Shiksha Mandal's
BAJAJ COLLEGE OF SCIENCE, WARDHA.
(Formerly, Jankidevi Bajaj College of Science, Wardha)
Affiliated to RTM Nagpur University, Nagpur.

Syllabus For
Undergraduate Programme (B.Sc.) in Electronics

Note: ***Syllabus for B.Sc. Part I (SEM I & II) in Electronics is updated from the academic session 2021-22. Syllabus for B.Sc. Part II (SEM III & IV) and B.Sc. Part III (SEM V & VI) in Electronics will remain same till further notification.***

Programme Objective:

There are two main objectives to the B.Sc. Electronics Programme.

a) To produce electronic professionals who can be directly employed or start his/her own work as Electronic circuit designer, Electronics consultant, Testing professional, and even an entrepreneur in electronic industry.

b) To train students to a level where they can readily compete for seats for advanced degree courses like M.Sc. (Electronics).

On completion of the B.Sc. (Electronics) Programme, the student will:

a) Have sound knowledge of the theory behind core subjects like, Electronic components, Electronic measuring and testing instruments, Analog and Digital IC's, Electronic circuit design and implementation, Troubleshooting and maintenance of electronic and electrical devices.

b) Have sound skills in assembly Language and High Level Language programming, interfacing of electronic devices with computers, etc.

c) Be in a position to develop industrial and entrepreneur applications.

Scheme for Teaching, Evaluation and Examination Credit Based System (CBS) to be Implemented from 2021-22 Academic Session & Onwards for B.Sc. I, II & III.

Department of Electronics

No. of Paper: **One** Max. Marks : **120**

(Internal Assessment: **20**, End Semester Exam: **100**)

No. of Practical: **One** Max. Marks for Practical: **30**

(End Semester Exam: **30**)

No. of Lectures, Tutorials and Practicals (per week):

a) B. Sc. I : 6 Theory, 1Tutorial, 6 Practical/Batch,

b) B. Sc. II & III : 6 Theory, 2 Tutorial, 6 Practical/Batch.

Scheme:

Subject	Credits	Paper	Internal Assessment (Max.)	End Semester Exam. (Max.)	Total Marks	Min. Passing marks	No. of Hours	No. of Lectures
Electronics	6	Theory	20	100	120	48	60	80
		Practical	Nil	30	30	12	60	80

Internal Assessment

Theory:

SN	Evaluation type	Marks
1	Seminar	5
2	Unit Test(s)	5
3	Assignments	5
3	Overall Performance (based on overall conduct as a responsible learner, manners, sincerity, skill inarticulation, leadership qualities demonstrated through organizing, co-curricular activities, active participation in routine class, etc.)	5

Grade Awards:

Seven point rating scale is used for the evaluation of the performance of the students to provide letter grade for each course.

Range of percentage of Marks obtained	Grade Points	Grade	Remark (Not to be displayed on the transcripts)
136 - 150	10	O	Outstanding
121 - 135	9	A+	Excellent
106 - 120	8	A	Very Good
91- 105	7	B+	Good
76 - 90	6	B	Fair
61 - 75	5	C	Average
= 60	4	P	Below Average
< 60	0	F	Fail
Absent	0	AB	Fail

(Note: In case, the marks scored by the student fall in multiple grades, higher grade will be considered in the interest of the student)

Computation of Semester Grade Point Average (SGPA) for each semester:

$$\text{SGPA} = \frac{\sum \text{Credits in the subject X Grade points obtained}}{\text{Total credits in the semester}}$$

Computation of Cumulative Grade Point Average (CGPA) after completion of Program:

Sem-I		Sem-II		Sem-III		Sem-IV		Sem-V		Sem-VI	
Credits	SGPA	Credits	SGPA	Credits	SGPA	Credits	SGPA	Credits	SGPA	Credits	SGPA

$$\text{CGPA} = \frac{\sum (\text{Credits X SGPA})}{\text{Total credits in the program}}$$

SYLLABUS FOR B.Sc. PART I SEM I(ELECTRONICS) TO BE IMPLEMENTED FROM ACADEMIC SESSION 2021-22 APPROVED IN BoS MEETING HELD ON 09/04/2021

B.Sc. PART I - SEMESTER I

Course Name: **Analogue and Digital Electronics - I**

Subject code: ***UG-ELE(04)-S1-T***

Course Objective and Course Outcome Framework

SN	Course Objectives	Course Outcomes
	Students will try to learn:	*After successful completion of the course student will be able to:*
1.	To understand operation of basic electronic components and semiconductor devices.	Understand the current voltage characteristics of basic electronic components and semiconductor devices.
2.	To explain the basic concepts and laws of DC electrical networks and circuits and solve them using mesh, nodal and network theorems analysis techniques.	Assemble and analyze electronic circuits using mesh, nodal and network theorems analysis techniques.
3.	To understand operation of transistor, its various parameters of transistor and biasing modes.	Assemble and analyze transistor circuits.
4.	To understand number representation and conversion between different representation, and various binary codes.	Understand various number systems, binary codes and logic gates.
5.	To understand logic gates, Boolean algebra and K-map technique.	Assemble and analyze a digital logic circuit based on logic gates, Boolean algebra and K-map technique.
6.	To analyze logic processes and implement logical operations using combinational logic circuits.	Assemble and analyze various combinational logic circuits.

B.Sc. PART I - SEMESTER I

Course Name: **Analogue and Digital Electronics - I**

Subject code: ***UG-ELE(04)-S1-T***

Course Outline

Unit I

Passive components: Definition, types, identification and uses of electronic components: Resistors, Capacitors, Inductors.

Introduction to Switches, Transformers and Relays.

Introduction to surface mounting devices.

Basics of CRO.

Ideal Voltage and Current sources (Internal impedance of battery and its effect on its performance), Kirchoff's current and voltage laws, Voltage and current divider circuits.

Unit II

Superposition, Thevenin, Norton, Maximum power transfer theorems (Statement and simple numerical based on DC circuits only).

Introduction to semiconductors: Concept of energy band diagram (Conductor, Semiconductor, Insulator) , Intrinsic and extrinsic semiconductor (P type, N type), diffusion junction, depletion layer, Barrier potential, Avalanche and Zener effect.

Unit III

Construction, working, characteristics and applications of PN Junction diode, Zener diode, and Light Emitting diode.

Construction and working of BJT, Modes of B.J.T. (CE, CC, CB), transistor equation; α, β and their relationship, junction biasing, Input, output and transfer characteristics of BJT in CE mode, Transistor Biasing (Voltage divider and emitter biasing only), DC load line, Q point, transistor as switch.

Unit IV

Number Systems: Decimal, Binary, Octal, Hexadecimal, representation of integer, fraction and mixed numbers, Mutual conversions, Binary addition, Complement of binary numbers, Binary subtraction using 1's and 2's complement method, SM representation of binary numbers. Binary codes- BCD, 8421, Excess 3, Parity and Gray code.

Unit V

Logic gates: Logic, symbol and truth table of OR, AND, NOT, NAND, NOR, XOR and XNOR gates.

Boolean algebra: Boolean Laws, double inversion, Duality and De Morgan's theorems, Use of NAND and NOR gate as universal building blocks.

Karnaugh Maps: Concept of standard SOP and POS, Pair, Quads, Octets, minterm, maxterm in K Map, K-map for 2,3 and 4 variables, , Simplification of SOP and POS logic expressions using K-map.

Unit VI

Combinational Logic Circuits: Half Adder, Full adder, Half subtracter and Full subtracter, 4-bit Full adder/ subtracter, Concept and implementation of decimal to BCD encoder using logic gates, Concept and implementation of 2:4, 3:8 and BCD to 7 segment decoder using logic gates, Parity generator and checker, Concept of multiplexer, 4:1 mux using logic gates , Concept of demultiplexer, 1:4 demultiplexer using logic gates.

B.Sc. I (SEM I) ELECTRONICS PRACTICALS

Subject code: UG-ELE(04)-S1-P

Students are expected to perform at least 5 experiments from section A and 5 experiments from section B.

Section A

1. Study of laws of series resistor and application as voltage divider.
2. Study of laws of parallel resistor and application as current divider.
3. Study of laws of series capacitor and application as voltage divider.
4. Study of laws of parallel capacitor and application as current divider.
5. Verification of Terman's equation for inductance. Reactance characteristics of inductor
6. Study of transformer.
7. Study of battery as practical (i) voltage source (ii) current source.
8. Study of maximum power transfer.
9. Study of Forward Bias characteristics of diode. (PN & LED)
10. Study of Reverse Bias characteristics of Zener diode.

11. Study of Characteristics of BJT. (Input, Output, Transfer)
12. Study of voltage divider biasing of transistor.
13. Verification of Norton's Theorem.
14. Verification of Thevenin's Theorem.

Section B

1. Study of basic logic gates.
2. Study of NAND as universal gate.
3. Study of NOR as universal gate.
4. Verification of Demorgan's Theorem.
5. Simplification of logic expressions using Boolean algebra.
6. Study of binary to gray code converter using K map.
7. Study of gray to binary code converter using K map.
8. Study of Multiplexer using gates.
9. Study of De Multiplexer using gates.
10. Study of Multiplexer using IC.
11. Study of De- Multiplexer using IC
12. Study of BCD to 7 segment decoder.
13. Construction and study of half adder and full adder.
14. Construction and study of half subtracter and full subtracter.
15. Verification of Boolean laws & Verification of duality theorem.

REFERENCE BOOKS

1. Basic Electronics solid state physics B. L. Theraja, S. Chand and company
2. Electronic Devices and circuits Allen Mottershed, Prentice Hall of India Pvt. Ltd.
3. An Introduction to Electronics, R. G. Kale, U. K. Puranik, V. N. Pendse, A . A. Sakale, Kitab Mahal Publications.
4. Basic Electronics, Grob, Tata McGraw Hill
5. Electronic Devices, T. L. Floyd, Pearson Education Asia
6. Electronic Principles, Malvino ,Tata McGraw Hill
7. Electronic components and materials, Madhuri Joshi, Schroff pub. And Distributors

8. Electronic components and materials, S. M. Dhir, TMH
9. Network analysis, Van Valkenburg, PHI
10. Digital principles and applications, A. P. Malvino, D. P. Leach McGraw Hill Book Co.
11. Principles of digital Electronics, M. B. Matsagar, V. S. Kale, Vision publication
12. Modern Digital Electronics, R. P. Jain Tata McGraw Hill publishing co.ltd
13. Digital Fundamentals, Floyd, Jain, Pearson
14. 2000 solved problems in digital Electronics, S. P. Bali, Tata McGraw Hill publishing co. ltd.
15. Electronic circuits and systems: Analog and digital, Y. N. Bapat, Tata McGraw Hill publishing co. ltd.
16. Digital Electronics and Logic Design, B. S. Nair, Prentice hall.
17. Digital Computer Electronics, Malvino, Brown Tata McGraw Hill
18. Fundamentals of Digital Electronics C.V.Dhuley and V.M. Ghodki.

Web Resources

Students are advised to make use of the resources available on the internet. Some useful links related to electronics are given below.

1. M.I.T. open course ware video lectures are available athttp://ocw.mit.edu/OcwWeb/Electrical-Engineering-and-Computer-Science/6-002Spring-2007/VideoLectures/index.htm
2. www.electronics-tutorials.com
3. http ://electronics .howstuffworks .com
4. www.science-ebooks.com/electronics
5. http://computer.howstuffworks.com
6. www.geocities.com/CapeCanaveral/1221/elec1.htm
7. http://101 science.com/eleclinks.htm
8. www.electro-tech-online.com/blogs/gayan-soyza/23-useful-electronic-links.html
9. www.discovercircuits.com/resources/tutorials.html
10. www.electronics-lab.com/
11. www.glolab.com/links/links.html etc

SYLLABUS FOR B.Sc. PART I SEM II(ELECTRONICS) TO BE IMPLEMENTED FROM ACADEMIC SESSION 2021-22 APPROVED IN BoS MEETING HELD ON 09/04/2021

B.Sc. PART I - SEMESTER II

Course Name: **Analogue and Digital Electronics - II**

Subject code: ***UG-ELE(04)-S2-T***

Course Objective and Course Outcome Framework

SN	Course Objectives *Students will try to learn:*	Course Outcomes *After successful completion of the course student will be able to:*
1.	To introduce hybrid parameters and their interrelationship and operation of JFET and MOSFET devices.	Learn the various h parameters and their interrelationship, able to solve numerical using two port parameters, Assemble and analyze the basic operations of JFET and MOSFET.
2.	To understand the operation and design of various types of power amplifier circuits.	Know about different power amplifier circuits, their design and use in electronics circuits.
3.	To understand operation of various power electronics semiconductor devices.	Understand the current voltage characteristics of various power electronics semiconductor devices.
4.	To understand concepts of various flip-flops.	Analyze, assemble and verify the truth tables of flip-flop circuits.
5.	To understand concepts of counters and shift registers.	Analyze assemble and verify truth tables of various counters and shift registers.
6.	To understand characteristics of TTL and CMOS logic family, memory and its expansion and their classification.	Classify different logic families, semiconductor memories, know their characteristics and expand the memory capacity.

B.Sc. PART I - SEMESTER II

Course Name: **Analogue and Digital Electronics - II**

Subject code: ***UG-ELE(04)-S2-T***

Course Outline

Unit I

Amplifier parameters, notations, concept and definition of h-parameters, open circuit and short circuit tests, Introduction to input impedance, output impedance, current, voltage and power gains using h parameters, classification of amplifiers (Descriptive ideas only).

Construction, working, characteristics and applications of FET and MOSFET (depletion and enhancement type), Parameters of JFET and their relationship parameters of MOSFET and their relationship.

Unit II

Introduction to power transistor, difference between Voltage and power amplifiers, transformer coupled class A power amplifier and its efficiency, class B Push-pull amplifier, derivation for efficiency, complementary symmetry power amplifier with two power supplies.

Unit III

Construction, working, characteristics and applications of Silicon Controlled Rectifier (SCR), DIAC, TRIAC , UJT and UJT as relaxation oscillator.

Unit IV

Sequential Logic Circuits- Concepts of Edge and Level Triggering, Propagation Delay, Set up time, Hold time of FF, R-S Flip Flop, Clocked R-S Flip Flop, Limitations of R-S FF, D FF, JK FF, preset and clear terminals of FF, Race around Condition of JK FF, JKMS FF.

Unit V

Counters: Asynchronous, Up/down, Decade, Synchronous, Modified counter, Ring Counter, Johnson counter (Truth tables and timing diagrams up to 4 bit).
Registers: Left shift, Right shift, SISO, SIPO, PISO and PIPO Registers.

Unit VI

Introduction to memories, classification, Memory expansion (word size and word capacity).
Logic Families: Characteristics of digital ICs, construction and working of TTL NAND

and NOR gates, construction and working of CMOS NAND and NOR gates, Tristate logic, comparison of TTL and CMOS logic families with respect to propagation delay, power consumption, noise immunity, noise margin, fan in and fan out.

B.Sc. I (SEM II) ELECTRONICS PRACTICALS

*Subject code: **UG-ELE(04)-S2-P***

Students are expected to perform at least 5 experiments from section A and 5 experiments from section B.

Section A

1. Study of JFET characteristics.
2. Study of MOSFET characteristics.
3. Study of SCR characteristics.
4. Study of DIAC characteristics.
5. Study of UJT characteristics.
6. Study of UJT as relaxation oscillator.
7. Study of Transistor as a switch.
8. Study of transistor as voltage amplifier using CRO.
9. Study of class A power amplifier.
10. Study of TRIAC characteristics.
11. Study of Band width in single stage amplifier.
12. Study of complementary symmetry power amplifier.

Section B

1. Switching characteristics of NOR.
2. Switching characteristics of NAND.
3. Study of RS Flip Flop using NAND/NOR gate.
4. Study of clocked RS Flip Flop using NAND/NOR gate.
5. Study of D Flip Flop using NAND/NOR gate.
6. Study of JK MS FF.
7. Construction and study of decade counter.
8. Study of mod-counter.
9. Study of ring counter.
10. Study of Johnson counter.

11. Study of SISO register.
12. Study of SIPO register.
13. Study of PISO register.
14. Study of PIPO register.
15. Construction and study of synchronous counter.

REFERENCE BOOKS

1. Principles of Electronics, V. K. Mehta, Rohit Mehta
2. Functional Circuits in Electronics, S. G. Pimpale, Sushama Pimpale, Mcmillan India ltd.
3. Electronics,Fundamental and applications, Ryder PHI
4. Elements of electronics M. K.Bagde, S. P. Singh, Kamal Singh, S.Chand
5. Op-Amp and Linear Circuits, Gaikwad, PHI
6. Electronic Instrumentation, Khedkar
7. Monograph on electronic design principles, Goel, Khaitan Khanna publisher
8. Basic Electronics and Linear Cicuits, Bhargava, Kulshreshtha, Gupta, Technical education series
9. Electronic Devices & Circuits I & II, A. P. Godse, U. P. Bakshi Technical Publishers Pune.
10. Digital principles and applications A. P. Malvino, D. P. Leach, McGraw Hill Book Co.
11. Principles of Digital Electronics, M. B. Matsagar, V. S.Kale, Vision publication
12. Modern Digital Electronics, R.P.Jain, Tata McGraw Hill publishing co. ltd
13. Digital fundamentals, Floyd, Jain, Pearson
14. 2000 solved problems in digital Electronics, S. P. Bali, Tata McGraw Hill publishing co.ltd.
15. Electronic circuits and systems: Analog and digital,Y. N. Bapat, Tata McGraw Hill publishing co.ltd.
16. Digital Electronics and Logic Design, B. S. Nair, Prentice hall
17. Digital Computer Electronics, Malvino, Brown, Tata McGraw Hill
18. Fundamentals of Digital Electronics, C.V.Dhuley and V.M. Ghodki

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2. www.electronics-tutorials.com
3. http ://electronics .howstuffworks .com
4. www.science-ebooks.com/electronics
5. http://computer.howstuffworks.com
6. www.geocities.com/CapeCanaveral/1221/elec1.htm
7. http://101 science.com/eleclinks.htm
8. www.electro-tech-online.com/blogs/gayan-soyza/23-useful-electronic-links.html
9. www.discovercircuits.com/resources/tutorials.html
10. www.electronics-lab.com/
11. www.glolab.com/links/links.html etc