Department of Physics, Kakatiya University offers Physics and Electronics as core subjects at UG level (3 Year course) with six semesters with internal assessment for theory papers under Choice Based Credit System (CBCS) in University constituent and affiliated colleges for the students admitted in first year from 2016-17 academic year onwards.

1. Each of first four Semesters (i.e I, II III and IV) contains one theory core paper (20 marks for Internal Assessment and 80 marks for Semester End Exam equivalent to 4 credits) as Discipline Specific Course (DSC) and one practical paper (25 marks equivalent to 01 credit), whereas each of last two semesters (i.e V and VI) contains one theory core paper as DSC (15 marks for Internal Assessment and 60 marks for Semester End Exam equivalent to 3 credits), one theory elective paper as Discipline Specific Elective (DSE) (15 marks for Internal Assessment and 60 marks for Semester End Exam equivalent to 3 credits) and two practical papers (One for DSC and the other for DSE carries 25 marks in each paper equivalent to 01 credit). Total marks are 900 and credits are 36 for Physics course.

2. Internal Assessment examination will be conducted twice in every Semester. Marks will be awarded from the average of the two Internal Assessment Exams in each Semester.

3. Scheme for CBCS, work-load for each paper, distribution of marks and credits; and scheme of question paper for Physics are attached herewith.

4. The practical examination will be conducted at the end of each semester. A minimum of 40% marks should be obtained by the student to pass the practical examination of Physics in all semesters.

5. All the theory papers and practical papers of Physics in I, II, III, IV and DSC paper of V & VI semesters are common to all students. But, elective theory (DSE) papers of Physics in V and VI Semesters are to be chosen by the student from the available options.

6. Elective (DSE) papers of Physics will be offered separately at the beginning of Semesters V and VI. Every student has to choose one elective from the Electives being offered.
## KAKATIYA UNIVERSITY, WARANGAL

### SCHEME FOR CHOICE BASED CREDIT SYSTEM

#### B.Sc. (PHYSICS)

#### SEMESTER PATTERN

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SEM</th>
<th>COURSE (PAPER) TITLE WITH CODE</th>
<th>COURSE TYPE*</th>
<th>HRS/ WEEK</th>
<th>CREDITS</th>
<th>MARKS</th>
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<td>Internal Assessment</td>
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<td>DSC-1(P)</td>
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<tr>
<td>I</td>
<td>2</td>
<td>201: Waves and Oscillations</td>
<td>DSC-2</td>
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<tr>
<td>II</td>
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<td>III</td>
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<td>401(P): Optics Lab (Pr)</td>
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<tr>
<td>V</td>
<td>5</td>
<td>501: Electromagnetism</td>
<td>DSC-5</td>
<td>3</td>
<td>15</td>
<td>60</td>
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<td>501(P): Electromagnetism Lab (Pr)</td>
<td>DSC-5(P)</td>
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<td>502: Elective (Theory) – 1 (A/B/C)</td>
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<td>A. Solid state physics</td>
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<td>B. Modern Optics</td>
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<td>B. Modern Optics Lab</td>
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<tr>
<td>VI</td>
<td>6</td>
<td>601: Modern Physics</td>
<td>DSC-6</td>
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<tr>
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<td>601(P): Modern Physics Lab (Pr)</td>
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<td>A. Basic Electronics</td>
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<tr>
<td></td>
<td></td>
<td>B. Physics of Semiconductor devices</td>
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<td>602(P): Elective (Practical) – 2 (A/B/C)</td>
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<td>A. Basic Electronics Lab</td>
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<td></td>
<td>B. Physics of Semiconductor devices Lab</td>
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<td>36</td>
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<td>Grand Total : 900</td>
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*DSC: Discipline Specific Course (Core)  DSE: Discipline Specific Elective (Elective)
### SUMMARY OF CREDITS

<table>
<thead>
<tr>
<th>SEM</th>
<th>Course Type*</th>
<th>Credits/Marks (Theory) (Internal +Sem End Exam)</th>
<th>HPW (Theory)</th>
<th>Credits/Marks (Practical)</th>
<th>HPW (Practical)</th>
<th>Dept workload per week per section</th>
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<tr>
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<td>4 / (20+80)</td>
<td>4</td>
<td>1/25</td>
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<tr>
<td>V</td>
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<td>3 / (15+60)</td>
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<td>1/25</td>
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<td>DSE - Elective(A/B)</td>
<td>3 / (15+60)</td>
<td>3</td>
<td>1/25</td>
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<td>VI</td>
<td>DSC - Core</td>
<td>3 / (15+60)</td>
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<td><strong>Total</strong></td>
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<td><strong>28</strong></td>
<td><strong>8 / 200</strong></td>
<td><strong>24</strong></td>
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</tbody>
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* DSC: Discipline Specific Course,  
  DSE: Discipline Specific Elective
SCHEME OF QUESTION PAPER

B.Sc. (Physics) I/II/III/IV
I - Internal Assessment Examination
Code: Name of the Paper
(Under CBCS Scheme)

Time: 90 Min] [Marks: 20

Answer ALL questions. Each question carries equal marks (2 x 10 = 20)

1. From Unit 1
2. From Unit 1
3. From Unit 1
4. From Unit 1
5. From Unit 1
6. From Unit 2
7. From Unit 2
8. From Unit 2
9. From Unit 2
10. From Unit 2

SCHEME OF QUESTION PAPER

B.Sc. (Physics) I/II/III/IV
II - Internal Assessment Examination
Code: Name of the Paper
(Under CBCS Scheme)

Time: 90 Min] [Marks: 20

Answer ALL questions. Each question carries equal marks (2 x 10 = 20)

1. From Unit 3
2. From Unit 3
3. From Unit 3
4. From Unit 3
5. From Unit 3
6. From Unit 4
7. From Unit 4
8. From Unit 4
9. From Unit 4
10. From Unit 4

Dr. B. Venkatram Reddy
Chairman, Board of Studies in Physics, KU, Wgl
Date: 24th Aug., 2016 & 5th June, 2017
A SCHEME OF QUESTION PAPER

B.Sc. (Physics) V/VI
I - Internal Assessment Examination
Code: Name of the Paper
(Under CBCS Scheme)

Time: 90 Min [Marks: 15]

Answer ALL questions. Each question carries equal marks (1½ x 10 = 15)

1. From Unit 1
2. From Unit 1
3. From Unit 1
4. From Unit 1
5. From Unit 1
6. From Unit 2
7. From Unit 2
8. From Unit 2
9. From Unit 2
10. From Unit 2

A SCHEME OF QUESTION PAPER

B.Sc. (Physics) V/VI
II - Internal Assessment Examination
Code: Name of the Paper
(Under CBCS Scheme)

Time: 90 Min [Marks: 15]

Answer ALL questions. Each question carries equal marks (1½ x 10 = 15)

1. From Unit 3
2. From Unit 3
3. From Unit 3
4. From Unit 3
5. From Unit 3
6. From Unit 4
7. From Unit 4
8. From Unit 4
9. From Unit 4
10. From Unit 4

Dr. B. Venkatram Reddy
Chairman, Board of Studies in Physics, KU, Wgl
Date: 24th Aug., 2016 & 5th June, 2017
SCHEME OF QUESTION PAPER

B.Sc. (PHYSICS) I/II/III/IV Semester Examination
KAKATIYA UNIVERSITY, WARANGAL
Code: Name of the Paper
(Under CBCS Scheme)

Time: 3 Hours] [Marks: 80

SECTION A: SHORT ANSWER QUESTIONS (8 X 4 = 32)

Answer Any EIGHT questions. Each question carries equal marks

1. From Unit 1
2. From Unit 1
3. From Unit 1 (Problem)
4. From Unit 2
5. From Unit 2
6. From Unit 2 (Problem)
7. From Unit 3
8. From Unit 3
9. From Unit 3 (Problem)
10. From Unit 4
11. From Unit 4
12. From Unit 4 (Problem)

SECTION B: ESSAY TYPE ANSWER QUESTIONS (4 X 12 = 48)

Answer Any FOUR questions. All questions carry equal marks

13. (a) From Unit 1
OR
(b) From Unit 1
14. (a) From Unit 2
OR
(b) From Unit 2
15. (a) From Unit 3
OR
(b) From Unit 3
16. (a) From Unit 4
OR
(b) From Unit 4
SCHEME OF QUESTION PAPER

B.Sc. (PHYSICS) V/VI Semester Examination
KAKATIYA UNIVERSITY, WARANGAL
Code: Name of the Paper
(Under CBCS Scheme)

Time: 3 Hours] [Marks: 60

SECTION A: SHORT ANSWER QUESTIONS (8 X 3 = 24)

Answer Any EIGHT questions. Each question carries equal marks

1. From Unit 1
2. From Unit 1
3. From Unit 1 (Problem)
4. From Unit 2
5. From Unit 2
6. From Unit 2 (Problem)
7. From Unit 3
8. From Unit 3
9. From Unit 3 (Problem)
10. From Unit 4
11. From Unit 4
12. From Unit 4 (Problem)

SECTION B: ESSAY TYPE ANSWER QUESTIONS (4 X 9 = 36)

Answer Any FOUR questions. All questions carry equal marks

13. (a) From Unit 1
   OR
   (b) From Unit 1
14. (a) From Unit 2
   OR
   (b) From Unit 2
15. (a) From Unit 3
   OR
   (b) From Unit 3
16. (a) From Unit 4
   OR
   (b) From Unit 4

Dr. B. Venkatram Reddy
Chairman, Board of Studies in Physics, KU, Wgl
Date: 24th Aug., 2016 & 5th June, 2017
Unit – I
1. Vector Analysis (12)

Unit – II
2. Mechanics of Particles (6)
Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section.

3. Mechanics of Rigid Bodies (6)
Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler’s equation, precession of a top, Gyroscope.

Unit – III
4. Central Forces (12)
Central forces – definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler’s laws, Coriolis force and its expressions.

Unit – IV
5. Special theory of Relativity (12)
Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.

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

Suggested Books

3. First Year Physics - Telugu Academy.
B.Sc. (Physics) Syllabus, Kakatiya University, Warangal

CBCS pattern in Semester System (w. e. from 2016-2017)

7. **Sears and Zemansky’s University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition.*
11. **The Feymman Lectures in Physics, Vol.-1,** R P Feymman, RB Lighton and M Sands, BI Publications,

**B.Sc. (Physics Practicals) – I year**

**Semester - I**

**Paper – I:: Mechanics Practicals**

2. Calculation of slope and intercept of a $Y = mX +C$ graph by theoretical method (simple pendulum experiment)
3. Study of a compound pendulum- determination of ‘g’ and ‘k’.
4. Y’ by uniform Bending
5. Y by Non-uniform Bending.
7. Rigidity moduli by torsion Pendulum.
8. Determine surface tension of a liquid through capillary rise method.
9. Determination of Surface Tension of a liquid by any other method.
10. Determine of Viscosity of a fluid.

**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**

3. Worsnop and Flint- Advanced Practical physics for students.

Dr. B. Venkatram Reddy  
Chairman, Board of Studies in Physics, KU, Wgl  
Date: 24th Aug., 2016 & 5th June, 2017
Unit – I
Fundamentals of Vibrations (12)
Simple harmonic oscillator, and solution of the differential equation—Physical characteristics of SHM, torsion pendulum, - measurements of rigidity modulus, compound pendulum, measurement of ‘g’, combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures.

Unit – II
Damped and forced oscillations (12)
Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with undamped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance. Coupled Oscillators.

Unit – III
Vibrating Strings (12)
Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport, transverse impedance.

Unit – IV
Vibrations of bars (12)
Longitudinal vibrations in bars—wave equation and its general solution. Special cases (i) bar fixed at both ends (ii) bar fixed at the mid point (iii) bar free at both ends (iv) bar fixed at one end. Transverse vibrations in a bar—wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

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

Suggested Books

3. First Year Physics - Telugu Academy.
B.Sc. (Physics) Syllabus, Kakatiya University, Warangal
CBCS pattern in Semester System (w. e. from 2016-2017)

7. **Sears and Zemansky’s University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition.*

**B.Sc. (Physics Practicals) – I year**

**Semester - II**

**Paper – II ::Waves and Oscillations Practicals**

1. Study of damping of an oscillating disc in Air and Water logarithmic decrement.
2. Study of Oscillations under Bifilar suspension-Verification of axis theorems
3. Study of oscillations of a mass under different combination of springs-Series and parallel.
4. Verification of Laws of a stretched string (Three Laws).
5. Determination of frequency of a bar-Melde’s experiment.
6. Observation of Lissajous figures from CRO-Frequency ratio.Amlitude and phase difference of two waves.
8. Velocity of Transverse wave along a stretched string.
9. Study of damping of a bar pendulum-damping factor
10. Study of coupled oscillator-resonance

**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**
3. Worsnop and Flint- Advanced Practical physics for students.

Dr. B. Venkatram Reddy
Chairman, Board of Studies in Physics, KU, Wgl
Date: 24th Aug., 2016 & 5th June, 2017
Unit – I
1. **Kinetic theory of gases:** (4)

2. **Thermodynamics:** (8)

Unit – II
3. **Thermodynamic potentials and Maxwell’s equations:** (6)

4. **Low temperature Physics:** (6)

Unit – III
5. **Quantum theory of radiation:** (12)

Unit – IV
6. **Statistical Mechanics:** (12)

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

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Dr. B. Venkatram Reddy
Chairman, Board of Studies in Physics, KU, Wgl
Date: 24th Aug., 2016 & 5th June, 2017
Suggested books

2. **Second Year Physics** – *Telugu Academy.*

**B.Sc. (Physics Practicals) – II year**
**Semester - III**
**Paper – III:: Thermal Physics Practicals**

1. Co-efficient of thermal conductivity of a bad conductor by Lee’s method.
2. Measurement of Stefan’s constant.
3. Specific heat of a liquid by applying Newton’s law of cooling correction.
5. Calibration of thermo couple
6. Cooling Curve of a metallic body
7. Resistance thermometer
8. Thermal expansion of solids
9. Study of conversion of mechanical energy to heat.
10. Determine the Specific of a solid ( graphite rod )

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**

3. Worsnop and Flint- Advanced Practical physics for students.
4. “Practical Physics” R.K Shukla, Anchal Srivastava
Unit I: Interference: (12)
Interference by division of wave front: Fresnel’s biprism – determination of wave length of light.
Determination of thickness of a transparent material using Biprism – change of phase on reflection – Lloyd’s mirror experiment.

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – Non-reflecting films – Interference by a plane parallel film illuminated by a point source – Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) – Determination of diameter of wire-Newton’s rings in reflected light with and without contact between lens and glass plate, Newton’s rings in transmitted light (Haidinger Fringes) – Determination of wave length of monochromatic light – Michelson Interferometer – types of fringes – Determination of wavelength of monochromatic light, Difference in wavelength of sodium D, D lines and thickness of a thin transparent plate.

Unit II: Diffraction: (12)
Introduction – Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction:- Diffraction due to single slit and circular aperture – Limit of resolution – Fraunhofer diffraction due to double slit – Fraunhofer diffraction pattern with N slits (diffraction grating).
Fresnel diffraction-Fresnel’s half period zones – area of the half period zones – zone plate – Comparison of zone plate with convex lens – Phase reversal zone plate – diffraction at a straight edge – difference between interference and diffraction.

Unit III: Polarization (12)
Polarized light : Methods of Polarization, Polarization by reflection, refraction, Double refraction, selective absorption, scattering of light – Brewster’s law – Malus law – Nicol prism polarizer and analyzer – Refraction of plane wave incident on negative and positive crystals (Huygen’s explanation) – Quarter wave plate, Half wave plate – Babinet’s compensator – Optical activity, analysis of light by Laurent’s half shade polarimeter.

Unit IV: Aberrations and Fiber Optics : (12)

NOTE: Problems should be solved at the end of every chapter of all units.
Suggested books
2. **Optics** by Subramaniyan and Brijlal. *S. Chand & Co.*
5. **Second Year Physics** – *Telugu Academy.*

**B.Sc. (Physics Practicals) – II year**  
**Semester - IV**  
**Paper – IV:: Optics Practicals**

1. Thickness of a wire using wedge method.
2. Determination of wavelength of light using Biprism.
3. Determination of Radius of curvature of a given convex lens by forming Newton’s rings.
4. Resolving power of grating.
5. Study of optical rotation-polarimeter.
6. Dispersive power of a prism
9. Resolving power of a telescope.
10. Refractive index of a liquid and glass (Boys Method).

**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**

3. Worsnop and Flint- Advanced Practical physics for students.
B.Sc. (Physics) Syllabus, Kakatiya University, Warangal  
CBCS pattern in Semester System (w. e. from 2016-2017)

B.Sc. (Physics) - III Year  
Semester – V  
Paper – V: Electromagnetism  
(DSC - Compulsory)  
(w.e.f the academic year 2018-2019)  

Unit I: Electrostatics (11 hrs)  
Electric Field: Concept of electric field lines and electric flux, Gauss’s law (Integral and differential forms), application to linear, plane and spherical charge distributions. Conservative nature of electric field ‘E’, Irrotational field. Electric potential: Concept of electric potential, relation between electric potential and electric field, potential energy of a system of charges. Energy density in an electric field. Calculation of potential from electric field for a spherical charge distribution.

Unit II: Magnetostatics (12 hrs)  

Unit III: Electromagnetic Induction (9 hrs)  

Unit IV: Electromagnetic waves (10 hrs)  
Maxwell’s equations in vacuum and dielectric medium, boundary conditions, plane wave equation: transverse nature of EM waves, velocity of light in vacuum and in medium, polarization, reflection and transmission. Polarization of EM waves, Brewster’s angle, description of linear, circular and elliptical polarization.

Text Books  

Reference Books  
1. Electricity and magnetism By Edward M. Purcell (McGraw-Hill Education, 1986)  
2. Electricity and magnetism. By D C Tayal (Himalaya Publishing House,1988)  

Dr. B. Venkatram Reddy  
Chairman, Board of Studies in Physics, KU, Wgl  
Date: 24th Aug., 2016 & 5th June, 2017
B.Sc. (Physics Practicals) – III year
Semester - V
Paper – V: Electromagnetism Lab

PHYSICS LABORATORY
1. To verify the Thevenin Theorem
2. To verify Norton Theorem
3. To verify Superposition Theorem
4. To verify maximum power transfer theorem.
5. To determine a small resistance by Carey Foster’s bridge.
6. To determine the (a) current sensitivity, (b) charge sensitivity, and (c) CDR of a B.G.
7. To determine high resistance by leakage method.
8. To determine the ratio of two capacitances by De Sauty’s bridge.
9. To determine self-inductance of a coil by Anderson’s bridge using AC.
10. To determine self-inductance of a coil by Rayleigh’s method.
11. To determine coefficient of Mutual inductance by absolute method.

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 for Reference:

2. InduPrakash and Ramakrishna, A Text Book of Practical Physics, KitabMahal

Dr. B. Venkatram Reddy
Chairman, Board of Studies in Physics, KU, Wgl
Date: 24th Aug., 2016 & 5th June, 2017
B.Sc. (Physics)- III Year
Semester – V
(DSE – Elective-1)
(w.e.f the academic year 2018-2019)

Unit-I (11 hrs )

Unit-II (11 hrs)

Unit-III (10 hrs)

UNIT IV (10 hrs )
Superconductivity: Introduction, Critical temperature, Critical magnetic field, Meissner effect. Type I and type II superconductors, London’s equation and penetration depth, Isotope effect, concept of BCS theory

Text Books:
5. LASERS: Fundamentals and Applications – Thyagarajan and Ghatak (McMillanIndia)
B.Sc. (Physics) Syllabus, Kakatiya University, Warangal
CBCS pattern in Semester System (w. e. from 2016-2017)

Reference Books:
2. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India

B.Sc. (Physics Practical) – III year
Semester - V
Paper: VI(A) Solid State Physics

1. Measurement of susceptibility of paramagnetic solution (Quinck’s Tube Method)
2. To measure the Magnetic susceptibility of Solids (Guoy’s method)
3. To determine the Coupling Coefficient of a Piezoelectric crystal.
4. To measure the Dielectric Constant of a dielectric Materials with frequency
5. To study the polarization-electric field (P-E) hysteresis loop of a Ferroelectric Crystal.
6. To draw the B-H curve of Fe using Solenoid & determine energy loss from Hysteresis.
7. To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150°C) and to determine its band gap.
8. To determine the Hall coefficient of a semiconductor sample.
9. Calculation of d-values of a given Laue’s pattern.
10. Calculation of d-values of power diffraction method.
12. To study the spectral characteristics of a Photo- Voltaic cell.
13. Verification of Bragg’s equation.

Reference Books:
3. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Ed., 2011, KitabMahal

Note: Minimum of eight experiments should be performed.

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Date: 24th Aug., 2016 & 5th June, 2017
Unit I (11 hrs)

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.

Unit IV (10 hrs)

Recommended Books:
2. Introduction to Fourier optics – J.W. Goodman
3. Lasers and Non-Linear optics – B.B. Laud
5. Principles of Lasers – O. Svelto
6. Optical Fiber Communications – by Gerad Keiser
7. Optical Fiber Communications – by John M. Senior (PHI)
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.
10. Study of audio signal transmission through optical fibers.
11. To study the interference of light using optical fibers.

Reference 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

Note: Minimum of eight experiments should be performed.
UNIT-I (11 hrs)
Atomic Spectra and Models - Inadequacy of classical physics:

UNIT-II (11 hrs)
Wave particle duality, de-Broglie hypothesis, Experimental confirmation of matter wave, Davisson-Germer experiment, velocity of de-Broglie wave, wave particle duality, Complementarity. Superposition of two waves, phase velocity and group velocity, wave packets, Gaussian wave packet, spatial distribution of wave packet, Localization of wave packet in time. Time development of a wave Packet; Heisenberg uncertainty Principle, Illustration of the principle through thought experiments of Gamma ray microscope and electron diffraction through a slit. Time-independent Schroedinger wave equation and its application to linear harmonic oscillator.

UNIT-III (9 hrs)
Nuclear physics: Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph. Liquid-drop model: semi-empirical mass formula and binding energy, Nuclear shell model and magic numbers.

Unit IV (11 hrs)
Radioactivity: stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli’s prediction of neutrino; Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus. Fission and fusion - Mass defect, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions driving stellar energy (brief qualitative discussion).

Text Books:
1. Introduction to Atomic spectra – H. E. White, McGraw-Hill
3. Quantum Theory and Nuclear Physics – V. K. Srivastava, ABD Publisher, Jaipur
5. Modern Physics ---Murugesan and Sivaprasad –(S. Chand Higher Academics)
B.Sc. (Physics) Syllabus, Kakatiya University, Warangal
CBCS pattern in Semester System (w. e. from 2016-2017)


Reference Books
1. Modern Physics – Bernstein, Fishbane and Gasiorowicz (Pearson India) 2010
2. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles -- R. Eisberg (Wiley India) 2012
4. Basic ideas and concepts in Nuclear Physics, K.Heyde, 3rd Edn., Institute of Physics Pub.

Dr. B. Venkatram Reddy
Chairman, Board of Studies in Physics, KU, Wgl
Date: 24th Aug., 2016 & 5th June, 2017
B.Sc. (Physics Practical) – III year
Semester – VI
Paper: VII: Modern Physics

1. Measurement of Planck’s constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
3. To determine the Planck’s constant using LEDs of at least 4 different colors.
4. To determine the ionization potential of mercury.
5. To determine the absorption lines in the rotational spectrum of Iodine vapour.
6. To determine the value of $e/m$ by (a) Magnetic focusing or (b) Bar magnet.
7. To setup the Millikan oil drop apparatus and determine the charge of an electron.
8. To show the tunneling effect in tunnel diode using I-V characteristics.
9. To determine the wavelength of laser source using diffraction of single slit.
10. To determine the wavelength of laser source using diffraction of double slits.
11. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating
12. To determine the value of $e/m$ for electron by long solenoid method.
13. Photo Cell – Determination of Planck’s constant.
14. To verify the inverse square law of radiation using a photo-electric cell.
15. To find the value of photo electric work function of a material of the cathode using a photo-electric cell.
17. To determine the dead time of a given G.M. tube using double source.
18. Hydrogen spectrum – Determination of Rydberg’s constant
19. Energy gap of intrinsic semi-conductor
20. G. M. Counter – Absorption coefficients of a material.
21. To draw the plateau curve for a Geiger Muller counter.
22. To find the half-life period of a given radioactive substance using a G.M. Counter.

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
3. A Text Book of Practical Physics, I. Prakash& Ramakrishna, 11th Edn, 2011,Kitab Mahal

Note: Minimum of eight experiments should be performed.
B.Sc. (Physics) Syllabus, Kakatiya University, Warangal
CBCS pattern in Semester System (w. e. from 2016-2017)

B.Sc. (Physics)- III Year
Semester – VI
Paper – VIII(A):: Basic Electronics
(DSC – Elective-2)
(w.e.f the academic year 2018-2019) 42 hrs
(3 hrs / week)

Unit-I: (10 Hrs)
Network Elements and Network Theorems
Passive elements, Power sources, Active elements, Network models: T and π Transformations,
Superposition theorem, Thevenin’s theorem, Norton’s theorem. Reciprocity theorem and Maximum
power transfer theorem (Simple problems).
Two-port Networks – Introduction - Z-parameters, Y-parameters, h-parameters and ABCD-
parameters (Simple problems).

Unit – II: (10 Hrs)
Band theory of P-N junction
1. Energy band in solids (band theory), valence band, conduction band and forbidden energy gap in
solids, insulators, semi conductors and pure or intrinsic semiconductors and impure or extrinsic semi-
conductors. N-type semi-conductors, P-type semi-conductors, Fermi level, continuity equation.
2. Diodes: P-N junction diode, Half-wave, full-wave and bridge rectifier. Zener diode & its
characteristics. Zener diode as voltage regulator.

Unit-III: (11 Hrs)
1. 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).
2. Feedback concept & Oscillators: Feedback, General theory of feedback – Concepts of oscillators,
Barkhausen’s criteria, Phase shift oscillator – Expression for frequency of oscillation.

Unit-IV: (11 Hrs)
1. Digital Electronics
Binary number system, conversion 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.
2. 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 – Statement and proof.

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

Textbooks
3. Basic Electronics (Solid state) – B. L. Theraja, S. Chand & Co.

Dr. B. Venkatram Reddy
Chairman, Board of Studies in Physics, KU, Wgl
Date: 24th Aug., 2016 & 5th June, 2017
4. A First Course in Electronics - Anwar A. Khan & Kanchan K. Dey, PHI.

Reference Books

1. Basic Electronics – Bernod Grob.
2. Third year Electronics – Telugu Academy
3. Digital Principles & Applications – A.P. Malvino and D.P. Leach

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

1. AND, OR, NOT, gates – Truth table Verification
2. AND, OR, NOT – gates constructions using universal gates – Verification of truth tables.
3. NAND and NOR gates 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.

Text Books for LAB (Practical 6)

3. Laboratory manual for Physics Course by B.P. Khandelwal.
4. Practical Physics by M. Arul Thakpathi by Comptex Publishers.

Note: Minimum of eight experiments should be performed.

Dr. B. Venkatram Reddy
Chairman, Board of Studies in Physics, KU, Wgl
Date: 24th Aug., 2016 & 5th June, 2017
B.Sc. (Physics)- III Year  
Semester – VI  
Paper – VIII(B):: Physics of Semiconductor Devices  
(DSE – Elective-2)  
(w.e.f the academic year 2018-2019)  

Unit-I: (11 hrs)  
Semiconductor Physics: Conductors, semiconductors, forbidden gap, energy levels, crystals and  
covalent bonds, free electrons and holes, recombination and life-time, energy bands. Intrinsic  
semiconductor - intrinsic carrier concentration, density of electrons in conduction band, Fermi-level,  
Mass action law. Carrier transport phenomena - mobility, resistivity, diffusivity, Einstein’s relation,  
current density equation. Extrinsic semiconductor - n-type semiconductor, p-type semiconductor,  
energy band diagram of extrinsic semiconductor. Hall effect- mobility and Hall angle, experiment  
arrangement for the study of Hall effect, significance of Hall effect.

Unit – II: (11 hrs)  
P-N junction - Depletion layer, Energy level diagram of p-n junction, Band structure of an open  
circuited p-n junction, Biasing of p-n junction, effect of barrier potential on forward bias, reverse  
leakage current, reverse breakdown, p-n junction under various conditions - thermal equilibrium,  
forward and reverse bias, current-voltage characteristics. Derivation of ideal diode equation of p-n  
junction, diode model and its approximations. Forward and reverse resistance of diode. Dynamic  
characteristic of diode.

Unit-III: (10 hrs)  
Special diodes – Construction and characteristics of Zener diode, Light emitting diode (LED), Photo-  
diode, Schottky diode, Backward diodes and Tunnel diode.  
Transistors - Bipolar junction transistor (BJT), transistor characteristics, transistor equation in active  
region, Field effect transistor (FET), MOSFET and photo transistor.

Unit-IV: (10 hrs)  
Control devices- Shockley diode, Silicon controlled rectifier (SCR), Silicon controlled switch (SCS),  
Unijunction transistor (UJT), Solar cells, Opto-couplers.

Textbooks

1. A First Course in Electronics- Anwar A. Khan&Kanchan K. Dey, PHI  
2. Physics of Semiconductor Devices- S. M. Sze  

Dr. B. Venkatram Reddy  
Chairman, Board of Studies in Physics, KU, Wgl  
Date: 24th Aug., 2016 & 5th June, 2017
B.Sc. (Physics Practical) – III year
Semester – VI
Paper: VIII(B): Physics of Semiconductor Devices

1. Characteristics of a Transistor in CE configuration
2. Zener diode V-I characteristics.
3. P-n junction diode V-I characteristics.
4. Zener diode as a voltage regulator
5. Determination of carrier concentration using Hall effect
6. Thermistor characteristics
7. Efficiency of a LED
8. Solar cell: fill factor and efficiency
9. FET characteristics
10. SCR characteristics
11. UJT characteristics

❖ Every student should complete minimum 06 experiments.

Text Books:
1. Basic electronics - Grob
2. Practical Electronics – Zbar

Dr. B. Venkatram Reddy
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Date: 24th Aug., 2016 & 5th June, 2017