NAGARJUNA GOVERNMENT COLLEGE,

AUTONOMOUS:NALGONDA

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(Re Accredited by NAAC with "A" Grade)

BOARD OF STUDIES MEETING

DEPARTMENT OF PHYSICS

2016-17

NAGARJUNA GOVERNMENT COLLEGE, NALGONDA
(Autonomous) (Reaccredited with "A" Grade by NAAC)
(Affiliated to Mathatma Gandhi University)

DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING 2016-17

The members of Board of studies in Physics Department, N.G. College, Nalgonda met under the chairmanship of Sri M.Srinivas Reddy on -09-2016 and passed the following Resolutions.

AGENDA :

1. To consider and approve the syllabus for B.Sc. I,II,III years(I, II, III, IV,V &VI Semesters) during 2016-17.
2. To consider and approve the introduction of Internal Assessment for the students admitted into I,II & III years degree course during 2016-17.
3. To consider and approve the model question paper for B.Sc. I,II,&III year 2016-17
4. To consider and approve the list of examiners for paper setting, evaluation for B.Sc. I,II, & III year (I,II,III,IV,V & VI Semester) during 2016-17.
5. Any other related academic matters.

RESOLUTIONS:

1. It is resolved to approve the Syllabus and Question papers Models for the I,II,III,IV,V and VI Semester for the year 2016-17 and also in authorized the chairman of Board of Studies to nominate panel of Examiners and paper setter.
2. It is resolved to adopt each semester is of 100 marks in which 70 Marks for Theory and 30 Marks for Internal Examinations (20 Marks for written examination, 5 Marks for Assignment and 5 marks for Seminar) introduce for the year 2014-15 as per the direction of CCE, Hyd.
3. It is resolved to organize class wise and year wise Class Seminar, Group Discussion and Guest Lecture.
4. Approved to conduct practical examination at the end of each semester for 1st year students and of fourth and sixth semesters for 2nd & 3rd year students.

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N.G. College, NALGONDA.

SIGNATURES

1.	M.Srinivas Reddy H.O.D of Physics N.G. College, Nalgonda	Chairman B.O.S.
2.	Prof.K.Madhukar Dept. of Physics O.U., Hyderabad.	University Nominee
3.	M.Sathyanarayana Lecturer in Physics GDC,Devarakonda.	Subject Expert
4.	Ch. Aruna, Lecturer in Physics GDC-Women-Nalgonda.	Subject Expert
5	CH.Bixamaiah, Lecturer in Physics, N.G. College, Nalgonda	Member

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PANEL OF EXAMINERS FOR THE YEAR 2016-17

S.No.	Papers	Name of the Examiners with full Addresses	Year of Experience	Papers Taught	Phone Numbers
1	I&II	P. Gattaiah, S.V. College, Suryapet	10 Years	I, II	8985928257
2		V.Buchi Reddy , GDC, Ramannapet	10 Years	I, II ,V,VII	9440383327
3		Dr.Y.Rajaram GDC Deverakonda	10 Years	I, II	9866863432
4		Dr.J.Chinnababu G.D.C. City College ,Hyd.	5 Years	I, II	9394801744
5		K.Manjula, MVS GDC, Mohabhoob Nagar	5 Years	I, II ,VI,VIII	9885627542
6	III&IV	Dr.Srinath Reddy, Nizam college, Hyderabad	15 Years	III, IV,V,VII	9849936509
7		Ch.Aruna, GDC(W), Nalgonda	3 Years	III, IV	9704787934 9441495293
8		R.Venkateswarlu, GDC Kodad.	5 Years	III, IV	9440493244
9		M.Satyanarayana, GDC Devarakonda	5 Years	III, IV,V,VII	9491992201
10		M.Kondaiah,NM GDC Jogipet,Medak.	5 Years	III, IV	9966586998
11	V&VII	G.Venugopal, SV.College, Suryapet.	20 Years	V, VII	9848482435
12		Md. Najmuddin Khan,MKR GDC,Devarakonda	11 Years	V, VII	9701311588
13		Dr.N.Vijaya Laxmi, NM GDC Jogipet,Medak.	10 Years	I,II,V, VII	9441899369
14		T.Suresh, GDC, Kodad	5 Years	V, VII	9666266222
15		M.Satyanarayana, GDC Devarakonda	5 Years	III, IV,V,VII	9491992201
16	VI&VIII	Dr.Srinath Reddy, Nizam college, Hyderabad	10 Years	VI , VIII	9849936509
17		B.Charadra Shekar, GDC Kukatpally, HYD	7 Years	VI , VIII	9440322507
18		N.Chandana,GDC,City College,HYD.	7 Years	VI , VIII	9866557935
19		Y.Vasudeva Reddy, GDC Kodad	7 Years	III, IV,VI , VIII	9440136451
20		U.Nagalingam, S.V. College, Suryapet	6 Years	I, II ,VI,VIII	9704742172

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NAGARJUNA GOVERNMENT COLLEGE, NALGONDA
DEPARTMENT OF PHYSICS
ALLOCATION OF CREDITS AT SUBJECT LEVEL

COURSE : SCIENCE **SUBJECT: PHYSICS**

S. No	Semester	Module(Paper)	Hours per week	Max. Marks	No. of credits
1	I (CORE)	Mechanics	4	100	3
2	Practicals	Mechanics	3	50	2
3	II (CORE)	Waves & Oscillations	4	100	3
4	Practicals	Waves & Oscillations	3	50	2
5	III (CORE)	Thermal Physics	4	100	3
6	IV (CORE)	Optics	4	100	3
7	Practicals	Thermodynamics, Optics	3	50	2
8	V Core	Electromagnetic theory	4	100	3
9	V Elective (Advanced)	Modern Physics-I	3	100	2
10	V Elective (Advanced)	Biomedical Instrumentation	3	100	
11	Practicals	Electromagnetic theory	3	50	2
12	VI Core	Electronics	4	100	3
13	VI Elective-1 (Applied)	Modern Physics-II	3	100	2
14	VI Elective-2 (Applied)	Renewable Energy & Energy harvesting	3	100	
15	Practicals	Modern Physics	3	50	2
16	Project Work	Student Individual		Grade	
17	Others(General Elective)	Electrical and Electronic appliances	2	50	2
		Total Credits			**34**

Department of Physics

Nagarjuna Government College, Nalgonda

Name of the Module: Mechanics
Semester: I
Nature of the Module: Core
Subject: Physics
Mode of Learning: Regular
No. of Hours: 04
Credits: 03
Total Hours: 60

CURRICULAR PLAN

Semester: I

S. No	Month and Week	No. of Hours	Topic	Curricular Activity	Co-curricular Activity	Remarks
1	June II	4	Scalar& vector fields,Gradient,Divergence, Curl	Teaching & Practical	Self Study on basics	
2	June III	4	Line,Surface ,Volume Integrals ,Stokes Theorem	Teaching & Practical		
3	June IV	4	Gauss & Green Theorem,Laws of motion ,Varable mass Sysem	Teaching & Practical	Assiagnment	
4	July I	4	Motion of Rocket Conservation of Energy & Momentum ,collisions in 2&3 dimensions	Teaching & Practical		
5	July II	4	Impact parameter,scattering cross secton, Rutherford scattering ,Rigid Body	Teaching & Practical	Quiz	
6	July III	4	Equation of motion ,Angular mometum,Euler's equation	Teaching & Practical		
7	July IV	4	Precession of a top,Gyroscope,Prescession of Equinoxes	Teaching & Practical	Assignment	
8	Aug I	4	Central forces ,Conservative nature,Equation of motion under central force	Teaching & Practical		
9	Aug II	4	Gravitional potential & field ,Inverse square Law	Teaching & Practical	Seminar	
10	Aug III	4	Derivation of Kepler Laws,coriolis force and its expressions	Teaching & Practical	Quiz	
11	Aug IV	4	Galilian relativity, Absolute frames,Michelson & Morley Expt.	Teaching & Practical	Group Discussion	
12	Sep I	4	Postulates of spl. theory of Relativity,Lorentz transformation	Teaching & Practical	Seminar	
13	Sep II	4	Time delation, length contraction,addition of velocities	Teaching & Practical	Student Carrier Counselling	
14	Sep III	4	mass-energy relation. Concept of four vector formalism.	Teaching	Revison	
15	Sep IV	4	Revision of the Syllabus	Teaching	Mock test	

Department of Physics

Nagarjuna Government College, Nalgonda

Name of the Module: Waves & Oscillations Semester: II

Nature of the Module: Core Subject: Physics

Mode of Learning: Regular

No. of Hours: 04 Credits: 03 Total Hours: 60

CURRICULAR PLAN

Semester: II

S. No	Month and Week	No. of Hours	Topic	Curricular Activity	Co-curricular Activity	Remarks
1	Nov I	4	Simple harmonic oscillator,and solution of the differential equation-Physical characteristics of SHM	Teaching & Practical (1)	Self Study on basics	
2	Nov II	4	Torsion pendulum, measurements of rigidity modulus, compound pendulum, measurement of 'g'	Teaching & Practical (1)		
3	Nov III	4	Damped har-monic oscillator, solution of the differential equation of damped oscillator.	Teaching & Practical (1)	Assignment	
4	Nov IV	4	logarithmic decre-ment, relaxation time, quality factor, differential equation of forced oscillator and its	Teaching & Practical (1)		
5	Dec I	4	solution, amplitude resonance, velocity resonance.	Teaching & Practical (1)	Student Seminar	
6	Dec II	4	Addition of two simple harmonic mo-tions with different frequencies	Teaching & Practical (1)		
7	Dec III	4	Transverse wave propagation along a stretched string, general solution of wave equation and its significance	Teaching & Practical (1)	Quiz	
8	Dec IV	4	modes of vibration of stretched string clamped at both ends, overtones, energy transport, trans-verse impedance	Teaching & Practical (1)	Assignment	
9	Jan I	4	Reflection and transmission of waves, Longitudinal waves in air, solution, of a differential equation, reflection and	Teaching & Practical (1)	Student Seminar	
10	Jan II	4	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	Teaching & Practical (1)		
11	Jan III	4	bar free at both ends (iv) bar fixed at one end. Transverse vibrations in a bar-wave equation and its general solution.	Teaching & Practical (1)	Invited talk	
12	Jan IV	4	Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.	Teaching & Practical (1)		
13	Feb I	4	Ultrasonics, properties of ultrasonic waves, production of ultra-sonics by piezoelectric and magnetostriction methods	Teaching & Practical (1)	Student Carrier Counselling	
14	Feb II	4	detection of ultrasonics, de-termination of wavelength of ultransonic waves. Velocity of ultrasonics in liquids by Sear's mehtod.	Teaching & Practical (1)	Group-discussion	
15	Feb III	4	Revision of the Syllabus	Discussion	Mock test	
16	Feb IV	4	Remedial Classes	Discussion		

Department of Physics

Nagarjuna Government College, Nalgonda

Name of the Module: THERMODYNAMICS
Semester: III
Nature of the Module: Core
Subject: Physics
Mode of Learning: Regular
No. of Hours: 04
Credits: 03
Total Hours: 60

CURRICULAR PLAN

Semester: I

S. No	Month and Week	No. of Hours	Topic	Curricular Activity	Co-curricular Activity	Remarks
1	June II	4	Kinetic theory of gases-Deduction of Maxwell's law of distribution of molecular speeds	Teaching & Practical (1)	Self Study on basics	
2	June III	4	Experimental verification Toothed Wheel Experiment, Transport Phenomena –Viscosity of gases – thermal conductivity – diffusion of gases.	Teaching & Practical (1)		
3	June IV	4	Thermodynamic potentials – Derivation of Maxwell's thermodynamic relations –Clausius	Teaching & Practical (1)	Assiagnment	
4	July I	4	Derivation for ratio of specific heats –Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect– expression for Joule Kelvin	Teaching & Practical (1)		
5	July II	4	Thermodynamics- Introduction – Reversible and irreversible processes – Carnot's engine and its efficiency – Carnot's theorem – Second law of	Teaching & Practical (1)	Quiz	
6	July III	4	Thermodynamic scale of temperature – Entropy, physical significance – Change in entropy in reversible and irreversible processes –Entropy and	Teaching & Practical (1)		
7	July IV	4	Entropy (T-S)diagram – Change of entropy of a perfect gas-change of entropy when ice changes into steam.	Teaching & Practical (1)	Assignment	
8	Aug I	4	Low temperature Physics -Joule Kelvin effect – liquefaction of gas using porous plug experiment. Joule expansion – Distinction between adiabatic	Teaching & Practical (1)		
9	Aug II	4	Liquefaction of helium, Kapitza's method – Adiabatic demagnetization – Production of low temperatures – Principle of refrigeration, vapour	Teaching & Practical (1)	Seminar	
10	Aug III	4	Statistical Mechanics - Introduction to statistical mechanics, concept of ensembles, Phase space	Teaching & Practical (1)	Quiz	
11	Aug IV	4	Fermi-Dirac Distribution law, comparison of three distribution laws, Black Body Radiation, Rayleigh-Jean's formula,	Teaching & Practical	Group Discussion	
12	Sep I	4	Quantum theory of radiation - , Rayleigh-Jeans law, from Planck's law -measurement of radiation – Types of pyrometers	Teaching & Practical	Seminar	
13	Sep II	4	Reversible and irreversible processes – Carnot's engine and its efficiency – Carnot's theorem	Teaching & Practical	Student Carrier Counselling	
14	Sep III	4	Kinetic theory of gases, Thermodynamic potentials and Maxwell's equations.	Teaching	Revision	
15	Sep IV	4	Statistical Mechanics , Quantum theory of radiation	Teaching	Mock test	

Department of Physics

Nagarjuna Government College, Nalgonda

Name of the Module: Optics Semester: IV

Nature of the Module: Core Subject: Physics

Mode of Learning: Regular

No. of Hours: 04 Credits: 03 Total Hours: 60

CURRICULAR PLAN

Semester: II

S. No	Month and Week	No. of Hours	Topic	Curricular Activity	Co-curricular Activity	Remarks
1	Nov I	4	Interference-Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light.	Teaching & Practical (1)	Self Study on basics	
2	Nov II	4	Fresnel's biprism–determination of wave length of light.Determination of thickness of a transparent material using Biprism;Loyd's mirror	Teaching & Practical (1)		
3	Nov III	4	Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films	Teaching & Practical (1)	Assignment	
4	Nov IV	4	Non reflecting films – interference by a plane parallel film illuminated by a point source – Interference by a wedge film, diameter of wire	Teaching & Practical (1)	Student Seminar	
5	Dec I	4	Newton's rings in reflected light with and without contact between lens and glass plate,Difference in wavelength of sodium D1,D2 lines	Teaching & Practical (1)		
6	Dec II	4	Newton's rings in transmitted light (Haidinger Fringes) – Determination of wave length of monochromatic light – Michelson Interferometer	Teaching & Practical (1)	Assignment	
7	Dec III	4	Aberrations - Monochromatic aberrations, spherical aberration, methods of minimizing spherical aberration, coma, astigmatism	Teaching & Practical (1)	Student Seminar	
8	Dec IV	4	aberration – the achromatic doublet – Removal of chromatic aberration of a separated doublet	Teaching & Practical (1)		
9	Jan I	4	Lasers: Spontaneous emission – Stimulated emission – Population inversion . Laser principle – Einstein coefficients – Types of Lasers	Teaching & Practical (1)	Invited Talk	
10	Jan II	4	Fiber Optics : .Introduction – Optical fibers – Step and graded index fibers – Principles of fiber communication	Teaching & Practical (1)	Group Discussion	
11	Jan III	4	Rays and modes in an optical fiber – Fiber material, advatages of fiber communication	Teaching & Practical (1)		
12	Jan IV	4	Diffraction- Fraunhoffer diffraction due to double slit – Fraunhoffer diffraction pattern with N slits Resolving Power of grating	Teaching & Practical (1)	Student Carrier Counselling	
13	Feb I	4	Fresnel's half period zones-Comparison of zone plate with convex lens – Phase reversal zone plate	Teaching & Practical (1)		
14	Feb II	4	Polarized light : Methods of Polarization, Polarization by reflection, refraction, Double refraction, selective absorption	Teaching & Practical (1)	Quiz	
15	Feb III	4	Quarter wave plate, Half wave plate – Babinet's compensator – Optical activity, analysis of light by Laurent's half shade polarimeter.	Teaching & Practical (1)		
16	Feb IV	4	Revision of the Syllabus	Teaching & Practical (1)	Mock test	

SYLLABUS

College: NAGARJUNA GOVT. DEGREE COLLEGE

Year: 2016-17 **Course: B.Sc.**

Name of the Module: MECHANICS **Subject: Physics**

Nature of the Module: Core **Semester: I**

Mode of the Learning: Regular

UNIT – I

Vector Analysis

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 and Greens theorems - simple applications.

UNIT – II

Mechanics of Particles

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.

Mechanics of rigid bodies

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

Central forces

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

Special theory of relativity

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.

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Textbooks

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. **College Physics-I.** T. Bhimasankaram and G. Prasad. *Himalaya Publishing House*

Reference Books

1. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company* Edition,2008.
2. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005.*
3. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *PearsonEducation Eleventh Edition.*
4. **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow. *The McGraw HillCompanies.*
5. **Mechanics.** Hans & Puri. *TMH Publications.*
6. **Engineering Physics.** R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications.*
7. R P Feymman, RB Lighton and M Sands - The Feymman Lectures in Physics, Vol.-1, BI Publications,
8. J.C. Upadhyay - Mechanics.
9. P.K. Srivastava - Mechanics, New Age International.

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FIRST SEMISTER
PRACTICALS
Practical Paper – I :: Mechanics

1. Study of a compound pendulum determination of 'g' and 'k'.
2. Y' by uniform Bending
3. Y by Non-uniform Bending.
4. Moment of Inertia of a fly wheel.
5. Measurement of errors –simple Pendulum.
6. 'Rigidity moduli by torsion Pendulum.
7. Determination of surface tension of a liquid through capillary rise method.
8. Determination of Surface Tension of a liquid by different methods.
9. Determination of Viscosity of a fluid.
10. Calculation of slope and intercept of a Y= mX +C by theoretical 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.

Text and reference 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. Workshop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Sriva

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College: NAGARJUNA GOVT. DEGREE COLLEGE

Year : 2016-17 **Course: B.Sc.**

Name of the Module: WAVES AND OSCILLATIONS **Subject: Physics**

Nature of the Module: Core **Semester: II**

Mode of the Learning: Regular

UNIT – I

FUNDAMENTALS OF VIBRATIONS

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 OSCILLATION

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

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

Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the midpoint 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.

Text books

1. **Fundamentals of Physics.** Halliday/Resnick/Walker.*C. Wiley India Edition 2007.*
2. **First Year Physics** – *Telugu Academy.*
3. **University Physics.** FW Sears, MW Zemansky and HD young 13/e,1986.Addision-Wesley
4. **Engineering Mechanics, Basudeg Bhattacharya, 2nd edn.**,2015, Oxford University Press.
5. P.K.Srivastava – Mechanics , New Age International.

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SECOND SEMISTER PRACTICALS

Practical Paper – II :: Waves and Oscillations

1. Study of damping of an oscillating disc in Air and Water logarithmic decrement.
2. Study of Oscillations under Bifilar suspension.
3. Study of oscillations of a mass under different combination of springs.
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.
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
10. Study of coupled oscillator.

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.

Text and reference 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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College: NAGARJUNA GOVT. DEGREE COLLEGE

Year : 2016-17 **Course: B.Sc.**

Name of the Module: THERMAL PHYSICS **Subject: Physics**

Nature of the Module: Core **Semester: III**

Mode of the Learning: Regular

UNIT – I

KINETIC THEORY OF GASES

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

THERMODYNAMICS

Basics of thermodynamics-Kelvin's and Claussius 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

THERMODYNAMIC POTENTIALS AND MAXWELL'S EQUATIONS

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.

LOW TEMPERATURE PHYSICS

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

QUANTUM THEORY OF RADIATION

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 pyrometersDisappearing filament optical pyrometer – experimental determination – Angstrom pyroheliometer - determination of solar constant, effective temperature of sun.

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Unit – IV

Statistical Mechanics

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.

Textbooks

6. **Fundamentals of Physics.** Halliday/Resnick/Walker.*C. Wiley India Edition 2007.*
7. **Second Year Physics** – *Telugu Academy.*
8. **Modern Physics** by R. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co.*

Reference Books

1. **Modern Physics** by G. Aruldhas and P. Rajagopal, *Eastern Economy Education.*
2. Berkeley Physics Course. Volume-5. **Statistical Physics** by F. Reif. *The McGraw-Hill Companies.*
3. **An Introduction to Thermal Physics** by Daniel V. Schroeder.*Pearson Education Low Price Edition.*
4. **Thermodynamics** by R.C. Srivastava, Subit K. Saha&Abhay K. *Jain Eastern Economy Edition.*
5. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand& Co. Publications.*
6. **Feyman's Lectures on Physics** Vol. 1,2,3& 4. *Narosa Publications.*
7. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*

8 .B.B. Laud "**Introduction to statistics Mechanics**" (Macmillan 1981)

9. F.Reif:"**Statistical Physics** "(Mcgraw-Hill, 1998)

10. K.Haung: "**Statistical Physics** "(Wiley Eastern 1988)

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N.G. College, NALGONDA.

College: NAGARJUNA GOVT. DEGREE COLLEGE

Year : 2016-17
Name of the Module: Optics
Nature of the Module: Core
Mode of the Learning: Regular

Course: B.Sc.
Subject: Physics
Semester: IV

UNIT I

INTERFERENCE

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

DIFFRACTION

Introduction – Distinction between Fresnel and Fraunhoffer diffraction Fraunhoffer diffraction:- Diffraction due to single slit and circular aperture – Limit of resolution – Fraunhoffer diffraction due to double slit – Fraunhoffer 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's 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.

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UNIT III

POLARIZATION

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

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 fiber communication and advantages of fiber communication.

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

Textbooks

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.*

Reference Books

1. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand& Co. Publications.*
2. **Feyman's Lectures on Physics** Vol. 1,2,3& 4. *Narosa Publications.*
3. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
4. K. Ghatak, **Physical Optics'**
5. D.P. Khandelwal, Optical and Atomic Physics' (Himalaya Publishing House, Bombay,1988)
6. Jenkins and White: 'Fundamental of Optics' (McGraw-Hill)
7. Smith and Thomson: 'Optics' (John Wiley and sons)

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Practical Paper – II

B.Sc SECOND YEAR PRACTICALS (2016-17)

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. Thickness of a wire-wedge method.
6. Determination of wavelength of light –Biprism.
7. Determination of Radius of curvature of a given convex lens- Newton's rings.
8. Resolving power of grating.
9. Study of optical rotation-polarimeter.
10. Dispersive power of a prism
11. Determination of wavelength of light using diffraction grating minimum deviation method.
12. Wavelength of light using diffraction grating – normal incidence method.
13. Resolving power of a telescope.
14. Refractive index of a liquid and glass (Boys Method).
15. Pulfrich refractometer – determination of refractive index of liquid.
16. Wavelength of Laser light using diffraction grating.

Text and reference 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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College: NAGARJUNA GOVT. DEGREE COLLEGE
Year : 2016-17 **Course: B.Sc.**
Name of the Module: Electromagnetic theory **Subject: Physics**
Nature of the Module: Core **Semester: V**
Mode of the Learning: Regular

Unit - I:

Electrostatics: Gauss law and its applications – Uniformly charged sphere, charged cylindrical conductor and an infinite conducting sheet of charge. Deduction of Coulomb's law from Gauss law, Mechanical force on a charged conductor, Electrical Potential – Potential due to a charged spherical conductor, electric field strength from the electric dipole and an infinite line of charge. Potential of a uniformly charged circular disc.

Unit – II:

Dielectrics: An atomic view of dielectrics, potential energy of a dipole in an electric field. Polarization and charge density, Gauss's law for dielectric medium – Relation between D, E and P. Dielectric Constant, susceptibility and relation between them. Boundary conditions at the dielectric surface. Electric fields in cavities of a dielectric – needle shaped cavity and disc shaped cavity.

Capacitance: Capacitance of concentric spheres and cylindrical condenser, capacitance of parallel plate condenser with and without dielectric. Electric energy stored in a charged condenser – force between plates of condenser, construction and working of attracted disc electrometer, measurement of dielectric constant and potential difference.

Unit – III:

Magnetostatics: Magnetic shell – potential due to magnetic shell – field due to magnetic shell – equivalent of electric circuit and magnetic shell – Magnetic induction (B) and field (H) – permeability and susceptibility – Hysteresis loop.

Moving charge in electric and magnetic field: Motion of charged particles in electric and magnetic fields. Hall effect, cyclotron, synchrocyclotron and synchrotron – force on a current carrying conductor placed in a magnetic field, force and torque on a current loop, Biot – Savart's law and calculation of B due to long straight wire, a circular current loop and solenoid.

Unit – IV:

Electromagnetic induction: Faraday's law – Lenz's law – expression for induced emf – time varying magnetic fields – Betatron – Ballistic galvanometer – theory – damping correction – self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid – toroid – energy stored in magnetic field – transformer – Construction, working, energy losses and efficiency.

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Textbooks

1. **Modern Physics** by R. Murugeshan and Kiruthiga Siva Prasath – *S. Chand & Co.* for semi conductor & Digital Principles)
2. **Fundamentals of Physics**- Halliday/Resnick/Walker - *Wiley India Edition 2007.*
3. Berkeley Physics Course – Vol. II - **Electricity and Magnetism** – Edward M Purcell – *The McGraw-Hill Companies.*
4. **Electricity and Magnetism** – D.N. Vasudeva. *S. Chand & Co.*
5. **Electronic devices and circuits** – Millman and Halkias. *Mc.Graw-Hill Education.*
6. **Electricity and Magnetism** Brijlal and Subramanyam. *Ratan Prakashan Mandir.*
7. **Digital Principles and Applications** by A.P. Malvino and D.P. Leach. *McGraw Hill Education.*
8. Electromagnetic theory by D.J. Grifiths

Reference Books

1. **Electricity and Electronics** – D.C. Tayal. *Himalaya Publishing House.*
2. **Electricity and Magnetism** – C.J.Smith. *Edward Arnold Ltd.*
3. **Electricity, Magnetism with Electronics** – K K Tewari. *R.Chand & Co.*
4. **Third year Physics** – *Telugu Akademy*
5. **Principles of Electronics** by V.K. Mehta – *S. Chand & Co.*

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College: NAGARJUNA GOVT. DEGREE COLLEGE
Year : 2016-17 **Course: B.Sc.**
Name of the Module: Modern physics-I **Subject: Physics**
Nature of the Module: Elective-1 **Semester: V**
Mode of the Learning: Regular

Unit - I:

Atomic Spectra: Introduction – Drawbacks of Bohr's atomic model – Sommerfeld's elliptical orbits – relativistic correction (no derivation). Stern & Gerlach experiment Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Spectral terms, selection rules, intensity rules. Spectra of alkali atoms, doublet fine structure. Alkaline earth spectra, singlet and triplet fine structure. Zeeman Effect, Paschen-Back Effect and Stark Effect (basic idea).

Unit – II:

Molecular Spectroscopy: Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule, determination of internuclear distance. Vibrational energies and spectrum of diatomic molecule. Raman effect, Classical theory of Raman effect. Experimental arrangement for Raman effect and its applications.

Unit – III:

Quantum Mechanics
Inadequacy of classical Physics: (Discussion only)

Spectral radiation – Planck's law. Photoelectric effect – Einstein's photoelectric equation. Compton's effect (quantitative) experimental verification. Stability of an atom – Bohr's atomic theory. Limitations of old quantum theory.

Matter Waves:

de Broglie's hypothesis – wavelength of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Double slit experiment. Standing de Brogile waves of electron in Bohr orbits.

Unit – IV:

Uncertainty Principle:
Heisenberg's uncertainty principle for position and momentum (x and p_x), Energy and time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Particle in a box. Complementary principle of Bohr.

Schrodinger Wave Equation:
Schrodinger time independent and time dependent wave equations. Wave function properties – Significance. Basic postulates of quantum mechanics. Operators, eigen functions and eigen values, expectation values. Application of Schrodinger wave equation to particle in one and three dimensional boxes, potential step and potential barrier.

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Text Books

1. **Modern Physics** by G. Aruldhas & P. Rajagopal. Eastern Economy Edition.
2. **Concepts of Modern Physics** by Arthur Beiser. Tata McGraw-Hill Edition.
3. **Modern Physics** by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.
4. **Nuclear Physics** by D.C. Tayal, Himalaya Publishing House.
5. **Molecular Structure and Spectroscopy** by G. Aruldhas. Prentice Hall of India, New Delhi.
6. **Spectroscopy – Atomic and Molecular** by Gurdeep R Chatwal and Shyam Anand – Himalaya Publishing House.
7. **Third Year Physics** – Telugu Academy
8. **Elements of Solid State Physics** by J.P. Srivastava. (for chapter on nanomaterials) – Prentice-hall of India Pvt. Ltd.

Reference Books

1. **University Physics with Modern Physics** by Young & Freedman. A. Lewis Ford. Low Price Edition (Eleventh Edition).
2. **Quantum Physics** by Eyvind H. Wichman. Volume.4, The McGraw-Hill Companies.
3. **Quantum Mechanics** by Mahesh C. Jani. Eastern Economy Edition.
4. **Nuclear Physics** Irving Kaplan – Narosa Publishing House.
5. **Introduction to Solid State Physics** by Charles Kittel. John Wiley and Sons.
6. **Solid State Physics** by A.J. Dekker. Mac Millan India.

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College: NAGARJUNA GOVT. DEGREE COLLEGE
Year : 2016-17 **Course: B.Sc.**
Name of the Module: BIO - MEDICAL INSTRUMENTATION **Subject: Physics**
Nature of the Module: Elective-2 **Semester: V**
Mode of the Learning: Regular

Unit-I

Electro - Cardiography (ECG) - Electromyography (EMG) - Electro - Encephelograph (EEG) - Phonocardiography.

Unit - II

Pacemakers - Introduction - External and Internal pacemakers - Artificial heart valves - (Principle - block diagram and operation).

Unit - III

Recording fetal heart movements and blood circulation using Doppler ultrasonic method - Laser based Doppler blood flow meter - Blood cell counter - B.P. measurement - Direct and indirect method - Haemocytometer - counting of RBCs and WBCs.

Unit - IV

Radiation safety instrumentation - Effects of radiation exposure - Radiation monitoring instruments - Pocket dosimeter - pocket type radiation alarm.

Books for Study and Reference:

1. Bio-medical Instrumentation - Dr. M. Arumugam - Anuradha Agencies.

2. Bio instrumentation - John G. Webster, editor - John Wiley & Sons, Inc

3. Biological Instrumentation and methodology, P.K. Bajpai.

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College: NAGARJUNA GOVT. DEGREE COLLEGE
Year : 2016-17
Name of the Module: Electronics
Nature of the Module: Core
Mode of the Learning: Regular

Course: B.Sc.
Subject: Physics
Semester: VI

Unit – I:

Varying and alternating currents: Growth and decay of currents in LR, CR and LCR circuits – Critical damping. Alternating current, relation between current and voltage in pure R, C and L-vector diagrams – Power in ac circuits, LCR series and parallel resonant circuit – Q-factor, AC & DC motors – single phase, three phase (basics only).

Unit – II:

Maxwell's equations and electromagnetic waves: A review of basic laws of electricity and magnetism – displacement current – Maxwell's equations in differential form – Maxwell's wave equation, plane electromagnetic waves - Transverse nature of electromagnetic waves, Poynting theorem, production of electromagnetic waves (Hertz experiment).

Unit – III:

Basic Electronics: Formation of energy bands in solids, classification of solids in terms of forbidden energy gap. Intrinsic and extrinsic semiconductors, Fermi level, continuity equation – p-n junction diode, half wave and full wave rectifiers and filters, ripple factor (quantitative), Characteristics of Zener diode and its application as voltage regulator – p n p and n p n transistors, current components in transistors, CB, CE and CC configurations – concept of transistor biasing, operating point, fixed bias and self bias (Qualitative only), transistor as an amplifier – concept of negative feed back and positive feed back – Barkhausen criterion, RC coupled amplifier and phase shift oscillator (qualitative).

Unit – IV:

Digital Principles: Binary number system, converting 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 – vice versa and Decimal to Hexadecimal 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, De Morgan's Laws – statement and proof, Half and Full adders. Parallel adder circuits.

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

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Textbooks

1. **Fundamentals of Physics**- Halliday/Resnick/Walker - *Wiley India Edition 2007.*

2. Berkeley Physics Course – Vol. II - **Electricity and Magnetism** – Edward M Purcell – *The McGraw-Hill Companies.*

3. **Electricity and Magnetism** – D.N. Vasudeva. *S. Chand & Co.*

4 **Electronic devices and circuits** – Millman and Halkias. *Mc.Graw-Hill Education.*

5. **Electricity and Magnetism** Brijlal and Subramanyam. *Ratan Prakashan Mandir.*

6. **Digital Principles and Applications** by A.P. Malvino and D.P. Leach. *McGraw Hill Education.*

7. Electromagnetic theory by D.J. Grifiths

Reference Books

6. **Electricity and Electronics** – D.C. Tayal. *Himalaya Publishing House.*

7. **Electricity and Magnetism** – C.J.Smith. *Edward Arnold Ltd.*

8. **Electricity, Magnetism with Electronics** – K K Tewari. *R.Chand & Co.*

9. **Third year Physics** – *Telugu Akademy*

10. **Principles of Electronics** by V.K. Mehta – *S. Chand & Co.*

College: NAGARJUNA GOVT. DEGREE COLLEGE
Year: 2016-17 **Course: B.Sc.**
Name of the Module: Modern Physics-II **Subject: Physics**
Nature of the Module: Elective-1 **Semester: VI**
Mode of the Learning: Regular

Unit – I:
Nuclear Physics
Nuclear Structure: Basic properties of nucleus – size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, p-p and n-p scattering (concepts), nuclear forces. Nuclear models – liquid drop model, shell model.

Alpha and Beta Decays: Range of alpha particles, Geiger – Nuttal law, Gammow's theory of alpha decay. Geiger – Nuttal law from Gammow's theory. Beta spectrum – neutrino hypothesis, Fermi's theory of β-decay (qualitative).

Unit – II:

Nuclear Reactions: Types of nuclear reactions, channels, nuclear reaction kinematics. Compound nucleus, direct reactions (concepts).

Nuclear Detectors: GM counter, proportional counter, scintillation counter, Wilson cloud chamber and solid state detector.

Unit – III:

Solid State Physics
Crystal Structure: Crystalline nature of matter. Crystal lattice, Unit Cell, Elements of symmetry. Crystal systems, Bravais lattices. Miller indices. Simple crystal structures (S.C., BCC, CsCl, FCC, NaCl diamond and Zinc Blends).

X-ray Diffraction: Diffraction of X – rays by crystals, Bragg's law, Experimental techniques – Laue's method and powder method.

Nanomaterials: Introduction, nanoparticles, metal nanoclusters, semiconductor nanoparticles, carbon clusters, carbon nanotubes, quantum nanostructures – nanodot, nanowire and quantum well. Fabrication of quantum nanostructures.

Unit – IV:

Bonding in Crystals: Types of bonding in crystals – characteristics of crystals with different bindings. Lattice energy of ionic crystals – determination of Medelung constant for NaCl crystal, calculation of Born coefficient and repulsive exponent. Born – Haber cycle.

Magnetism: Magnetic properties of dia, para and ferromagnetic materials. Langevin's theory of paramagnetism. Weiss' theory of ferromagnetism – Concepts of magnetic domains, antiferromagnetism and ferrimagnetism ferrites and their applications.

Superconductivity: Basic experimental facts – zero resistance, effect of magnetic field, Meissner effect, persistent current, Isotope effect Thermodynamic properties, specific heat, entropy. Type I and Type II superconductors.

Elements of BCS theory-Cooper pairs. Applications. High temperature superconductors (general information).

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

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Text Books

1.**Modern Physics** by G. Aruldhas & P. Rajagopal. Eastern Economy Edition.

2. **Concepts of Modern Physics** by Arthur Beiser. Tata McGraw-Hill Edition.

3. **Modern Physics** by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.

4. **Nuclear Physics** by D.C. Tayal, Himalaya Publishing House.

5. **Molecular Structure and Spectroscopy** by G. Aruldhas. Prentice Hall of India, New Delhi.

6. **Spectroscopy – Atomic and Molecular** by Gurdeep R Chatwal and Shyam Anand – Himalaya Publishing House.

7. **Third Year Physics** – Telugu Academy

8. **Elements of Solid State Physics** by J.P. Srivastava. (for chapter on nanomaterials) – Prentice-hall of India Pvt. Ltd.

Reference Books

1.**University Physics with Modern Physics** by Young & Freedman. A. Lewis Ford. Low Price Edition (Eleventh Edition).

2. **Quantum Physics** by Eyvind H. Wichman. Volume.4, The McGraw-Hill Companies.

3. **Quantum Mechanics** by Mahesh C. Jani. Eastern Economy Edition.

4. **Nuclear Physics** Irving Kaplan – Narosa Publishing House.

5. **Introduction to Solid State Physics** by Charles Kittel. John Wiley and Sons.

6. **Solid State Physics** by A.J. Dekker. Mac Millan India.

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College: NAGARJUNA GOVT. DEGREE COLLEGE
Year : 2016-17 **Course: B.Sc.**
Name of the Module: RENEWABLE ENERGY AND ENERGY HARVESTING **Subject: Physics**
Nature of the Module: Elective-2 **Semester: VI**
Mode of the Learning: Regular

Unit –I

Fossil fuels and Alternate Sources of energy: Fossil fuels and Nuclear Energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.

Unit-II

Solar energy: Solar energy, its importance, storage of solar energy, solar pond, non convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.

Unit-III

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies.
Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass.
Geothermal Energy: Geothermal Resources, Geothermal Technologies.

Unit-IV

Hydro Energy: Hydropower resources, hydropower technologies, environmental impact of hydro power sources.
Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power
Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent applications. Carbon captured technologies, cell, batteries, and power consumption. Environmental issues and Renewable sources of energy, sustainability

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Reference Books :

- Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi
- Solar energy - M P Agarwal - S Chand and Co. Ltd.
- Solar energy-Suhas P Sukhative Tata McGraw-Hill Publishing Company Ltd.
- Godfrey Boyle, "Renewable Energy, Power for a sustainable future", 2004, Oxford University Press, in association with The Open University.
- Dr. P Jayakumar, Solar Energy: Resource Assesment Handbook, 2009
- J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).

NAGARJUNA GOVERNMENT COLLEGE (AUTONOMOUIS) , NALGONDA

B. Sc. (Physics) IV semester

GENERAL ELECTIVE

ELECTRICAL AND ELECTRONIC APPLIANCES

2 Hours per week, total hours 30 per semester
No internals
End semester examination : 50 Marks

UNIT- I

ELECTICAL INSTRUMENTS (10)

Resistance – capacitance – Inductance and unit – Transformers – Electrical charge – Current – Potential –Units and measuring meters –Ohms Law - Galvanometer, Ammeter Volt meter and Multi meter. Electrical energy – watt – kWH – Consumption of electrical power.

UNIT - II

Electrical Appliances (10)

AC and DC - single phase and three phase connections - R M S and peak values, house wiring – over loading - earthing – shot circuiting - Fuses – Colour code for insulation wires – Inverter – UPS – Generator and motor – circuit breakers – Electrical switches.

Unit - III

Electronic appliances (10)

Introduction to semi conductor diode – transistor - L E D - L C D photo diode photo transistor Their uses , Diode rectifiers Half wave and full wave –Regulated power supply - TV receivers (\Qualitative study only) TV antennas and Dish Antennas.

Books Of Study:

1. A text book in electrical technology – BL Theraja's S. Chand & Co.
2. A text book in electrical technology – AK Theraja
3. Performance and design of Ac Machines-MG Say ELBS Edn
4. Semi Conductor physics and opto electronics by P K Palnichamy
5. Basic Electronics –BL Theraja – Schand & Co.
6. Principles of Communication Engineering –Arokh singh S Cand & co

Practical Paper - III

B.Sc THIRD YEAR PRACTICALS (2016-17)

1. Carey Foster's Bridge – comparison of resistances.
2. Internal resistance of a cell by potentiometer.
3. Figure of merit of a moving coil galvanometer.
4. Voltage sensitivity of a moving coil galvanometer.
5. RC circuit (Frequency response)
6. LR circuit (Frequency response)
7. LCR circuit series/parallel resonance, Q-factor
8. Power factor of an A.C. circuit
9. Determination of ac-frequency-sonometer.
10. Design and construction of multimeter.
11. Construction of a model D.C. power supply.
12. Characteristics of a Junction diode
13. Characteristics of Transistor
14. Characteristics of Zener diode
15. Verification of Kirchoff's laws.

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Practical Paper – IV

B.Sc THIRD YEAR PRACTICALS (2016-17)

1. e/m of an electron by Thomson method.
2. Energy gap of semiconductor using a junction diode
3. Temperature characteristics of thermistor
4. R.C. coupled amplifier
5. Verification of Logic gates AND, OR NOT, X-OR gates
6. Verification of De Morgan's theorems
7. Construction and verification of truth tables for half and full adders.
8. Phase shift Oscillator
9. Hysteresis curve of transformer core
10. Determination of Planck's constant (photocell)
11. Study of spectra of hydrogen spectrum (Rydberg constant)
12. Study of absorption of α and β rays.
13. Hall-probe method for measurement of magnetic field.
14. Absorption spectrum of iodine vapour.
15. Study of alkaline earth spectra using a concave grating.

Suggested Books for Practicals

1. **A textbook of Practical Physics** by M.N. Srinivasan. *S. Chand & Co.*
2. **Practical Physics** by M. Arul Thakpathi by *Comptek Publishers.*
3. **A. Laboratory manual for Physics Course** by B.P. Khandelwal.
4. **B.Sc. Practical Physics** – C.L. Arora – *S. Chand & Co.*
5. **Viva-voce in Advanced Physics** – R.C. Gupta and Saxena P.N. – *Pragathi Prakashan, Meerut.*
6. **Viva-Voce in Physics – R.C. Gupta, *Pragathi Prakashan, Meerut.***

Practical scheme of valuation [For Examiner use only]

1.Formula and explanation of symbols	5 marks
2.Tabular forms with circuit diagram wherever necessary	5 marks
3.Observations	15 marks
4.Calculations and graphs	8 marks
5.Result	2 marks
6.Viva - Voice	5 marks
7.Practical Record	10 marks

Total Marks = 50 marks

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MODEL PAPER

NAGARJUNA GOVERNMENT COLLEGE (AUTONOMOUS), NALGONDA

TENTATIVE SCHEME OF EVALUATION

COURSE: B.Sc. | SUBJECT: PHYSICS
Semester: I | Module: MECHANICS
Max. Marks: 70 | Time: 2:30 Hours

PART -A

(Very Short Questions) 5X2=10

I. Answer all the questions

1. Explain the divergence of a vector field.
2. Explain briefly multistage rocket.
3. Explain the coriolis force
4. Explain equilibrium properties of Fluid motion.
5. Explain the postulates of special theory of relativity

PART - B

(Short Questions) 4 X 5=20.

II Answer any four of the following problems.
(At least one problem from each unit)

6. Find the unit vector normal to the plane represented by $x^2+y^2=4$.
7. The speed of the particle of 10kg that is moving a circle of radius 0.75m increases at the rate 0.25m/s. Find the torque acting on it.
8. Calculate the kinetic energy of an electron moving with a velocity 2.9×10^8.
9. Find the work done in stretching a wire of cross seconding 1.25 mm^2 and length 1.9 m through 0.14mm the Young's modulus of wire is 45 GN/m^2
10. Estimate the mass of the sun assuming the orbit of earth round the sun is a circle. The distance between the sun and the earth is 1.49×10^{11} m and G=6.67×10^{-11} $N\text{-}m^2kg^2$
11. A Small ball of mass m and radius r, starting from rest, rolls down on the inner surface of a large hemisphere of radius R. What fraction of its energy is rotational and what translational?

PART-C

(Essay Type Questions)

III. Answer the following questions 4 X 10=40

12. (a) State and prove stokes theorem.

(OR)

(b) Derive the relations between impact parameters and the scattering angle for Rutherfords scattering of *a* Particle.

13. (a) Obtain expression for the velocity of a rocket at an instant of time T.

(OR)

(b) State Kepler's laws and derive second law.

14. (a) Describe the motion of symmetric top by derivation and explain its precessional angular velocity.

(OR)

(b) Derive relationship between Y, η, σ and κ.

15. (a) Obtain Lorentz transformation equations.

(OR)

(b) Describe the Michelson – Morley experiment.

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NAGARJUNA GOVERNMENT COLLEGE (AUTONOMOUS), NALGONDA

TENTATIVE SCHEME OF EVALUATION

COURSE: B.Sc., **SUBJECT: PHYSICS**
Semester: II **Module: WAVES AND OSCILLATIONS**
Max. Marks: 70 **Time: 2:30 Hours**

PART -A

(Very Short Questions) **5X2=10**

I. Answer all the questions

1. Obtain an expression for logarithmic decrement.
2. Explain the characteristics of S.H.M.
3. Explain character sties mechanical impedance.
4. What do you mean by amplitude resonance?
5. Explain the concept of magnetostriction.

PART – B

(Short Questions) **4 X 5=20**

II. Answer any four of the following problems.
(At least one problem from each unit)

6. A body of mass 4.9kg hangs from a spring and oscillates with a period of 0.6 sec. How much will the spring shorten when the body is removed?
7. A steel wire 50 cm long as mass of 5 g. It is stretched with a tension of 400 N. Find the frequency of the wire in fundamental mode of vibration.
8. Calculate the capacitance to produce the Ultrasonic waves of 10^6 Hz with an inductance of 1H.
9. Find the Fourier series expansion for the function $f(x)=1$ for $-\pi \leq x \leq 0$ and $f(x)=2$ for $0 \leq x \leq \pi$
10. The amplitude of a second pendulum falls to half initial value in 150 sec. Calculate the Q factor.
11. What fraction of total energy is kinetic and what fraction is potential when the displacement is one half of Amplitude.

PART-C

(Essay Type Questions)

III. Answer the following questions **4 X 10=40.**

12. (a) What is S.H.M? Deduce the equation of motion of S.H.O. and obtain its solution.

(OR)

(b) Set up differential equation of motion of damped harmonic oscillator and obtain its solution.

13. (a) Discuss the effect of combining two simple harmonic Vibrations in the same direction of the same angular frequency but different amplitudes and phases.

(OR)

(b) Discuss the application of Fourier's theorem for the analysis of a square wave.

14. (a) Obtain an expression for velocity of transverse waves along stretched string. Show that the Characteristic impedance offered by a string to the travelling waves is $Z = Jpf$, where' p' is the linear density and T is the Tension with which it is Stretched.

(OR)

(b) Write the necessary Theory giving corresponding diagrams that explain different modes of vibration of stretched string clamped at both the ends.

15. (a) Explain longitudinal vibrations in bars. Derive wave equation and its general solution.

(OR)

(b) What are Ultrasonics? Describe the piezoelectric method of producing them.

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TENTATIVE SCHEME OF EVALUATION

COURSE: B.Sc., **SUBJECT: PHYSICS**
Semester: III **Module: THERMODYNAMICS**
Max. Marks: 70 **Time: 2:30 Hours**

PART -A
(Very Short Questions) 5X2=10

I. Answer all the questions

1. Distinguish between classical and quantum statistics.
2. What are the thermodynamic potentials.
3. A refrigerator work under a reversible cycle between the temperatures 300K and 400K Calculate its thermal efficiency.
4. Write an expression for the work done during an isothermal process.
5. Write the properties of Helium - II

PART - B
(Short Questions) 4X5=20

II. Answer any four of the following
(At least one question from each unit)

6. At what temperature is the r.m.s. Speed of oxygen molecules twice their r.m.s speed at 27°C.
7. A Cornot engine working between 227°C and 27°C. What is its efficiency.
8. What is the change in entropy when 1 0 grams of ice at 0°C converts in to water at 0°C (L=80 Calories/gr)
9. Calculate the Fermi energy in copper. Density of copper p =8.94 x 1 03 kg/m3 and atomic mass of copper I is 63.5 amu.
10. Find the energy of oscillator at 300k° temperature when it vibrates with a frequency 5.6 x 1 012 / sec.
11. 100 g of steam at 100Oc is converted into steam of the same temperature. Calculate the change in entropy. Latent heat of steam=536 cal/g

PART-C
(Essay Type Questions)

III. Answer the following questions **4 X 10=40**

12. (A) On the basis of kinetic theory, obtain an expression for the coefficient of viscosity of a gas.

(OR)

(B) Describe Joule-Kelvin experiment and discuss its results.

13. (A) Define entropy, show that entropy remains constant in a reversible process.

(OR)

(B) Explain T-S diagram and how a Carnot cycle look on such diagram,

14. (A) Derive an expression for Joule-Thomson cooling and hence define temperature of inversion.

(OR)

(B) Write the Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein distribution laws and also its applications.

15. (A) Derive Rayleigh - Jeans formula for energy distribution in a black body radiation.

(OR)

(B) Obtain Wien's equation for energy distribution of a black body.

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TENTATIVE SCHEME OF EVALUATION

COURSE: B.Sc., **SUBJECT: PHYSICS**
Semester: IV **Module:** OPTICS
Max. Marks: 70 **Time: 2:30 Hours**

PART -A
(Very Short Questions)

I. Answer all the questions **5X2=10**

1. Explain various cardinal points of a lens system.
2. What are the conditions for sustained interference?
3. What is population inversion?
4. Explain the principle of optical fibre.
5. Explain Nodal planes.

PART - B
(Short Questions)

II. Answer any four of the following **4X5=20**
(At least one question from each unit)

6. Find the focal length of Huygens's eye piece.
7. The radius of curvatures of the surfaces of a double convex lens are 25cm and-25cm.The refractive index of the material of the lens is 1.5. Find the power of the lens.
8. Two lenses of focal lengths 4.5cm and 1.5cm are arranged coaxially. Find the condition for achromatism.
9. The focal lengths of a thin convex lens are 100cm and 96.8cm for red and blue coloures respectively find the dispersive power of the material of the lens.
10. In Newton's rings experiment the diameter of 10th dark ring is 0.433cm. The radius of curvature of the lens is 70cm. What is the wave length of the incident light.
11. In Michelson's interferometer 200 fringes cross the field of view when the movable mirror is displaced through 0.00589mm. Calculate the wave length of the light used..

PART-C
(Essay Type Questions)

III. Answer the following questions **4 X 10=40**

12.(A) Explain the translation, Refraction and system matrices.

(OR)

(B) Use matrix method to obtain an expression for the combined focal length of an optical System consisting of two thin convex lenses.

13. (A) What do you mean by achromatism of lenses? Derive the expression for condition of achromatism for two lenses separated by a distance.

(OR)

(B) What is holography? Explain the recording of hologram and reconstruction of the image.

14. (A) Describe the construction and working of Michelson's interferometer.

(OR)

(B) Describe the formation of Newton's rings in reflected light and obtain an expression for the diameter of dark rings.

15. (A) Explain Fresnel's half period zones. Derive an expression for the amplitude due to nth zone.

(OR)

(B) Discuss the theory of elliptically and circularly polarized light.

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TENTATIVE SCHEME OF EVALUATION

COURSE: B.Sc. **SUBJECT: PHYSICS**

Semester: V **Module: ELECTROMAGNETIC THEORY**

Max. Marks: 70 **Time: 2:30 Hours**

Part-A

(Very Short Questions)

I. Answer all the questions **5x2=10**

1. What is an electric dipole? What is the dipole moment?
2. State Faradey laws
3. Discuss the Boundary conditions at the surface of a dielectric.
4. Show the energy stored in a capacitor is ½ CV^2.
5. What is Hysteresis Loop?

Part-B

(Short Questions)

II Answer any Four questions. **4 x 5 = 20**

(At least one problem from each unit)

6. Calculate the intensity of electric field on a water drop of mass 10^{-7} kg and charge $5x10^{-4}$ C.
7. What is the value of electric potential at a distance of 2 m from a charge of 1 μC.
8. Assuming the earth is spherical shape with a radius 6400 km, find out its capacitance.
9. A parallel plate capacitor of capacitance 0.2 μF is charged to a potential of 2 V. Calculate the energy stored in it.
10. Calculate the resultant capacity of combination of three capacitors 8 μF , 24 μF and 34 μF when connected in series and in parallel.
11. 2 A current is flowing through 20 H inductor of 200 Ω resistance. Calculate the energy stored in the magnetic field created by the inductor.

Part-C

Answer all questions. **4 x 10 = 40**

12 (a) State and prove Gauss's Law in electrostatics.

OR

(b) Obtain an expression for electric field due to a uniform charged sphere using Gauss's Theorem.Find the electric filed on the surface of the sphere of radius 1 cm and a charge of 100 coulombs.

13. (a) Define D, E and P. Obtain the relation between D, E and P.

OR

(b) Obtain an expression for the capacitance of a cylindrical condenser.

14. (a) Explain magnetic susceptibility and magnetic permeability. Find the relation between them.

OR

(b) What is Hall Effect? Describe how Hall Effect is useful to know the nature of charge carriers in a conductor.

15. (a) Explain the construction and working of a Betatron.

OR

(b) Explain self and mutual inductance. Derive an expression for the co-efficient of mutual inductance between two coils.

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TENTATIVE SCHEME OF EVALUATION

COURSE: B.Sc., **SUBJECT: PHYSICS**
Semester: VI **Module: Electronics**
Max. Marks: 70 **Time: 2:30 Hours**

Part-A

I Answer any Four of the following. **5 x 2 = 10**

1. A parallel resonant circuit is formed with c = 1 μF, L = 10 mH
2. Explain what is meant by displacement current.
3. Show that electromagnetic waves are transverse in nature.
4. Explain how transistor acts an amplifier.
5. Draw the logic diagram for Half Adder.

Part-B

II Answer any Four questions. **4 x 5 = 20**
(At least one problem from each unit)

6. If the intensity of the electric field of an electromagnetic wave at a point in vacuum is 1.2×10^6 N/C. Find energy density.
7. The dielectric constant of water is 81 find the refractive index and velocity if light in water.
8. A parallel circuit is formed by C=1 μF, L= 10 mH, R= 1kΩ. find its resistance frequency and impedance.
9. The base amplification factor (β) of a transistor is 40 and base current is 30 μA. Calculate emitter current.
10. Find the decimal equivalent of $(101.011)_2$.
11. Find 2's compliment of 101100.

Part-C

III Answer all questions. **4 x 10 = 40**

12. (a) Discuss in detail growth and decay of current in L-R circuit.
OR
(b) Draw vector diagram for relation between voltage and current in pure RC circuit.

13. (a) State Maxwell's equations in differential and integral form.
OR
(b) What is pointing vector? Explain its significance.

14. (a) Explain the working of a Hall-Wave Rectifier and Full Wave Rectifier.
OR
(b) Draw the circuit diagram of a phase-shift oscillator and explain its operation.

15. (a) Draw the circuit diagram for OR, AND and NOT gates using discrete components and explain their operations. Give the truth tables.
OR
(b) State and explain De Morgan's Laws.

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COURSE: B.Sc., **SUBJECT: PHYSICS**
Semester: V **Module: Modern Physics-I**
Max. Marks: 70 **Time: 2:30 Hours**

Part-A

I Answer any Four of the following. **5 x 2 = 10.**

1. What are stokes and anti stokes lines in Raman Effect?
2. State and explain Bohr's Postulates to explain hydrogen spectra.
3. What are the matter waves?
4. Write time dependent and independent Schrödinger wave equations?
5. Explain Heisenberg Uncertainty Principle.

Part-B

II Answer any Four questions from following. **4 x 5 = 20**
(At least one problem from each unit)

6.
7.
8.
9.
10.
11

Part-C

III Answer all questions. **4 x 10 = 40**

12. (a) Explain LS – coupling and JJ - coupling (8)
OR
(b) Mention the properties and uses of x-rays. (3)
(c) Compare X-ray spectra with optical spectra. (5)

13. (a) Explain discrete set of electronic energies of molecules. (4)
(b) Explain the origin of pure rotational and rotational vibrational spectra (4)
OR
(c) Describe in detail the different sources of excitation in the ultra violet and visible regions (5).
(d) Explain emission and absorption spectra. (3)

14. (a) What are matter waves? Write their properties.
(b) Write the de-Broglie concept of matter waves.
OR
(c) Discuss the dual nature of matter waves.
Derive an expression for de-Broglie wave length.

15. (a) What is the importance of Schrodinger wave equation.
(b) Deduce Schroodinger time independent wave equation.
OR
(c) Derive an expression for the energy levels of a harmonic oscillator.

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COURSE: B.Sc., **SUBJECT: PHYSICS**
Semester: VI **Module: Modern Physics-II**
Max. Marks: 70 **Time: 2:30 Hours**

Part-A

I Answer any Four of the following. **5 x 2 = 10**

1. What are the advantages and disadvantages of G.M. Counter.
2. Explain Curie-Weiss Law.
3. Write a short note on ferrites.
4. What are miller indices? How they are calculated?
5. Give a general concept of nuclear forces.

Part-B

II Answer any Four questions from following. **4 x 5 = 20**
(At least one problem from each unit)

6.
7.
8.
9.
10.
11

Part-C

III Answer all questions. **4 x 10 = 40**

12. (a) Explain Gamow's theory of Alpha Decay. (5)

    (b) Write a short notes on Geiger Nuttal Law (3)

    OR

    (c) Explain what is meant by nuclear fission and nuclear fusion. (3)
    (d) Explain the energy production in stars by carbon – nitrogen cycle. (5)

13. (a) Explain the principle and working of scintillation counter. (8)

    OR

    (b) Explain the principle and working of cloud chamber. Discuss the merits and demerits. (8).

14. (a) What is Bragg's Law. Derive Bragg's Law for diffraction of X-rays by a crystal.

    OR

    (b) Explain the terms space lattice, and unit cell. What are miller indices?
    (c) Explain with neat diagram of the NaCl crystal.

15. (a) Distinguish between dia, para and ferromagnetic materials. Describe the Weiss Theory of ferromagnetism. State Weiss Law.

    OR

    (b) What is superconductivity? Mention properties and applications.
    (c) What is Meissener's effect in superconductivity?

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