Gondwana University, Gadchiroli

Choice Based Credit System (CBCS) Syllabus

B. Sc. I

Subject: Electronics

Semester-I & II

Board of Studies - Electronics

Gondwana University Gadchiroli

Scheme of Bachelor of Science for CBCS Semester Examination

Gondwana University, Gadchiroli

Subject: Electronics

Class	Semester	Paper	Teaching Scheme Per Week			Examination Scheme				
			Theory	Total	Practical	Theory Marks			Practical Marks	Total Marks
						Paper	Internal Assessment	Total		
B.Sc.I	I	I	3	6 + 1T*	6	50	10	120	30	150
		II	3			50	10			
	II	I	3	6 + 1T*	6	50	10	120	30	150
		II	3			50	10			
B.Sc. II	III	I	3	6 + 2T*	6	50	10	120	30	150
		II	3			50	10			
	IV	I	3	6 + 2T*	6	50	10	120	30	150
		II	3			50	10			
B.Sc.III	V	I	3	6 + 2T*	6	50	10	120	30	150
		II	3			50	10			
	VI	I	3	6 + 2T*	6	50	10	120	30	150
		II	3			50	10			

* Periods for Tutorials per batch.

** **The student should appear in the University practical examination otherwise he/she will be treated as a failed. However their internal marks will be carried forward.**

Pattern of Question Papers (UG)

Time : 3 Hours

Maximum marks : 50

Question No.	**Marks Allotted**
Qu. 1 Either	
From Unit - I	10
Or	
From Unit - I	10
Qu. 2 Either	
From Unit - II	10
Or	
From Unit - II	10
Qu. 3 Either	
From Unit - III	10
Or	
From Unit - III	10
Qu. 4 Either	
From Unit - IV	10
Or	
From Unit - IV	10
Q.5 Solve any 10 out of 12 questions	10 marks
(3 questions from each unit)	1 mark each

The above pattern is for all papers of each semester of B. Sc. I, w.e.f. 2016-2017 and for B.Sc. II and B.Sc. III from subsequent years.

Details of the Syllabus

B.Sc. (First Year)

Subject: Electronics

Scheme for Semester-I

W.E.F. 2016-17

Paper	No. of Periods per week (48 minutes each)			Marks				
	Lecture	Practical	Tutorial	Theory	Internal Assessment	Theory Total	Practical	Total
Paper – I (USELT01) Network Analysis and Digital Fundamentals	3	6	1	50	10	120	30	150
Paper – II (USELT02) Semiconductor Diodes and Analog Electronics	3			50	10			

CHOICE BASED CREDIT SYSTEM

B. Sc. SEM-I

ELECTONICS

Paper-I (USELT01)

(Network Analysis and Digital Fundamentals)

Theory: 48 Lectures **Credit 02**

UNIT-I: Concept of Voltage and Current Sources. Kirchhoff's Current Law, Kirchhoff's Voltage Law, Mesh Analysis, Node Analysis, Star and Delta networks, Star-Delta Conversion, Principle of Duality, Superposition Theorem, (Simple numericals). **12L**

UNIT-II: Thevenin's Theorem, Norton's Theorem, Reciprocity Theorem, Maximum Power Transfer Theorem, Two Port Networks: h, y and z parameters and their conversion. (Simple Numericals). **12L**

Unit-III: *Number systems and codes*: Decimal, binary, octal and hexadecimal number systems, base (radix) conversions, representation of signed and unsigned numbers, *BCD code*: 8421 code, Excess-3 code, gray code and parity code. Binary, octal and hexadecimal arithmetic: addition, subtraction by 1's and 2's complement methods (Simple numerical). **12L**

Unit-IV: *Logic gates and Boolean algebra*: Basic logic gates; AND, OR and NOT gates ,universal gates: NAND and NOR gates, combinational gates: XOR and XNOR gates, Basic postulates and fundamentals theorem of Boolean algebra, Application of XOR gate as a controlled inverter. **12L**

Paper-II (USELT02)

(Semiconductor Diodes and Analog Electronics)

Theory: 48 Lectures **Credit 02**

UNIT-I: *Junction Diode and its applications:* PN junction diode (Ideal and practical)– Constructions, Formation of Depletion Layer, Diode Equation and I-V characteristics, Idea of static and dynamic resistance, dc load line analysis, Quiescent (Q) point, Zener diode, Reverse saturation current, Zener and avalanche breakdown, Schottky diode, (Simple numericals). **12L**

UNIT-II: *Rectifiers*- Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms ripple factor and efficiency. Filter-Shunt capacitor filter, its role in power supply, output waveform, and working. *Regulation*- Line and load regulation, Zener diode as voltage regulator and explanation for load and line regulation, (Simple numericals). **12L**

UNIT-III: *Bipolar Junction Transistor*: Review of the characteristics of transistor in CE and CB configurations, Regions of operation (active, cut-off and saturation), Current gains α and β, Relations between α and β, dc load line and Q point. *Amplifiers*: Transistor biasing and Stabilization circuits, Fixed Bias and Voltage Divider Bias, Thermal runaway, stability and stability factor S, (Simple numericals). **12L**

UNIT-IV: Transistor as a two Port network, h-parameter equivalent circuit for CE, CB and CC configuration, Small signal analysis of single stage CE amplifier: Hybrid equivalent circuit, Input and Output impedance, Current and Voltage gains. *RC Coupled Amplifier*: derivation of voltage gain in mid, low and high frequency range using h-parameters, (Simple numericals). **12L**

Theory Internal Assessment (20 marks)

Sr.No.	Internal Assessment	P-I	P-II	T (20)
01	Assignment	02	02	04
02	Class test	05	05	10
03	Active participation in routine class activities / seminars etc.	03	03	06
	Total	**10**	**10**	**20**

PRACTICALS (Conducted by internal examiner) (USELP01)

It is divided into two sections i.e. Section-A and Section-B. At least five experiments from each section must be performed and the practical record book duly signed should be submitted at the time of examination. Each student is expected to perform one experiment from each section, in the University Examination. The duration of practical examination is six hours.

Marks Distribution:

	Record	Experiment	Viva	Total
Section – A	3	9	3	15
Section – B	3	9	3	15
			Total	**30**

Section A: List of Experiments:

1. Measurement of Amplitude, Frequency & Phase difference using Oscilloscope.

2. Verification of Thevenin's theorem.
3. Verification of Superposition Theorem.
4. Verification of the Maximum Power Transfer Theorem.
5. Study of basic logic gates.
6. Study of NAND gate as a universal gate.
7. Study of NOR gate as a universal gate
8. Study of Ex – OR gate.
9. Study of Ex – NOR gate.
10. Verification of truth table for given Boolean expression.
11. Study of Demorgan's theorems.

Section B: List of Experiments:

1. Identification and testing of basic electronic components R, C, L, diodes and transistors.
2. Study of laboratory instruments digital Multimeter, Function Generator and Oscilloscope.
3. Study of the F.B. I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode.
4. Study of the R.B. I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode.
5. Study of Half wave rectifier.
6. Study of center tap Full wave rectifier.
7. Study of Full wave Bridge rectifier.
8. Study of the Zener voltage regulator (Load regulation).
9. Study of BJT input- output characteristics.
10. Study of Voltage divider bias configuration for CE transistor.
11. Study of a Single Stage CE amplifier of given gain.

Note: An Industrial visit / Study tour may be arranged during the academic year.

Reference Books:

1. Elements of Electronics by, Singh, Bagade
2. Principle of Electronics by, V. K. Mehta
3. Electronics Devices and Circuit by, Allen Mottershed
4. Basic electronics – B.L. Thareja
5. Basic electronics Linear Circuits – R.N. Bhargawa
6. Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004)
7. Electrical Circuits, M. Nahvi& J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005)
8. Electrical Circuits, M. Nahvi & J. Edminister, Schaum's Outline Series, Tata
9. McGraw-Hill (2005)
10. Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press
11. Network, Lines and Fields, J.D. Ryder, Prentice Hall of India.
12. Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.
13. Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill
14. Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning
15. Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata

McGraw-Hill (2005)
16. Digital and Analogue Technique by, Navneeth, Kale and Gokhale.
17. Modern Digital Electronics by, R. P. Jain

Details of the Syllabus
B.Sc. (First Year)
Subject: Electronics
Scheme for Semester-II
W.E.F. 2016-17

Paper	No. of Periods per week (48 minutes each)			Marks				
	Lecture	Practical	Tutorial	Theory	Internal Assessment	Theory Total	Practical	Total
Paper – I (USELT03) **Unipolar Devices and Linear Integrated Circuits**	3	6	1	50	10	120	30	150
Paper – II (USELT04) **Digital Integrated Circuit**	3			50	10			

CHOICE BASED CREDIT SYSTEM
B. Sc. SEM-II
ELECTONICS

Paper-I (USELT03)
(Unipolar Devices and Linear Integrated Circuits)

Theory: 48Lectures **Credit 2**

UNIT-I: *Unipolar Devices*: JFET: Construction, working and I-V characteristics (output and transfer), Pinch-off voltage, comparison of BJT and FET, parameters of JFET, JFET as an amplifier (common source), Construction and working of MOSFET (depletion and enhancement), advantages and disadvantages of MOSFET, UJT: basic construction, working, equivalent circuit and I-V characteristics. **12L**

UNIT-II: *Classes of Amplifiers***:** Class A, B and C Amplifiers, *Cascaded Amplifiers*: Two stage RC Coupled, transformer coupled and direct coupled Amplifiers and their Frequency Response. *Feedback in Amplifiers*: Concept of feedback, negative and positive feedback, advantages of negative feedback. *Sinusoidal Oscillators*: Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator, Determination of Frequency and Condition of oscillation. **12L**

Unit-III: *Operational Amplifiers*- characteristic of an Ideal and Practical operational amplifier, introduction to DC amplifier, Difference Amplifier, need of two power supplies, working of difference amplifier, block diagram of op-Amp (IC 741), open and close loop configuration, Frequency response, parameters of op-amp, Differential , common mode gain and CMRR, Slew rate, (Simple numericals). **12L**

Unit-IV: *Applications of op-amp*: Concept of virtual ground, op-amp as an inverting amplifier, sign changer, as an non-inverting amplifier, unity gain amplifier, summing amplifier (as an adder), subtractor, integrator, differentiator, comparator, zero crossing detector, Schmitt trigger (Simple numericals). **12L**

Paper-II (USELT04)
(Digital Integrated Circuit)

Theory: 48Lectures **Credit 2**

UNIT-I: *Combinational logic Analysis and Design*: Standard representation of logic functions (SOP and POS), Minimization techniques (Karnaugh map minimization up to 4 variables for SOP), *Arithmetic circuits*: Binary addition, Half and Full adders, half and full subtractor, Four bit binary adder/subtractor using 2' compliment method (using IC7483 and IC7486). *Data Processing circuits*: Multiplexer (2:1, 4:1and 8:1 MUX), Demultiplexer (1:2, 1:4 and 1:8 DEMUX), Decoder, Encoder (decimal to BCD and priority encoder). **12L**

UNIT-II: Clock and Timer (IC 555), Introduction, Block diagram, Astable and Monostable multivibrator circuits, *Sequential circuits*: Clock (Level and Edge triggered), SR, Clocked SR, D, and JK flip-Flops, TFF, Preset and clear operations, Race around condition in JK Flip-Flop, Master- Slave JK (JKMS) Flip-Flop (Truth Tables and their Timing Diagram). **12L**

Unit-III: *Counters (4 Bits)*: Concept of counters, Types- Asynchronous and Synchronous, Asynchronous UP/Down counter, Modulus of a counter, Different Modified counters, decade counter, Synchronous Counter, Ring and Johnson counters (Truth Table and Timing Diagram). **12L**

Unit-IV: *Shift Registers(only up to 4-bits)*: SISO, SIPO, PISO and PIPO, *D-A and A-D conversion*: 4 bit binary weighted and R-2R D-A converters, circuit and working, Accuracy and Resolution, A-D conversion characteristics, single slope, dual slope and successive approximation ADC, Sample and hold circuit. **12L**

Theory Internal Assessment (20 marks)

Sr.No.	Internal Assessment	P-I	P-II	T (20)
01	Assignment	02	02	04
02	Class test	05	05	10
03	Active participation in routine class activities / seminars etc.	03	03	06
	Total	**10**	**10**	**20**

PRACTICALS (conducted by internal and external examiners) (USELP02):

It is divided into two sections i.e. Section-A and Section-B. At least five experiments from each section must be performed and the practical record book duly signed should be submitted at the time of examination. Each student is expected to perform one experiment from each section, in the University Examination. The duration of practical examination is six hours.

Marks Distribution:

	Record	Experiment	Viva	Total
Section – A	3	9	3	15
Section – B	3	9	3	15
			Total	**30**

Section-A: List of Experiments:

1. Study of the output and transfer I-V characteristics of common source JFET.
2. Study of the I-V Characteristics of UJT.
3. Study of the RC Phase Shift Oscillator.
4. Study of RC coupled amplifier (frequency response).
5. Study of the Colpitt's Oscillator.
6. Study of an inverting amplifier using Op-amp (741) for dc voltage.
7. Study of non-inverting amplifier using Op-amp (741) for dc voltage.
8. Study of adder using Op-amp (for dc).
9. Study of subtractor using Op-amp (for dc).
10. Study of an op-amp as an Integrator.
11. Study of op-amp as differentiator
12. Study of zero-crossing detector and comparator using op-amp.

Section-B: List of Experiments:

1. Study of Four bit binary adder/subtractor using 2' compliment method (using IC7483 and IC7486)
2. Study 2-line to 4-line decoder using basic gates.
3. Study of IC 7447 Seven Segment Decoder Driver.
4. Study of 4:1 MUX and Construction of 8:1 MUX using 4:1 MUX.
5. Study of 1:4 DEMUX and 1:8 DEMUX.
6. Study of RSFF, Clocked RSFF and DFF using NAND gates.
7. Study of JKFF using NAND gates.
8. Study of JKMS Flip-flop using IC 7476/NAND gates.
9. Study of four bit Up Counter using IC 7476.
10. Study of IC 7490 (for different modulus counter).
11. Study of IC 7493 (for different modulus counter).
12. Study of Ring Counter using IC 7476.
13. Study of Johnson Counter using IC 7476.
14. Study of SISO shift register using IC 7476.
15. Study of A/D converter.
16. Study of D/A converter.

Note: An Industrial visit / Study tour may be arranged during the academic year.

Reference Books:

1. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall
2. Digital and Analogue Technique by, Navneeth, Kale and Gokhale. Modern Digital Electronics by, R. P. Jain
3. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, Oxford University Press.
4. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011,Tata McGraw
5. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
6. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
7. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
8. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
9. Digital System Principle and Application by, R. J. Tocci
10. Digital Principles, R. L. Tokheim, Schaum's Outline Series, Tata McGraw- Hill (1994)
11. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
12. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
13. J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991)
14. Elements of Electronics by, Singh, Bagade
15. Principle of Electronics by, V. K. Mehta
16. Electronics Devices and Circuit by, Allen Mottershed
17. Basic electronics – B. L. Thareja