DEPARTMENT OF PHYSICS
KAKATIYA UNIVERSITY
WARANGAL–506 009

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 (50 marks equivalent to 02 credits), 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 (25 marks in each paper equivalent to 01 credit). For total six semesters in Physics and Electronics courses, the total marks are 1000 and credits are 40 for each.

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 both Physics and Electronics are attached herewith.

4. The syllabi of Physics and Electronics theory and practical papers of I, II, III and IV semesters are enclosed. The syllabi of V and VI semesters will be kept available next academic year.

5. 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 both Physics and Electronics in all semesters.

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

7. Elective (DSE) papers of Physics and Electronics will be offered separately at the beginning of Semesters V and VI. Every student has to choose one elective from the Electives being offered.

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Chairman, Board of Studies in Physics, KU, Wgl
Date: 24th Aug., 2016

KAKATIYA UNIVERSITY, WARANGAL
SCHEME FOR CHOICE BASED CREDIT SYSTEM
B.Sc. (PHYSICS)

SEMESTER PATTERN

YEAR	SEM	COURSE (PAPER) TITLE WITH CODE	COURSE TYPE*	HRS/ WEEK	CREDITS	MARKS	
						Internal Assessment	SEM End Exam
FIRST	I	101: Mechanics	DSC-1	4	4	20	80
		101A: Mechanics Lab (Pr)	DSC-1A	2	2	-	50
	II	201: Waves and Oscillations	DSC-2	4	4	20	80
		201A: Waves and Oscillations Lab (Pr)	DSC-2A	2	2	-	50
SECOND	III	301: Thermal Physics	DSC-3	4	4	20	80
		301A: Thermal Physics Lab (Pr)	DSC-3A	2	2	-	50
	IV	401: Optics	DSC-4	4	4	20	80
		401A: Optics Lab (Pr)	DSC-4A	2	2	-	50
THIRD	V	501: Theory Paper	DSC-5	3	3	15	60
		501A: Practicals Paper	DSC-5A	2	1	-	25
		502: Theory Paper A/B/C (Electives)	DSE-1	3/3/3	3	15	60
		502A: Practicals Paper	DSE-1A	2/2/2	1	-	25
	VI	601: Theory Paper	DSC-6	3	3	15	60
		601A: Practicals Paper	DSC-6A	2	1	-	25
		602: Theory Paper A/B/C (Electives)	DSE-2	3/3/3	3	15	60
		602A: Practicals Paper	DSE-2A	2/2/2	1	-	25
		Total		**64**	**40**	**140**	**860**
						Grand Total : 1000	

*DSC: Discipline Specific Course (Core) DSE: Discipline Specific Elective (Elective)

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B.Sc. (PHYSICS)
KAKATIYA UNIVERSITY, WARANGAL

SUMMARY OF CREDITS

SEM	Course Type*	Credits/Marks (Theory) (Internal +Sem End Exam)	HPW (Theory)	Credits/ Marks (Practicals)	HPW (Practicals)	Dept workload per week per section
I	DSC - Core	4 / (20+80)	4	2/50	2	6
II	DSC - Core	4 / (20+80)	4	2/50	2	6
III	DSC - Core	4 / (20+80)	4	2/50	2	6
IV	DSC - Core	4 / (20+80)	4	2/50	2	6
V	DSC - Core DSE - Elective(A/B/C)	3 / (15+60) 3 / (15+60)	3 3x3 = 9	1/25 1/25	2 3x2 = 6	5 15
VI	DSC - Core DSE - Elective(A/B/C)	3 / (15+60) 3 / (15+60)	3 3x3 = 9	1/25 1/25	2 3x2 = 6	5 15
	Total	**28 / 700**	**40**	**12 / 300**	**24**	**64**

* DSC: Discipline Specific Course, DSE: Discipline Specific Elective

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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

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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

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

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

Answer ALL questions. Each question carries equal marks

1. (a) From Unit 1

   OR

   (b) From Unit 1

2. (a) From Unit 2

   OR

   (b) From Unit 2

3. (a) From Unit 3

   OR

   (b) From Unit 3

4. (a) From Unit 4

   OR

   (b) From Unit 4

SECTION B: SHORT ANSWER QUESTIONS (4 X 4 = 16)

Answer any FOUR questions. All questions carry equal marks

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

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SECTION C: PROBLEM SOLVING QUESTIONS (4 X 4 = 16)

Answer any FOUR questions. All questions carry equal marks

11. From Unit 1
12. From Unit 2
13. From Unit 3
14. From Unit 4
15. From Unit 1 or 2
16. From Unit 3 or 4

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

Answer ALL questions. Each question carries equal marks

1. (a) From Unit 1

   OR

   (b) From Unit 1

2. (a) From Unit 2

   OR

   (b) From Unit 2

3. (a) From Unit 3

   OR

   (b) From Unit 3

4. (a) From Unit 4

   OR

   (b) From Unit 4

SECTION B: SHORT ANSWER QUESTIONS (4 X 3 = 12)

Answer any FOUR questions. All questions carry equal marks

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

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SECTION C: PROBLEM SOLVING QUESTIONS (4 X 3 = 12)

Answer any FOUR questions. All questions carry equal marks

11. From Unit 1
12. From Unit 2
13. From Unit 3
14. From Unit 4
15. From Unit 1 or 2
16. From Unit 3 or 4

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B.Sc. (Physics)- I Year

Semester – I

Paper – I:: Mechanics

Total: 52 hrs
(4 Hrs / week)

Unit – I

1. Vector Analysis (13)

Scalar and Vector fields, Gradient of a Scalar field and its physical significance. Divergence and Curl of a Vector field and related problems. Vector integration, line, surface and volume integrals. Stokes', Gauss's and Green's theorems- simple applications.

Unit – II

2. Mechanics of Particles (7)

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 (13)

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 (13)

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

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008*.
2. **Fundamentals of Physics**. Halliday/Resnick/Walker *Wiley India Edition 2007*.
3. **First Year Physics** - *Telugu Academy*.
4. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. *McGraw Hill*.
5. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company* Edition, 2008.

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6. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005*.
7. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition.*
8. **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow. *The McGraw Hill Companies*.
9. **Mechanics**. Hans & Puri. *TMH Publications*.
10. **Engineering Physics**. R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications*.
11. **The Feymman Lectures in Physics, Vol.-1**, R P Feymman, RB Lighton and M Sands, BI Publications,
12. **Mechanics-**P.K. Srivastava - New Age International.

B.Sc. (Physics Practicals) – I year
Semester - I
(2 Hrs / week)

Paper – I:: Mechanics Practicals

1. Measurement of errors –simple Pendulum.
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.
6. Moment of Inertia of a fly wheel.
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

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastava.

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B.Sc. (Physics)- I Year

Semester – II

Paper II:: Waves and Oscillations

Total: 52 hrs
(4 Hrs / week)

Unit – I

Fundamentals of Vibrations (13)

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 (13)

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 (13)

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 (13)

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

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008*.
2. **Fundamentals of Physics**. Halliday/Resnick/Walker *Wiley India Edition 2007*.
3. **First Year Physics** - *Telugu Academy*.
4. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. *McGraw Hill*.
5. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company* Edition, 2008.
6. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005*.

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7. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition*.
8. **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow. *The McGraw Hill Companies*.
9. **Mechanics**. Hans & Puri. *TMH Publications*.
10. **Engineering Physics**. R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications*.
11. **The Feymman Lectures in Physics, Vol.-1**, R P Feymman, RB Lighton and M Sands, BI Publications,
12. **Mechanics-**P.K. Srivastava - New Age International.

B.Sc. (Physics Practicals) – I year
Semester - II
Paper – II ::Waves and Oscillations Practicals (2 Hrs / week)

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.
7. Volume Resonator –determination of frequency of a tuning fork.
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

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastav.

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B.Sc. (Physics)- II Year

Semester – III

Paper – III:: Thermal Physics

Total: 52 hrs
(4 Hrs / week)

Unit – I

1. Kinetic theory of gases: (4)

Introduction – Deduction of Maxwell's law of distribution of molecular speeds, Transport Phenomena – Viscosity of gases – thermal conductivity – diffusion of gases.

2. Thermodynamics: (9)

Basics of Thermodynamics-Kelvin's and Clausius statements – Thermodynamic scale of temperature – Entropy, physical significance – Change in entropy in reversible and irreversible processes – Entropy and disorder – Entropy of universe – Temperature- Entropy (T-S) diagram – Change of entropy of a perfect gas-change of entropy when ice changes into steam.

Unit – II

3. Thermodynamic potentials and Maxwell's equations: (7)

Thermodynamic potentials – Derivation of Maxwell's thermodynamic relations – Clausius-Clayperon's equation – Derivation for ratio of specific heats – Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect – expression for Joule Kelvin coefficient for perfect and Vanderwaal's gas.

4. Low temperature Physics: (6)

Joule Kelvin effect – liquefaction of gas using porous plug experiment. Joule expansion – Distinction between adiabatic and Joule Thomson expansion – Expression for Joule Thomson cooling – Liquefaction of helium, Kapitza's method – Adiabatic demagnetization – Production of low temperatures – Principle of refrigeration, vapour compression type.

Unit – III

5. Quantum theory of radiation: (13)

Black body-Ferry's black body – distribution of energy in the spectrum of Black body – Wein's displacement law, Wein's law, Rayleigh-Jean's law – Quantum theory of radiation - Planck's law – deduction of Wein's law, Rayleigh-Jeans law, Stefan's law from Planck's law.Measurement of radiation using pyrometers – Disappearing filament optical pyrometer – experimental determination – Angstrom pyroheliometer - determination of solar constant, effective temperature of sun.

Unit – IV

6. Statistical Mechanics: (13)

Introduction, postulates of statistical mechanics. Phase space, concept of ensembles and some known ensembles ,classical and quantum statistics and their differences, concept of probability, Maxwell-Boltzmann's distribution law -Molecular energies in an ideal gas- Maxwell-Boltzmann's velocity distribution law, Bose-Einstein Distribution law, Fermi-Dirac Distribution law, comparison of three distribution laws, Application of B-E distribution to Photons-Planks radiation formula, Application of Fermi-Dirac statistics to white dwarfs and Neutron stars.

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

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Suggested books

1. **Fundamentals of Physics**. Halliday/Resnick/Walker.*C. Wiley India Edition 2007*.
2. **Second Year Physics** – *Telugu Academy.*
3. **Modern Physics** by R. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co*.
4. **Modern Physics** by G. Aruldhas and P. Rajagopal, *Eastern Economy Education*.
5. Berkeley Physics Course. Volume-5. **Statistical Physics** by F. Reif. *The McGraw-Hill Companies*.
6. **An Introduction to Thermal Physics** by Daniel V. Schroeder.*Pearson Education Low Price Edition*.
7. **Thermodynamics** by R.C. Srivastava, Subit K. Saha & Abhay K. *Jain Eastern Economy Edition*.
8. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand & Co. Publications*.
9. **Feyman's Lectures on Physics** Vol. 1,2,3 & 4. *Narosa Publications.*
10. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
12. B.B. Laud **"Introduction to statistics Mechanics"**(Macmillan 1981)
13. F.Reif**:"Statistical Physics "**(Mcgraw-Hill,1998)
14. K.Haung: "**Statistical Physics "**(Wiley Eastern 1988)

B.Sc. (Physics Practicals) – II year
Semester - III
Paper – III:: Thermal Physics Practicals **(2 Hrs / week)**

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.
4. Heating efficiency of electrical kettle with varying voltages.
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

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
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B.Sc. (Physics) - II Year

Semester – IV

Paper – IV:: Optics

Total: 52 hrs
(4 Hrs / week)

Unit I:

1. Interference: (13)

Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light.

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_1,D_2 lines and thickness of a thin transparent plate.

Unit II:

2. Diffraction: (13)

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).

Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using 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:

3. Polarization (13)

Polarized light : Methods of Polarization, Polarizatioin 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:

4. Aberrations and Fiber Optics : (13)

Introduction – Monochromatic aberrations, spherical aberration, methods of minimizing spherical aberration, coma, astigmatism and curvature of field, distortion. Chromatic aberration – the achromatic doublet – Removal of chromatic aberration of a separated doublet.

Fiber Optics : Introduction – Optical fibers – Types of optical fibers – Step and graded index fibers – Rays and modes in an optical fiber – Fiber material – Principles of optical fiber communication and advantages of optical fiber communication.

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

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Suggested books

1. **Optics** by Ajoy Ghatak. *The McGraw-Hill companies.*
2. **Optics** by Subramaniyam and Brijlal. *S. Chand & Co*.
3. **Fundamentals of Physics**. Halliday/Resnick/Walker.*C. Wiley India Edition 2007*.
4. **Optics and Spectroscopy**. R. Murugeshan and Kiruthiga Siva Prasath. *S. Chand & Co*.
5. **Second Year Physics** – *Telugu Academy.*
6. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand & Co. Publications*.
7. **Feyman's Lectures on Physics** Vol. 1,2,3 & 4. *Narosa Publications.*
8. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
9. K. Ghatak, **Physical Optics'**
10. D.P. Khandelwal, Optical and Atomic Physics' (Himalaya Publishing House, Bombay,1988)
11. Jenkins and White: 'Fundamental of Optics' (McGraw-Hill)
12. Smith and Thomson: 'Optics' (John Wiley and sons).

B.Sc. (Physics Practicals) – II year
Semester - IV
Paper – IV:: Optics Practicals **(2 Hrs / week)**

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
7. Determination of wavelength of light using diffraction grating minimum deviation method.
8. Wavelength of light using diffraction grating – normal incidence method.
9. Resolving power of a telescope.
10. Refractive index of a liquid and glass (Boys Method).
11. Pulfrich refractometer – determination of refractive index of liquid.
12. Wavelength of Laser light using diffraction grating.

***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. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastav.

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Date: 24th Aug., 2016

KAKATIYA UNIVERSITY, WARANGAL
SCHEME FOR CHOICE BASED CREDIT SYSTEM
B.Sc. (ELECTRONICS)

SEMESTER PATTERN

YEAR	SEM	COURSE (PAPER) TITLE WITH CODE	COURSE TYPE*	HRS/ WEEK	CREDITS	MARKS	
						Internal Assessment	SEM End Exam
FIRST	I	101: Circuit Analysis	DSC-1	4	4	20	80
		101A: Circuit Analysis Lab (Pr)	DSC-1A	2	2	-	50
	II	201: Electronic Devices	DSC-2	4	4	20	80
		201A: Electronic Devices Lab (Pr)	DSC-2A	2	2	-	50
SECOND	III	301: Analog Circuits	DSC-3	4	4	20	80
		301A: Analog Circuits Lab (Pr)	DSC-3A	2	2	-	50
	IV	401: Linear Integrated Circuits and Basics of Communication	DSC-4	4	4	20	80
		401A: Linear Integrated Circuits and Basics of Communication Lab (Pr)	DSC-4A	2	2	-	50
THIRD	V	501: Theory Paper	DSC-5	3	3	15	60
		501A: Practicals Paper	DSC-5A	2	1	-	25
		502: Theory Paper A/B/C (Electives)	DSE-1	3/3/3	3	15	60
		502A: Practicals Paper	DSE-1A	2/2/2	1	-	25
	VI	601: Theory Paper	DSC-6	3	3	15	60
		601A: Practicals Paper	DSC-6A	2	1	-	25
		602: Theory Paper A/B/C (Electives)	DSE-2	3/3/3	3	15	60
		602A: Practicals Paper	DSE-2A	2/2/2	1	-	25
		Total		**64**	**40**	**140**	**860**
						Grand Total : 1000	

*DSC: Discipline Specific Course (Core) DSE: Discipline Specific Elective (Elective)

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B.Sc. (ELECTRONICS)
KAKATIYA UNIVERSITY, WARANGAL

SUMMARY OF CREDITS

SEM	Course Type*	Credits/Marks (Theory) (Internal +Sem End Exam)	HPW (Theory)	Credits/ Marks (Practicals)	HPW (Practicals)	Dept workload per week per section
I	DSC - Core	4 / (20+80)	4	2/50	2	6
II	DSC - Core	4 / (20+80)	4	2/50	2	6
III	DSC - Core	4 / (20+80)	4	2/50	2	6
IV	DSC - Core	4 / (20+80)	4	2/50	2	6
V	DSC - Core DSE - Elective(A/B/C)	3 / (15+60) 3 / (15+60)	3 3x3 = 9	1/25 1/25	2 3x2 = 6	5 15
VI	DSC - Core DSE - Elective(A/B/C)	3 / (15+60) 3 / (15+60)	3 3x3 = 9	1/25 1/25	2 3x2 = 6	5 15
	Total	**28 / 700**	**40**	**12 / 300**	**24**	**64**

* DSC: Discipline Specific Course, DSE: Discipline Specific Elective

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SCHEME OF QUESTION PAPER

B.Sc. (Electronics) 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. (Electronics) 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

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SCHEME OF QUESTION PAPER

B.Sc. (Electronics) 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

SCHEME OF QUESTION PAPER

B.Sc. (Electronics) 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

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SCHEME OF QUESTION PAPER

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

Time: 3 Hours] **[Marks: 80**

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

Answer ALL questions. Each question carries equal marks

1. (a) From Unit 1

   OR

   (b) From Unit 1

2. (a) From Unit 2

   OR

   (b) From Unit 2

3. (a) From Unit 3

   OR

   (b) From Unit 3

4. (a) From Unit 4

   OR

   (b) From Unit 4

SECTION B: SHORT ANSWER QUESTIONS (4 X 4 = 16)

Answer any FOUR questions. All questions carry equal marks

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

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SECTION C: PROBLEM SOLVING QUESTIONS (4 X 4 = 16)

Answer any FOUR questions. All questions carry equal marks

11. From Unit 1
12. From Unit 2
13. From Unit 3
14. From Unit 4
15. From Unit 1 or 2
16. From Unit 3 or 4

SCHEME OF QUESTION PAPER

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

Time: 3 Hours] **[Marks: 60**

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

Answer ALL questions. Each question carries equal marks

1. (a) From Unit 1

   OR

   (b) From Unit 1

2. (a) From Unit 2

   OR

   (b) From Unit 2

3. (a) From Unit 3

   OR

   (b) From Unit 3

4. (a) From Unit 4

   OR

   (b) From Unit 4

SECTION B: SHORT ANSWER QUESTIONS (4 X 3 = 12)

Answer any FOUR questions. All questions carry equal marks

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

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SECTION C: PROBLEM SOLVING QUESTIONS (4 X 3 = 12)

Answer any FOUR questions. All questions carry equal marks

11. From Unit 1
12. From Unit 2
13. From Unit 3
14. From Unit 4
15. From Unit 1 or 2
16. From Unit 3 or 4

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B.Sc. (ELECTRONICS) – I year
Semester - I
Paper - I: Circuit Analysis

Total number of hours: 52
No of hours per week: 4

UNIT - I

AC Fundamentals: Sinusoidal wave – average and RMS values – J-Operator – Polar and Rectangular forms of complex numbers – Phasor diagram – Complex impedance and admittance.

Kirchhoff's Current and Voltage Laws: Concept of voltage and current sources - KVL and KCL - application to simple circuits (AC and DC) consisting of resistors and sources – Node voltage analysis and mesh analysis.

UNIT-II

Network Theorems (DC and AC): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Milliman's theorem,
Application to simple Networks.

UNIT-III

RC and RL circuits: Transient response of RL and RC circuits with step input, Time constants. Frequency response of RC and RL circuits,Types of filters – Low pass filter and High pass filter-frequency response, passive differentiating circuit and passive integrating circuit.

UNIT-IV

Resonance: RLC Series and parallel resonance circuits – Resonant frequency – Q-Factor – Bandwidth – Selectivity.

Cathode Ray Oscilloscope: Cathode ray tube (CRT) and its working – electron gun focusing – deflection sensitivity – florescent screen – Measurement of time period, frequency, phase and amplitude.

Text Books:

1) Basic Electronics – Grob, 10th edition(TMH)
2) Circuit Analysis – P .Gnanaswamy, Pearson Education.
3) Circuit and Networks – A. Sudhakar & S. Pallri (TMH)
4) Pulse, digital & switching waveforms – Milliman &Taub.
5) Networks, Lines and Fields – John D Ryder (PHI)
6) Network theory – Smarajit Ghosh (PHI)

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B.Sc. (Electronics Practicals) – I year
Semester - I
Paper – I:: Circuit Analysis Practicals

No. of hours per week: 2

1. Measurement of peak voltage and frequency using CRO.
2. Measurement of phase using CRO.
3. Thevenin's theorem and Norton's theorem – verification.
4. Maximum power transfer theorem – verification.
5. CR circuit – Frequency response - (Low-pass and High-pass).
6. CR and LR circuits – Differentiation and integration – tracing of waveforms.
7. LCR – Series resonance circuit – frequency response – Determination of resonant frequency (f_r), Q-factor and band width.
8. Simulation: i) Verification of KVL and KCL.

   ii) Verification of network theorems.

   iii) Study of frequency response (LR).

Note: Student has to perform minimum of six experiments.

Reference Books:

1) Lab manual for Electronic Devices and Circuits – 4th Edition. By David A Bell – PHI
2) Basic Electronics – A Text Lab Manual – Zbar, Malvino, Miller.

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Dr. B. Venkatram Reddy
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Date: 24th Aug., 2016

B.Sc. (ELECTRONICS) – I year
Semester - II
Paper – II :: Electronic Devices

Total number of hours : 52
No. of hours per week : 4

UNIT-I

PN Junction: Formation of PN junction, Depletion region, Junction capacitance, Diode equation (no derivation) Effect of temperature on reverse saturation current , V-I characteristics and simple applications of i) Junction diode, ii) Zener diode, iii) Tunnel diode and iv) Varactor diode.

UNIT-II

Bipolar Junction Transistor(BJT): PNP and NPN transistors, current components in BJT, BJT static characteristics (Input and Output), Early effect, CB, CC and CE configurations of transistor and bias conditions (cut off, active, and saturation regions), CE configuration as two port network, h-parameter model and its equivalent circuit. Determination of h–parameters from the characteristics. Load line analysis (AC and DC). Transistor Biasing – Fixed and self bias.

UNIT- III

Field Effect Transistor (FET): Construction and working of JFET, output and transfer characteristics of FET, Determination of FET parameters. Application of FET as voltage variable resistor. Advantages of FET over BJT. **MOSFET**: construction and working of enhancement and depletion modes , output and transfer characteristics, Application of MOSFET as a switch .

Uni Junction Transistor (UJT): Construction and working of UJT and its Characteristics. Application of UJT as a relaxation oscillator.

UNIT- IV

Silicon Controlled Rectifier (SCR): Construction and working of SCR. Two transistor representation, Characteristics of SCR. Application of SCR for power control.

Photo electronic Devices: Construction and Characteristics of Light Dependent Resistor (LDR), Photo voltaic Cell, Photo diode, Photo transistor and Light Emitting Diode(LED).

Books Recommended:

1) Electronic Devices and circuits - Millman and Halkias,(TMH)
2) Principles of Electronics - V.K.Mehta & Rohit Mehta
3) Electronic Devices and Circuits - Allen Moltershed(PHI)
4) Basic Electronics and Linear Circuits - Bharghava U
5) Electronic Devices and Circuits - Y.N.Bapat
6) Electronic Devices and Circuits - Mithal.
7) Electronics Devices and Circuits - Salivahanan and Suresh
8) Experiments in Electronics - S.V.Subramanyam.

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B.Sc. (Electronics Practicals) – I year
Semester - II
Paper – II:: Electronic Devices

No. of hours per week: 2

1. To draw V-I characteristics of Junction diode and determine the cut-in voltage, forward and reverse resistances.
2. Zener diode V-I Characteristics – Determination of Zener breakdown voltage.
3. Voltage regulator (line and load) using Zener diode.
4. BJT input and output characteristics (CE configuration) and determination of 'h' parameters.
5. FET – Characteristics and determination of FET parameters.
6. UJT characteristics – determination of intrinsic stand-off ratio.
7. UJT as relaxation oscillator.
8. Characteristics of LDR/Photo diode/Photo transistor/Solar cell.

Note: Student has to perform minimum of six experiments.

Reference Books:

1) Lab manual for Electronic Devices and Circuits – 4th Edition. By David A Bell - PHI

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B.Sc. (ELECTRONICS) – II year
Semester - III
Paper - III: Analog Circuits

Total number of hours: 52

No. of hours per week: 4

UNIT – I

Rectifiers and filters: Rectifiers– half wave, full wave and bridge rectifiers, Efficiency, Ripple factor, regulation, harmonic components in rectified output. **Filters** – choke input (inductor) filter, Shunt capacitor filter, L-section and π-section filters.

UNIT – II

Regulated Power Supplies:: Block diagram of regulated power supply, Series and shunt transistor regulated power supplies, three terminal IC regulators (78XX and 79XX), Principle and working of switch mode power supply (SMPS). UPS –Principle and working.

UNIT – III

Transistor amplifier: Classification of amplifiers (Based on type of coupling and frequency range), Hybrid π-model of a transistor, RC-coupled CE amplifier – frequency response, analysis.

Feedback in amplifiers: Positive and negative feedback, Effect of negative feedback on gain, bandwidth, noise, input and output impedances. Emitter follower and Darlington pair and its advantages.

UNIT – IV

Oscillators:: Barkhausen criterion for sustained oscillations, RC oscillators- RC phase shift and Wien's bridge oscillators, LC oscillators- Hartley and Colpitt, derivation for frequency oscillation.

Multivibrators:: Astable, Monostable and Bistable multivibrators – Qualitative treatment only.

Recommended Books:

1. Electronic Devices and Circuits-Millman and Halkias (TMH)
2. Basic Electronics and linear circuits - Bhargava, Kulshreshta& Gupta TMH
3. A first course in Electronics-AA Khan and KK Dey-PHI
4. Electronic Devices and Circuit Theory-Robert L Boylestad & Louis Nashelsky
5. Pulse, Digital and Switching circuits - Milliman and Taub

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B.Sc. (Electronics Practicals) – II year
Semester - III
Paper - III:: Analog Circuits

No. of hours per week : 2

1. Study of HWR, FWR and bridge rectifier, determination of ripple factor.
2. Series inductor, shunt capacitor, L-section and π-section filters; determination of ripple factor using Full wave Rectifier.
3. Study of voltage regulator using IC's - 78XX & 79XX.
4. Colpitt's oscillator – determination of frequency.
5. RC Phase shift oscillator - determination of frequency
6. Astable multivibrator – determination of time period and duty cycle.
7. RC-coupled amplifier – frequency response
8. **Simulation experiments ::**
   - i) Rectifiers
   - ii) RC-coupled amplifier
   - iii) Wein's bridge oscillator
   - iv) Colpitt's oscillator
   - v) RC phase shift oscillator
   - vi) Astable multivibrator

Note: Student has to perform minimum of six experiments

1) Lab manual for Electronic Devices and Circuits – 4th Edition. By David A Bell – PHI
2) Basic Electronics – A Text Lab Manual –Zbar, Malvino, Miller.

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B.Sc. (ELECTRONICS) – II year
Semester - IV
Paper - IV:: Linear Integrated Circuits and basics of Communication

Total number of hours: 52
No. of hours per week: 4

UNIT – I

Operational Amplifiers: Emitter Coupled Differential amplifier, Block diagram of Op. Amp., Characteristics of Op. Amp, .Op. Amp. Parameters - Input resistance, Output resistance, Common mode rejection ratio (CMMR), Slew rate, Offset voltages, Input bias current, Basic Op-Amp circuits - Inverting Op-Amp, Virtual ground, Non-inverting Op-Amp, Frequency response of Op-Amp. Op Amp as: Summing amplifier, subtractor, Comparator, Voltage follower, Integrator, and Differentiator.

UNIT- II

Applications of Op-Amps: Logarithmic amplifier, Sine wave [Wien Bridge] generator and square wave [Astable] generator, Triangular wave generator, Mono stable multivibrator, Solving of simple second order differential equations. Basic Op-Amp series regulator and shunt regulator, IC 555 Timer [Block diagram and its working], IC 555 as mono stable and astable multivibrators.

UNIT – III

Modulation: Need for modulation- Types of modulation- Amplitude, Frequency and Phase modulation.

Amplitude modulation: Analysis of Amplitude modulation, side bands, modulation index, AM modulator, Balanced modulator, Demodulation – diode detector.

UNIT – IV

Frequency modulation: Analysis of FM**.** Working of simple frequency modulator, detection of FM waves – FM Discriminator. Advantages of frequency modulation.

AM and FM Transmitters and radio receivers [Block diagram approach]. Introduction to PAM, PPM, PWM, and PCM , Delta modulation.

Reference Books:

1. Op amps and linear Integrated Circuits – Ramakant Gayakwad, PHI
2. Linear Integrated Circuits – Coughlin and Driscoll
3. Linear Integrated Circuits- D Roy Choudhury and Shail B Jain
4. Electronic Communication Systems-George Kennedy & Bernard Davis
5. Principles of Electronic Communication Systems-Louis E Freznel, TMH

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B.Sc. (Electronics Practicals) – II year
Semester - IV
Paper - IV:: Linear Integrated Circuits and Basics of Communication

Number of hours per week: 2

Practicals : Using IC 741 OpAmp and IC 555 Timer ::

1. Op amp as inverting Amplifier- Study of frequency response
2. Op amp as non-inverting Amplifier- Study of frequency response.
3. OP Amp as Summing amplifier and comparator(Zero crossing detector)
4. Astable multivibrator – determination of time period and duty cycle.
5. Monostable multivibrator- determination of gate width.
6. Integrator/ Differentiator – study of wave forms.
7. Astable multivibrator using IC 555
8. Monostable multivibrator using IC 555.
9. AM modulator and detector

Simulation of all the above experiments::

1. Inverting and Non inverting amplifiers and comparator
2. Integrator/ Differentiator using op amp
3. Wein's bridge oscillator
4. Astable multivibrator using Op Amp
5. Astable multivibrator using IC 555

Note: Student has to perform minimum of six experiments

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2) Basic Electronics – A Text Lab Manual –Zbar, Malvino, Miller.

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