: 2 hrs.

Course Outcomes	At the end of the course the student should be able to: 1. At the end of the course the student should be able to: 2. Study and analyse basic networks using network theorems in a systematic manner. 3. Build simple electronic circuits used in various applications. 4. Describe the behaviour of basic semiconductor devices 5. Reproduce the I-V characteristics of diode/BJT devices 6. Describe the frequency response of BJT amplifiers. 7. Explain the behaviour, characteristics and applications of Varactor diode, Schottky diode, Tunnel diode, LED, LCD and solar cells. 8. Apply standard device models to explain/calculate critical internal parameters of semiconductor devices. 9. 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.

Unit No.	**Course Content**	**Hours**
Unit- I	**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. AC analysis of RC and RL circuits, RLC series and parallel circuits, Resonant circuits. **PN junction diode:** Ideal and practical diodes, Formation of Depletion Layer, Diode 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 foroutput voltage, ripple factor and efficiency (mention only), **Filters:** Filters and types of filters, Capacitor filter, Series inductor filter, Chock input or LC filter and Capacitor input filter, Comparison between them (study of wave forms qualitative). (Numerical examples wherever applicable).	**13**
Unit- II	**Voltage regulator:** Concept of voltage regulation, Block diagram of regulated power supply, Line and Load regulation, Zener diode as voltage regulator, advantages and 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, CE, CB and CC configurations (mention only), V-I characteristics of a transistor in CE mode, Regions of operation (active, cut off and saturation), leakage currents (mention only), Current gains α, β and γ and their inter-relations, dc load line and Q point. Applications of transistor as amplifier and switch - circuit and working. (Numerical examples wherever applicable).	**13**

Unit -III	**Transistor biasing and Stabilization circuits**- Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor. Two-port network: z,y,h parameters of a two port network. 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 CC amplifier. Class A, B and C Amplifiers (qualitative). Types of coupling, two stage RC Coupled Amplifier – circuit, working and its Frequency Response, GBW product. **Special semiconductor diodes: C**onstruction, characteristics, working, symbol, and applications for LED, LCD solar cell and 7-segment display, concept of common anode and common cathode types. (Numerical problems, whereverapplicable)	**13**
Unit -IV	**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. **Boolean Algebra:** 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).	**13**
Recommended Leaning Resources		
Reference Books	1. VK Mehta "Principles of Electronics" 2. N N Bhargav "Basic Electronics" 3. A Sudhakar "Network Analysis" 4. R S Sedha "Applied Electronics" 5. Brijlal and Subramanayam "Electricity and Magnetism" 6. Robert L Boylestad, "Introductory circuit analysis", 5th edition., Universal Book-2003. 7. A.P. Malvino, "Principles of Electronics", 7th edition. TMH, 2011. 8. Electronic devices and circuit theory by Boylestad, Robert Nashelsky. 9. David A. Bell "Electronic Devices and Circuits", 5th Edition, Oxford Uni. Press, 2015 10. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994) 11. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill. 12. Digital Systems: Principles & Applications, R.J. Tocci, N.S.Widmer, 2001, PHI Learning.	

Laboratory Experiments:

Year	I	Course Code: 21BSC1C1ELE1P	Credits	2
Sem.	1	Course Title: Electronic Devices and Circuits *(Hardware and Circuit Simulation Software)*	Hours	4 Hrs/week
Formative Assessment Marks: 25		Summative Assessment Marks:25	Duration of ESA: 4 hrs.	

Sl. No	Experiment
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 Theorem / Verification of Norton's Theorem.
3	Verification of Maximum Power Transfer Theorem.
4	Verification of Superposition Theorem.
5	Study of the I-V Characteristics of Zener diode.
6	Study of the I-V Characteristics of LEDs of two different colours and 7-segment display.
7	Study of Half wave rectifier without and with shunt capacitor filter– ripplefactor for different values of filter capacitors.
8	Study of full wave bridge rectifier without and with shunt capacitor filter –ripple factor for different values of filter capacitors.
9	Study of Zener diode as a Voltage Regulator using bridge rectifier with shunt capacitor filter [Load and line regulation].
10	Study of Clipping, Clamping and Voltage Multiplier circuits.
11	Designing and testing of fixed positive and negative voltage regulators using 78xx and 79xx series ICs (Using bridge rectifier and shunt capacitor filter).
12	Designing and testing of variable voltage regulator using IC LM317 (Using bridge rectifier and shunt capacitor filter).
13	Study of Transistor characteristics in CE configuration – determination of h- parameters.
14	Study of Fixed Bias and Voltage divider bias circuits – comparison for different β values
15	Study of single stage CE amplifier (frequency response, input and output impedances in mid-band)
16	Study of two-stage RC-coupled CE amplifier (AV1, AV2, AV) at mid-band frequency.
17	Study of Series and Parallel Resonance circuits – determination of its (a) Resonant frequency (b) Impedance at resonance (c) Bandwidth (d) Quality Factor
18	Verification of truth tables of OR, AND, NOT, NAND, NOR, XOR and XNOR gates using respective ICs. Realization of XOR and XNOR using basic gates.
19	Universal property of NAND and NOR gates.
20	Binary to Gray and Gray to Binary code conversion and parity checker using XOR gates IC 7486

OPEN ELECTIVE

Year	I	Course Code: 21BSC1O1ELE1	Credits	03
Sem.	1	Course Title: Basics of Electronics, Computers and PCB Design	Hours	40

Course Pre-requisites, if any	NA	
Formative Assessment Marks: 40	Summative Assessment Marks: 60	Duration of ESA: 2 hrs.

Unit No.	Course Content	Hours
Unit- I	**Basics Electronics:** Basic circuit elements (Resistor, Inductor & Capacitor), Basic principle of Transformer. Wave form types (Sine, Square, Triangular, Trigger pulses & Saw tooth). Voltage & Current sources. Ohms law, Kirchhoff's laws- Statement. Basics of Semiconductor Diode, Zener diode, LED, Transistor (Symbol and types only), Basics of IC. **COMPUTER CONCEPTS:** Introduction to computer, brief history of computer generations, block diagram of Computer system, central processing unit (CPU), ALU, Control Unit, main memory, Secondary memory, Cache memory. **Hardware:** Input devices (Key board, mouse and scanner). Output devices (various types of printers). Secondary storage devices (CDROM, optical disk). **Software:** System software, Operating system & Application software. Machine Language, Assembly Language & High-Level Language. Assembler, Compiler and Editor. Algorithm, Characteristics of an algorithm and flow charts. **Inverter:** Inverter, Uninterrupted Power supply (UPS) – online and off line UPS, SMPS.	**10**
Unit- II	**PCB Design:** Types of PCB, Single sided board – double sided – Multilayer boards – Plated through holes technology – Benefits of Surface Mount Technology (SMT) – Limitation of SMT – Surface mount components: Resistors, Capacitor, Inductor, Diode and IC's. **LAYOUT AND ARTWORK:** Layout Planning – General rules of Layout – Resistance, Capacitance and Inductance – Conductor Spacing – Supply and Ground Conductors – Component Placing and mounting–Cooling requirement and package density–Layout check. Basic artwork approaches– Artwork taping guideline–General artwork rules– artwork check and Inspection.	**10**
Unit -III	**LAMINATES AND PHOTO PRINTING:** Manufacture of copper clad laminates – Properties of laminates – Types of Laminates – Manual cleaning process – Basic printing process for double sided PCB's – Photo resists – wet film resists – Coating process for wet film resists – Exposure and further process for wet film resists – Dry film resists.	**10**
Unit -IV	**ETCHING AND SOLDERING:** Introduction – Etching machine – Etchant system. Soldering: Principles of Solder connection – Solder joints – Solder alloys – Soldering fluxes. **Soldering Tools:** Soldering, Desoldering tools and Techniques – Man Soldering – Solder mask – Safety, health and medical aspects in Soldering practice.	**10**
Laboratory Demonstration	1. Unboxing and assembling of desktop computers, 2. Types of PCB and fabrication process.	
Recommended Leaning Resources		

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Reference Books	1. Computer fundamentals - Anita Goel, Pearson Edition. 2. Fundamentals of Computers - V Rajaram, NeeharikaAdabala - PHI. 3. Computer Fundamentals - Peter Norton, McGraw-Hill Education 4. Walter C. Bosshart “PCB Design and Technology” Tata McGraw Hill, Publications, Delhi. 1983. 5. Clyde F. Coombs “Printed circuits Handbook” III Edition McGraw-Hill Kraig Mitzner, “Complete PCB Design Using OrCAD Capture and Layout,” Elsevier, Amsterdam, 6. Walter C Bosshart, “Printed Circuit Board Design and Technology”,1st ed., McGraw Hill Education