B.Sc. (Physics)- III Year

Semester – VI

Paper – VI :: A. Electronics

(DSE- Elective I)

Unit – I: (12 Hrs)

Band theory of P-N junction

Energy band in solids (band theory), valence band, conduction band and forbidden energy gap in solids, insulators, semiconductors and pure or intrinsic semiconductors and impure or extrinsic semi-conductors. N-type semi-conductors, P-type semi-conductors, Fermi level, continuity equation.

Diodes: P-N junction diode, Half-wave, full-wave and bridge rectifier. Zener diode & its characteristics. Zener diode as voltage regulator.

Unit-II: (12 Hrs)

Bipolar Junction Transistor (BJT) – p-n-p and n-p-n transistors, current components in transistors, CB, CE and CC configurations – transistor as an amplifier - RC coupled amplifier – Frequency response (Qualitative analysis).

Feedback concept & Oscillators: Feedback, General theory of feedback – Concepts of oscillators, Barkhausen's criteria, Phase shift oscillator – Expression for frequency of oscillation.

Unit-III : (10 hrs)

Special devices- Construction and Characteristics: Photo diode - Shockley diode - Solar cell, Opto-couplers - Field Effect Transistor (FET) - FET as an Amplifier - Uni Junction Transistor (UJT), UJT as a relaxation oscillator - Silicon controlled rectifier (SCR) - SCR as a switch.

Unit-IV: (14 Hrs)

Digital Electronics

Binary number system, convertion of binary to decimal and vice-versa. Binary addition and subtraction (1's and 2's complement methods). Hexadecimal number system. Conversion from binary to hexadecimal and vice-versa, Decimal to hexadecimal and vice-versa.

Logic gates:

OR, AND, NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive – OR gate (EX-OR). De Morgan's Laws – Verification.

NOTE: Problems should be solved from every chapter of all units.

Suggested books

1. Electronic devices and circuits – Millman and Halkias. *Mc.Graw-Hill Education.*
2. Principles of Electronics by V.K. Mehta – *S. Chand & Co.*
3. Basic Electronics (Solid state) – B. L. Theraja , S. Chand & Co.
4. A First Course in Electronics- Anwar A. Khan &Kanchan K. Dey, PHI.
5. Physics of Semiconductor Devices- S. M. Sze
6. Physics of Semiconductors- Streetman.
7. Basic Electronics – Bernod Grob.
8. Third year Electronics – Telugu Academy
9. Digital Principles & Applications – A.P. Malvino and D.P. Leach

CHAIRMAN
Board of Studies in Physics
Osmania University, Hyd.

HEAD
Department of Physics
University College of Science
Osmania University, Hyd-

B.Sc. (Physics Practical) – III year
Semester – VI
Paper: VI::A. Electronics

1. Construction of logic gates (AND, OR, NOT, gates) with discrete components – Truth table Verification
2. AND, OR, NOT – gates constructions using universal gates – Verification of truth tables.
3. Construction of NAND and NOR gates with discrete components and truth table verification
4. Characteristics of a Transistor in CE configuration
5. R.C. coupled amplifier – frequency response.
6. Verification of De Morgan`s Theorem.
7. Zener diode V-I characteristics.
8. P-n junction diode V- I characteristics.
9. Zener diode as a voltage regulator
10. Construction of a model D.C. power supply
11. R C phase shift Oscillator –determination of output frequency

❖ Every student should complete minimum 06 experiments.

Suggested Books

1. B.Sc. Practical Physics – C. L. Arora – S. Chand & Co.
2. Viva-voce in Physics – R.C. Gupta, Pragathi Prakashan, Meerut.
3. Laboratory manual for Physics Course by B.P. Khandelwal.
4. Practical Physics by M. Arul Thakpathi by Comptex Publishers.
5. B.Sc. practical physics – Subbi Reddy.

Note: Minimum of eight experiments should be performed.

CHAIRMAN
Board of Studies in Physics
Osmania University, Hyd.

HEAD
Department of Physics
University College of Science
Osmania University, Hyd.

Subject : (Physics)

B.Sc. Semester VI-Theory Syllabus
(DSE- Elective-II)
Paper-VI:: B. APPLIED OPTICS

Unit I (11hrs)

Principles of Lasers: Emission and absorption of Radiation – Einstein Relations. - Pumping Mechanisms – Optical feedback - Laser Rate equations for two, three and four level lasers. Pumping threshold conditions. – Properties of Laser beams. Classification of laser systems – Gas, Liquid and Solid Lasers: He- Ne, and Argon lasers, their energy level schemes - Ruby laser and YAG laser, GA-As laser, and their applications in various fields.

Unit II (11 hrs)

Holography: Basic Principles of Holography- Recording of amplitude and phase- The recording medium- Reconstruction of original wave front- Image formation by wave front reconstruction- Gaber Hologram- Limitations of Gaber Hologram-Off axis Hologram- Fourier transform Holograms- Volume Holograms, Applications of Holograms.

Unit III (10 hrs)

Fourier and Non-Linear Optics:Fourier optics- Thin lens as phase transformation – Thickness function- Various types of lenses- Fourier transforming properties of lenses – Object placed in front of the lens- Object placed behind the lens.

Non-Linear Optics: Harmonic generation- Second harmonic generation- Phase matching condition- Optical mixing- Parametric generation of light – Self focusing of light.

Unit IV (10 hrs)

Optical Fibers: Fiber types and their structures. Ray optics representation, acceptance angle and numerical aperture. Step index and graded index fibers, single mode and multimode fibers. Fiber Materials for glass fibers and plastic fibers. Signal attenuation in optical fibers: Absorption, scattering and bending losses in fibers, core and cladding losses. Material dispersion, wave guide dispersion, intermodes distortion and pulse broadening.

NOTE: Problems should be solved at the end of every chapter of all units.

Suggested Books:

1. Opto Electronics- An Introduction – Wilson & JFB Hawkes 2nd Edition.
2. Introduction to Fourier optics – J.W. Goodman
3. Lasers and Non-Linear optics – B.B. Laud
4. Optical Electronics – Ghatak nd Thyga Rajan.
5. Principles of Lasers – O. Svelto
6. Optical Fiber Communications – by Gerad Keiser
7. Optical Fiber Communications – by John M. Senior (PHI)

CHAIRMAN
Board of Studies in Physics
Osmania University, Hyd.

HEAD
Department of Physics
University College of Science
Osmania University, Hyd.

Subject : (Physics)

B.Sc. Semester VI-Theory Syllabus
(DSE- Elective-II)
Paper-VI:: B.APPLIED OPTICS Practical

Applied Optics

1. Study of the profile of a laser beam.
2. Determination of the diameter of a thin wire using laser.
3. Determination of wavelength of He-Ne laser by transmission grating.
4. Construction and recording of a hologram.
5. Study of Fourier transforming properties of lenses.
6. Study of second harmonic generation by KDP crystal.
7. Measurement of numerical aperture of an optical fiber.
8. Measurement of coupling losses in optical fibers.
9. Measurement of bending losses in optical fibers.
10. Study of audio signal transmission through optical fibers.
11. To study the interference of light using optical fibers.

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books:

1) Introduction to Fourier Optics – J. Goodman
2) Optical Fiber Communications- John M. Senior
3) Principles of Lasers- O. Svelto
4) Modern Optics- Grant Fowles.
5) Principles of Optics – Born & Wolf
6) Fundamentals of Optics- Jenkins & White

CHAIRMAN
Board of Studies in Physics
Osmania University, Hyd.

HEAD
Department of Physics
University College of Science
Osmania University, Hyd.