B Sc	Semester IV	Credits: 4
Course: 4	Electricity, Magnetism & Electronics	Hrs/Wk: 4

Student Able learn:

- To learn about Gauss law and solve the electric field and magnetic field for various geometric objects and to learn basic electronic concepts in analog and digital theory.
- To be Explain all the topics of Experiments, Concepts and Derivations to the student
- Apply the principles of electronics in day to day life.
- Encourage all the students to study higher educational courses in reputed institutes and to enrich the students with creative, logical and analytical skills and to motivate the students towards research side

UNIT I:

Electrostatics: (6hrs) : Gauss's law-Statement and its proof, Electric field intensity due to (i) uniformly charged solid sphere and (ii) an infinite conducting sheet of charge, Deduction of Coulomb's law from Gauss law, Electrical potential–Equipotential surfaces, Potential due to a uniformly charged sphere.

Dielectrics: (6 hrs): Dielectrics-Polar and Non-polar dielectrics- Effect of electric field on dielectrics,Dielectric strength, Capacitance of a parallel plate condenser with dielectric slab between the plates, Electric displacement D, electric polarization P,Relation between D, E and P, Dielectric constant and electric susceptibility.

UNIT II:

Magnetostatics: (6 hrs): Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, Ampere's Circuital Law and its application to Solenoid, Hall effect, determination of Hall coefficient and applications.

Electromagnetic Induction: (6 hrs): Faraday's laws of electromagnetic induction, Lenz's law, Self induction and Mutual induction,Self inductance of a long solenoid, Mutual inductance of two coils, Energy stored in magnetic field, Eddy currents.

UNIT III:

Alternating currents: (6 hrs): Alternating current - Relation between current and voltage in L,C, R, LR and CR circuits, Phasor and Vector diagrams, LCR series and parallel resonant circuit, Q – factor, Power factor.

Electromagnetic waves-Maxwell's equations:(6 hrs) : Idea of displacement current,Maxwell's equations-Derivation, Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves, Poynting theorem (Statement andproof). Velocity of wave equation using maxwells relations in vaccume.

UNIT IV:

Basic Electronic devices: (12 hrs): PN junction diode, Zenerdiode andLight Emitting Diode (LED) and their I-V characteristics, Zener diode as a regulator- Transistors and its operation, CB, CE and CC configurations, Input and output characteristicsofa transistor in CE mode, Relation between alpha, beta and gamma; Transistor as an amplifier.

UNIT-V:

Digital Electronics: (12 hrs): Number systems, Conversion of binary to decimal system and vice versa, Binary addition & Binary subtraction (1's and 2's complement methods), Laws of Boolean algebra, DeMorgan's laws-Statements and Proofs, Basic logic gates, NAND and NOR as universal gates, Exclusive-OR gate, Half adder and Full adder circuits.

REFERENCE BOOKS

1. BSc Physics, Vol.3, Telugu Akademy, Hyderabad.
2. Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.
3. Electricity and Magnetism, B.D.Duggal and C.L.Chhabra. Shobanlal& Co.
4. Electricity, Magnetism with Electronics, K.K.Tewari, R.Chand& Co.,
5. Electricity and Magnetism, R.Murugeshan, S. Chand & Co.
6. Principles of Electronics, V.K. Mehta, S.Chand& Co.,
7. Digital Principles and Applications, A.P. Malvino and D.P.Leach, McGrawHill Edition.

B Sc	Semester IV	Credits: 1
Course: 4	Electricity, Magnetism & Electronics Lab	Hrs/Wk: 2

Details of Lab/Practical/Experiments/Tutorials syllabus:

Minimum of 6 experiments to be done and recorded

1. Figure of merit of a moving coil galvanometer.
2. LCR circuit series/parallel resonance, Q factor.
3. Determination of ac-frequency –Sonometer.
4. Verification of Kirchoff's laws and Maximum Power Transfer theorem.
5. Field along the axis of a circular coil carrying current-Stewart & Gee's apparatus.
6. PN Junction Diode Characteristics
7. Zener Diode –V-I Characteristics
8. Zener Diode as a voltage regulator
9. Transistor CE Characteristics- Determination of hybrid parameters
10. Logic Gates- OR,AND,NOT and NAND gates. Verification of Truth Tables.
11. Verification of De Morgan's Theorems.
12. Construction of Half adder and Full adders-Verification of truth tables
13. Universal gates construction and verification of truth tables.

Recommended Reference books:

14. Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

G. Measurable:

1. **Assignments on**: Gauss's law-Statement and its proof, Electric field intensity due to uniformly charged solidsphere and Potential due to a uniformly charged sphere.
2. **Student seminars (Individual presentation of Courses) on topics relating to**:
3. Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, Ampere's Circuital Law and its application to Solenoid, Hall effect, determination of Hall coefficient and applications
4. **Quiz Programmes on**: PN junction diode, Zenerdiode andLight Emitting Diode (LED) and their I-V characteristics, Zener diode as a regulator- Transistors and its operation, CB, CE and CC configurations
5. **Individual Field Studies/projects**: Maxwell's equations-Derivation, Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves, Poynting theorem (Statement andproof)
6. **Group discussion on:** Number systems, Conversion of binary to decimal system and vice versa, Binary addition & Binary subtraction (1's and 2's complement methods), Laws of Boolean algebra
7. **Group/Team Projects on**: Alternating current - Relation between current and voltage in L,C, R, LR and CR circuits, Phasor and Vector diagrams, LCR series and parallel resonant circuit, Q –factor, Power factor.

H. General

8. Collection of news reports and maintaining a record of Course-cuttings relating to topics covered in syllabus
9. Group Discussions on:
10. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
11. Any similar activities with imaginative thinking.

Recommended Continuous Assessment methods:

MODEL QUESTION PAPER (Sem - End)

B.Sc DEGREE EXAMINATION
Semester – IV
Paper 4: Electricity, Magnetism &Electronics

Time: 3 hrs **Maximum Marks : 75**

Section A

Answer Any Five Questions **5X5=25M**

1. Derive expression for the potential due to a point charge.
   బిందు ఆవేశము వలన కలిగే పొటెన్సీల్ ఉత్పేదించుము
2. What is Hall Effect? Write the applications of Hall Effect.
   హాల్ ఎఫెక్ట్ ఫలితము అనగానేమి దాని అనువర్తనాలను వ్రాయండి
3. Write the integral and differential forms of Maxwell's equations.
   మాక్స్వెల్ నియమాల ఇంటెగ్రల్ మరియు సంకలన రూపాలను వ్రాయుము
4. Derive the relation among D, E and P.
   D, E and P మధ్య గల సంబంధము వ్రాయుము
5. Calculate the resonance frequency of a LCR series circuit with a resistance 10&!, inductance 20mH and a capacitance of 0.02μF
   LCR వలయం యొక్క అనువాద పౌనపుణ్యంను కనుగొనుము నిరోధము వోమ్ 10 &! ఇండక్టన్స్ మరియు కెపాసిటన్స్ 20mH, 0.02μF.
6. For a transistor α =0.95 and its emitter current is 1mA. Find its base and collector currents.
   ట్రాన్సిస్టర్ యొక్క α =0.95 మరియు ఉద్గార విద్యుత్ 1mA అయితే ఆధార మరియు కలక్టర్ విద్యుత్ విలువ ఎంత.
7. Convert the following binary numbers into equivalent decimal number
   i. 101010101 ii. 1111001
   ఈ క్రింది ద్వి సంఖ్యా మానంలోని సంఖ్యలను దశాంశ సంఖ్యలుగా వ్రాయుము
   i. 101010101 ii. 1111001
8. Perform the following subtraction using 2's compliment method
   i. 101101 – 011110 ii. 11110111 – 00001100
   ఈ క్రింది వ్యత్యాసములను 2' కాంప్లీమెంట్ పద్ధతి ద్వారా కనుగొనుము
   i. 101101 – 011110 ii. 11110111 – 00001100

Section B

Answer ALL The Questions. **5X10 = 50M**

9. a) State and prove Gauss's law.
   గాస్ నియమమును వ్రాసి నిరూపించుము

(OR)

b) Derive expression for the capacitance of parallel plate capacitor with dielectric slab

సమాంతర పలకల మధ్య నిరోధమును ఉంచినప్పుడు కెపాసిటెన్స్ ని ఉత్పాదించుము

10. a) State and explain Biot - Savart's law. Derive an expression for the magic induction at a point on the axis of a current carrying solenoid.
బయోడ్ - స్టావర్ట్ నియమమును వివరించుము ? సొలినాయిడ్ లో విద్యుత్ ప్రవహిస్తునట్లుగా దాని అక్షం మీద ఉన్న బిందువు వద్ద అయస్కాంత తీవ్రతను వివరింపుము.

(OR)

b) Explain Faraday's laws of electromagnetic induction. Derive expression for coefficient of coupling.
ఫెరాడేస్ విద్యుత్ అయస్కాంత నియమమును వ్రాయుము ? కంపీలింగ్ విధానాన్ని ఉత్పాదించుము

11. a)Describe the behavior of series LCR circuit when an alternating voltage is applied to it. Explain the condition for resonance.
LCR విలయానికి ఏ. సి వోల్టేజి ఇచ్చినప్పుడు దాని ప్రవర్తన వ్రాయుము మరియు అనువాద నియమము వివరింపుము

(OR)

b) Derive the equation of electromagnetic wave and hence determine the velocity of propagation of electromagnetic wave in free space.
విద్యుత్ అయస్కాంత తరంగ సమీకరణమును ఉత్పాదించుము ? తరంగ ప్రవాహ వేగము రాబట్టుము

12. a) What is transistor? Explain the working of PNP and NPN Transistor.
PNP మరియు NPN ట్రాన్సిస్టర్ యొక్క పనితనం వివరింపుము.

(OR)

b) Deduce relation between alpha, beta and gamma.
ఆల్ఫా, బీటా మరియు గామా ల మధ్య గల సంబంధము వ్రాయుము

13. a) Explain the functioning of a Half Adder and a Full Adder along with respective truth tables.
అర్ధ సంకలన కారిణి (హాఫ్ యాడారు) మరియు ఫుల్ యాడర్ ల యొక్క నిజ పట్టీల ద్వారా వీటి యొక్క పనితనం వివరింపుము

(OR)

b) State and prove Demorgan's laws. Realize AND, OR and NOT gates from NAND logic.
డీ - మార్గన్ సిద్ధాంతము నిర్వచించుము ? నాండ్(NAND) ద్వారము ద్వారా అండ్ (AND) , ఆర్ (OR) మరియు నాట్ (NOT) ద్వారాలను రాబట్టుము.