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	Course Outcomes
	Students will try to learn:	*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.
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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

Dr. V. V. Shinde
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APPROVED

[redacted] SYLLABUS FOR B.Sc. PART II (ELECTRONICS) TO BE IMPLEMENTED FROM ACADEMIC SESSION 2022-23

B.Sc. PART II - SEMESTER III

Course Name: **Op-Amp, Power Supply, IC 555 and Circuit Maker**

Subject code: UG-ELE(04)-S3-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 the concepts, working principles and key parameters of operational amplifier.	Understand the fundamentals and working principles of operational amplifier.
2.	To perform analysis of operational amplifier circuits based on negative and positive feedback applications.	Demonstrate the ability to design practical circuits based on negative and positive feedback applications that perform the desired operations.
3.	To understand operation of rectifier, filter, regulator and various parameters associated with power supply.	Understand the concept and operation of rectifier, filter, regulator and various parameters associated with power supply.
4.	To understand operation of regulated power supply and apply concepts for the design of regulated power supply.	Analyze and assemble regulated power supply using 78XX and 723 IC.
5.	To understand the operation and use of 555 timer IC.	Analyze and assemble various timer circuits using 555 IC.
6.	To study the analysis of circuit design using circuit maker simulation software.	Understand the behavior of the electronic circuits.

13.4.2022.

B.Sc. PART II - SEMESTER III

Course Name: **Op-Amp, Power Supply, IC 555 and Circuit Maker**

Subject code: UG-ELE(04)-S3-T

Course Outline

Unit I

RC coupled amplifier, Advantages and disadvantages, DC coupled amplifier, Advantages and disadvantages, Difference amplifier, Need of two power supplies, working of difference amplifier, differential mode gain, common mode gain, CMRR., Block diagram of OPAMP, Parameters of OP AMP and characteristics of an ideal OP AMP, Open and closed loop operation.

Unit II

Applications of OPAMP: Concept of virtual ground, OP AMP as an inverting amplifier, Sign changer circuit, Non-inverting amplifier, Unity gain amplifier, Adder, Subtractor, Integrator, Differentiator, Comparator, Zero crossing detector, Schmitt trigger.

Unit III

Introduction to power supply: Half wave, full wave and bridge rectifier, Concept of filter (capacitive). Introduction to unregulated, regulated power supply, Power supply parameters: Ripple factor, Efficiency, Line regulation, Load regulation, Zener regulator, Regulated power supply design using series pass transistor, short circuit protection.

Unit IV

General features of IC regulators, design of fixed and variable power supply, 78xx,79xx , LM 317, Design of dual power supply, LM 317 as variable regulator, Limitations of linear regulator, Switching regulator- (SMPS), Concept of Low Drop Out regulator (LDO).

Unit V

Timer IC 555: Pin and functional diagrams of IC 555, Description of functional diagram, Monostable multivibrator using IC 555, applications in monostable mode (missing pulse detector, linear ramp generator, frequency divider and pulse width modulation) and Astable multivibrator using IC 555, Applications in astable mode (FSK generator, pulse position modulator), Schmitt trigger using IC 555.

Unit VI

Introduction to circuit maker, basics, accessing tools & features, saving schematic options, file management, drawing a schematic, creating simple RC circuit,

setting up the analysis, running the simulation, mix signal simulation example. Digital logic simulation, setting of parameters, analysis of simple circuits.

B.Sc. II (SEM III) ELECTRONICS PRACTICALS

Subject code: UG-ELE(04)-S3-P

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

Section A

1. Study of Op-amp as inverting and sign changer amplifier.
2. Study of Op-amp as Non-inverting and unity gain amplifier.
3. Op-amp as adder and averaging amplifier.
4. Op-amp as difference amplifier. (Subtracter)
5. Op-amp as Integrator.
6. Op-amp as Differentiator
7. Op-amp as comparator and zero crossing detector.
8. Op-amp as Schmitt trigger.
9. Study of Half wave rectifier.
10. Study of Full wave rectifier.
11. Study of Full wave Bridge rectifier.
12. Study of Zener regulator.

Section B

1. Study of 78XX series regulators
2. Study of 79XX series regulators
3. Study of LM317 regulator
4. Study of astable multivibrator using IC555
5. Study of monostable multivibrator using IC555
6. Study of linear ramp generator using IC555
7. Frequency divider using IC555
8. Study transient & AC analysis of RC circuit
9. Study transient & AC analysis of different OP-Amp as comparator
10. Study transient & AC analysis of different OP-Amp as inverting

amplifier

11. Study CE amplifier parameters
12. Study of MOSFET Characteristics

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. Elements of electronics M. K.Bagde, S. P. Singh, Kamal Singh, S.Chand
4. Op-Amp and Linear Circuits, Gaikwad, PHI
5. Electronic Instrumentation, Khedkar
6. Basic Electronics and Linear Cicuits, Bhargava, Kulshreshtha, Gupta, Technical education series
7. Electronic Devices & Circuits I & II, A. P. Godse, U. P. Bakshi Technical Publishers, Pune.
8. Analogue and Digital technique, Navneeth, Kale. Gokhale,
9. Instrumentation devices and circuits, Rangan, Mani, Sharma
10. Linear Integrated Circuit by D. Roy Chaudhary
11. Op-Amps and Linear Integrated Circuits by Ramakant Gaikwad
12. Circuit maker mannual.

Web Resources

1. Students are advised to make use of the resources available on the internet. Some useful links related to electronics are given below.
2. 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
3. www.electronics-tutorials.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

B.Sc. PART II - SEMESTER IV

Course Name: **OP-AMP Applications & Electronic Instrumentation**

Subject code: ***UG-ELE(04)-S4-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 analyze the different RC and LC oscillator circuits using OPAMP and to determine the frequency of oscillation.	Assemble the different oscillator circuits using OPAMPs for various frequencies.
2.	To understand the operation and design of various multivibrator, S/H and IA circuits using OPAMP for a given specification.	Know and assemble multivibrator circuits using OPAMP in various configuration to determine its frequency.
3.	To understand A/D and D/A converters and analyze their characteristics and classification.	Classify, analyze and assemble A/D and D/A converters.
4.	To provide basic knowledge about the various types of transducers, sensors, actuators and instrumentation system based on these transducers.	Students will be able to explain principle of operation of various transducers, sensors, actuators and their use in developing electronic instrumentation system.
5.	To provide fundamental concepts of basic electronic and PC based instrumentation system.	Students will be able to describe various functional blocks of basic electronic and PC based instrumentation system.
6.	To provide fundamental knowledge of biomedical instrumentation system and its safety codes.	Students will be able to describe functional blocks of biomedical instrumentation system such as ECG,EEG and EMG and its safety codes.

B.Sc. PART II - SEMESTER IV

Course Name: **OP-AMP Applications & Electronic Instrumentation**

Subject code: UG-ELE(04)-S4-T

Course Outline

Unit I

Concept of feedback: Types- positive and negative feedback, Barkhausen criterion,Oscillators, types (AF and RF), basic oscillator action, L-C oscillator: Colpitts oscillator, RC oscillator using OP Amp ,Phase shift oscillator, Wein bridge oscillator, Oscillator stability, Crystal oscillator, NOT gate based crystal oscillator.

Unit II

Advanced applications of OPAMP: Astable multivibrator (asymmetric and symmetric), Monostable multivibrator (simple circuit) , Concept and working of sample and hold circuit, Concept of instrumentation amplifier (three OP Amp circuit) and working.

Unit III

Need of D/A and A/D converter, D/A converter and its Parameters: Range,Resolution, Linearity and speed, Types of D/A converter: Weighted type D/A, limitations of weighted type D/A, R-2R or binary ladder D/A converter using Op Amp.

Need for A/D conversion, Sampling theorem, Types of A/D converter: Single slope A/D converters, Dual slope A/D converter, Counter type, Successive approximation type, Flash type, Accuracy and resoltion of A/D concerter.

Unit IV

Sensors, Actuators, Transducers, Active and passive transducers, Characteristics (static and dynamic),
Passive : Thermister (NTC & PTC), LM35, L.D.R., Photo-transistor
Active : Piezo-electric transducer
Digital: Pressure sensor (MPXV4006DP).

Block diagram of temperature measurement system using thermister, and LM35, Advantages of LM35 over thermister, Lux meter using LDR, Colorimeter using LDR, Insect repellent using piezo buzzer.

Unit V

Block diagram for electronic system, Defining the system characteristics, Concept of calibration, Standards for calibration. Sysytem characteristics, Instrumentation Systems: Analog, Digital, Real, Virtual, Dedicated, Versatile, Stand alone, PC based

instrumentation system.

Unit VI

Biomedical Instrumentation: Biometrics, Man-Instrument system and its components, Introduction to physiological system of body, Problems encountered in measurement of living system, Sources and generation of bioelectric potentials, Resting and Action potentials, Block diagram and working of EEG, ECG and EMG, Electrical shock hazards, Precautions, Safety codes in biomedical instrumentation.

B.Sc. II (SEM IV) ELECTRONICS PRACTICALS

Subject code: UG-ELE(04)-S4-P

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

Section A

1. Study of OP-amp based Wein bridge oscillator.
2. Study of OP-amp based Phase shift oscillator.
3. Study of Colpitt's oscillator.
4. Study of Op-amp as astable multi vibrator.
5. Study of Op-amp as Mono stable multi vibrator.
6. Study of Instrumentation amplifier.
7. Study of successive approximation ADC.
8. Study of Flash type ADC.
9. Study of Single slope ADC.
10. Study of Dual slope ADC.
11. Study of Binary weighted DAC.
12. Study of ladder type DAC
13. Study of NOT gate based crystal oscillator.
14. Study of Sample and hold circuit.

Section B

1. Study transfer characteristics of NTC type thermister
2. Study resolution in characteristics of NTC type thermister
3. Study transfer characteristics of LM 35

4. Study transfer characteristics of Water heater (around 300W)
5. Study of ON/ OFF type thermo-state using LM 35
6. Study transfer characteristics of LDR
7. Study transfer characteristics of Piezo-electric transducer
8. Comparative study of accuracy in 3 ½ digit, 4 ½ digit, 5 ½ digit Multimeters
9. Directivity study of carbon Mic.
10. "Look up table" based o/p using microcontroller IC interface using R.T.C.

REFERENCE BOOKS

1. Digital and analogue Techniques, G. N. Navaneeth,V. M. Gokhale,R. G. Kale, Kitab Mahal.
2. Digital Principles and Applications, A. P. Malvino, D. P. Leach, McGraw Hill Book Co.
3. Op-Amp and Linear Circuits, Gaikwad, PHI,
4. Principles of Digital Electronics, M. B. Matsagar, V. S. Kale, Vision publication
5. Modern Digital Electronics, R. P. Jain, Tata McGraw Hill publishing co.ltd.
6. Digital Fundamentals, Floyd, Jain, Pearson,
7. 2000 Solved Problems in Digital Electronics, S. P. Bali, Tata McGraw Hill publishing co.ltd.
8. Electronic Circuits and Systems: Analog and Digital, Y.N.Bapat, Tata McGraw Hill Publishing co.ltd.
9. Digital Electronics and Logic Design, B. S. Nair, Prentice Hall
10. Digital Computer Electronics, Malvino, Brown, Tata McGraw Hill
11. Fundamentals of Digital Electronics, C.V.Dhuley and V.M. Ghodki Applied Electronics and Instrumentation, C. M. Dhir, Tata McGraw Hill
12. Digital Instrumentation, Bouwens, Tata McGraw Hill
13. Electronic Instrumentation, Khedkar
14. Modern Electronic Instrumentation and Measurement Techniques, Cooper, Prentice Hall.

Web Resources

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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/

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APPROVED SYLLABUS FOR B.Sc. PART III (ELECTRONICS)

B.Sc. PART III - SEMESTER V

Course Name: **Electronic Communication & Fundamentals of Microprocessor**

Subject code: UG-ELE(04)-S5-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 introduce students to electronic communication and various modulation and demodulation techniques of communication.	Use of different modulation and demodulation techniques used in analog communication and Identify and solve basic communication problems.
2.	To introduce students the concept and theory of propagation of signals and the various characteristics of different types of antennas.	Understand about various types of propagation signals. Analyze the radiation mechanisms of antennas and demonstrate knowledge of antennas in communication systems.
3.	To learn the basic elements of digital, optical fiber system, FAX and cellular communication.	Understand the concept and operation of digital, optical fiber system, FAX and cellular communication.
4.	To develop background and basic knowledge of 8085 microprocessor.	Draw and describe architecture of 8085 microprocessor.
5.	To write assembly language programs of 8085 microprocessor for various applications.	Write assembly language program for 8085 microprocessor.
6.	To know the different interfacing methods, DMA and basic knowledge of 8255 PPI and its interfacing to 8085 microprocessor.	Understand various interfacing schemes, DMA. Draw and describe architecture of 8255 PPI and its interfacing to 8085 microprocessor.

B.Sc. PART III - SEMESTER V

Course Name: **Electronic Communication & Fundamentals of Microprocessor**

Subject code: UG-ELE(04)-S5-T

Course Outline

Unit I

Introduction to Electronics communication, block diagram of communication system, Types of communication: analog, digital; simplex, duplex; baseband, modulated, concept of modulation, need for modulation, types of modulation (AM, FM, PM).

Unit II

Propagation modes of signals: ground waves, sky waves, Ionosphere and satellite; antenna fundamentals, basic principles and types.

Unit III

Digital communication: Introduction, synchronous, asynchronous transmission, Shannon theorem, ASK, FSK, and PSK modulation.

Fiber optic communication system, Advantages of FOC, concept of Fax, concept of cellular telephone, block diagram of cellular telephone, advantages

Unit IV

Block diagram of Intel 8085, ALU, Timing and control unit, General purpose registers, Accumulator, PC, SP, IR, ID, Interrupt, Address and Data bus multiplexing, Flags. Instruction Cycle: T-states, Fetch operation, Execute operation, Machine cycle.

Unit V

Addressing modes, instruction Set: Data transfer group, Arithmetic group, Logic group, Branch control group, I/O and machine control group, stack and subroutines, simple programs based on above instructions.

Unit VI

Need for interfacing, modes of data transfer, synchronous and asynchronous, interrupt driven, DMA, PPI 8255- Block diagram, modes, control word format.

B.Sc. III (SEM V) ELECTRONICS PRACTICALS

Subject code: UG-ELE(04)-S5-P

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

Section A

1. Study of Half duplex communication system using PC/µC (2 wire interface),
2. Study of Full duplex communication system using PC/µC (3 wire interface),
3. ASK using op-Amp,
4. FSK using op-Amp,
5. Study of AM detector,
6. Study of narrow band amplifier using op-amp/ Transistor,
7. Study of intensity characteristics of LASER diode,
8. X-bee interface using PC/ µC / field strength study,
9. IR Link study,
10. Wire impedance measurement.

Section B

1. Program for data transfer instruction,
2. Program for addition of 8-bit numbers (Hex and decimal),
3. Program for addition of 16-bit numbers (Hex and decimal),
4. Program for 8-bit subtraction,
5. Program for 8-bit multiplication,
6. Program for 1's and 2's complement of 8 bit numbers,
7. Program for masking of 4 MSB and LSB of a 8-bit numbers,
8. Program for finding the least number from a series of numbers,
9. Program for finding the largest number from a series of numbers,
10. Program for arranging a series of numbers in ascending order,
11. Program for arranging a series of numbers in descending order,
12. Study of 8255.

REFERENCE BOOKS

1. Electronic communication system, John kennedy ,Tata McGraw Hill
2. Communication Electronics, Principles and Application, Frenzel, Tata McGraw Hill.

3. Fundamentals of Microprocessor and Microcomputers, B.Ram, Dhanpat Rai publications
4. Microprocessor Architecture, programming and applications with 8085/8080A,
5. Ramesh S. Gaonkar, Wiley eastern ltd.
6. Introduction to Microprocessor, A. P. Mathur, Tata McGraw Hill,
7. Microprocessor and Interfacing, D. V. Hall, Tata McGraw Hill,
8. Introduction to Microprocessors, Vilas Ghodki and Satish Sharma

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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

B.Sc. PART III - SEMESTER VI

Course Name: **Programming in 'C' & Microcontroller 8051**

Subject code: UG-ELE(04)-S6-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 the different types of programming languages and in particular the basics of 'C'.	Understand the fundamental of 'C' language.
2.	To write and debug simple 'C' programs.	Demonstrate the ability to write and debug 'C' programs for various applications.
3.	To undertake small 'C' language projects.	Write algorithms, draw flow charts and 'C' programs for simple applications.
4.	To develop background knowledge and core expertise of 8051 microcontroller.	Draw and describe architecture of 8051 microcontroller.
5.	To write assembly language programs of 8051 microcontroller for various applications.	Write assembly language program for 8051 microcontroller.
6.	To know the importance of different peripheral devices and their interfacing to 8051 microcontroller.	Interface various peripheral devices to the 8051 microcontroller.

B.Sc. PART III - SEMESTER VI

***Course Name:* Programming in 'C' & Microcontroller 8051**

Subject code: UG-ELE(04)-S6-T

Course Outline

Unit I

Constant, Variables and Operators: Character set, C tokens, constant, Keyword, identifiers, variables, data types, declaration of variables, Arithmetic, relational logical, assignment, increment, conditional, bitwise, operators, Arithmetic expression, evaluation of expression, precedence of operators, input/output functions.

Unit II

Control Structures & Arrays: if- statements, if-else statement, switch statement, go-to statement, while statement, do-while statement, for statement, one dimensional array.

Unit III

User Defined Functions, Types of functions, return values and their types, scope and lifetime of variables in function; basic concept of structure and unions, difference between structure and union.

Pointers: Basic concept, expression, variables Defining and opening file, closing a file, I/O operations on file, command line arguments, port interfacing.

Unit IV

Architecture and features, Internal and External memory, Flags, SFR Map, SFR Function, Accumulator, Register B, Port registers (P0, P1, P2 and P3), Power Management (PCON).

Unit V

Instruction set: Data transfer, logical, arithmetic, interrupt handler, Addressing Modes .

Subroutine and Stack, Need for Subroutine LCALL and RETURN Instructions, ACALL Instructions, Nesting of subroutine, Stack Operation and Stack Instruction, Branching (Jump Instruction), simple programs .

Unit VI

Interfacing with Keyboard, display - LCD (16 x 2), ADC and DAC, LED Matrix and Serial communication with personal computer.

B.Sc. III (SEM VI) ELECTRONICS PRACTICALS

Subject code: UG-ELE(04)-S6-P

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

Section A

1. Programs based on use of Variables, Operators, Input Output function
2. Programs based on Control Structure using if, if-else, switch, goto, while & do while
3. Programs based on use of one dimensional Array , Operations on array
4. Programs based on function writing, Use of structure and Union
5. Programs based on pointer operation, file operation
6. Programs based on communication with external data source like Printer & serial port.

Section B

1. LED Blink
2. Relay interface
3. Stepper Motor Interface
4. 16x2 Interface
5. Study of bit operation on port(A,B,C,D)
6. LED Blink using timer
7. Frequency Generator using timer
8. External frequency counting timer
9. Interrupt driven operation
10. Single blink on key I/P
11. Opto- triac interface
12. Key to clk/CC
13. Serial interface with PC
14. ADC 0808 interface
15. DAC 0808 interface
16. IIC interface using R.T.C.

REFERENCE BOOKS

1. Let us C ,Y.Kanetkar
2. Gate to C programming, Kishor S. B., Vilas Ghodki and Madhavi
3. C in depth, Shrivastava, BPB publication
4. Programming in ANSI C, E Balgurusamy, Tata McGraw Hill
5. Programming with C Byron Gottfried Schaums outline series, TMH. 8051 microcontroller, V. Udayshankara, Mallikarjuna Swamy,Tata McGraw Hill
6. Microcontroller: Theory and Applications, A.V.Deshmukh Tata McGraw Hill
7. Microcontroller, Rajkamal, Pearsons
8. Microcontroller, Mazidi and Mazidi

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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/

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