GOVERNMENT COLLEGE [A]
RAJAMAHENDRAVARAM

2018-19

BOARD OF STUDIES MEETING
24 APRIL 2018

BOARD OF STUDIES MEETING: 24 APRIL 2018

The Board of studies meeting of **DEPARTMENT OF PHYSICS** was convened at 11.00 A.M on 24-04-2018 under the Chairmanship of **Dr. K. RAMACHANDRA RAO**, **In-charge** of the department. The members present discussed various aspects such as changes to be made in the Syllabi, Scheme of Evaluation and Blue print both for theory and practical papers for implementing them during the **I, I11 and V** semester of the academic year 2018-19 onwards. The following members were present.

S.No	Name	Designation	Signature
1	Dr.K. RAMACHANDRA RAO Lecturer in charge/HOD Department of physics Government College (A), Rajamahendravaram	Chairman	
2	1. Sri. P.V. Satyaji 2. Sri. Esub Basha Shaik 3. Dr. P.V.S.S.S Reddy 4. Sri. N. Venkanna Babu	Member (Faculty members of the Department)	1 2 3 4
3	Dr. B.V. Tirupanyam Lecturer in Physics, Government Degree College, Narayanapuram	Subject expert	
4	Dr. M.V.K. Meher, Lecturer in Physics, Government Degree College, Alamuru	Subject expert	
5	Dr. K. Jyothi Lecturer in Physics, PR Government Degree College, Kakinada	University Nominee	
6	Krishna Murthy, Sub – Divisional Engineer, BSNL,Rajamahendravaram	Subject expert (Industry)	
7	Kumari. STL Poornima	Student	
8	G. Naga Pushpa Rekha	Student	

The following documents are submitted to the Academic Coordinator and Controller of Examinations.

1. Resolutions of Board of Studies Meeting
2. Syllabi of I,III, V semesters
3. Model question papers of all semesters
4. Examiners list (Revised)
5. Any other new proposals

Date: 24 APRIL 2018   **Chairman**
                                                 Board of Studies
                                                 Department of PHYSICS

Allocation of Credits
For the Papers Offered during I, III & V Semesters

S. NO	Semester	Title of the Course (Paper)	Hrs/Week	Max.Marks (SEE)	Marks in CIA	Credits
1	I	**MECHANICS AND PROPERTIES OF MATTER**	4	60	40	3
2	I	**MECHANICS LAB**	2	--	50	2
3	I	**BASICS OF ENERGY & FLUID MECHANICS (For group of mathematics, physics & Renewable Energy management Course)**	4	60	40	3
4	I	**BASICS OF ENERGY & FLUID MECHANICS LAB (For group of mathematics, physics & Renewable Energy management Course)**	2	--	50	2
5	III	**OPTICS**	4	60	40	3
6	III	**OPTICS LAB**	2	--	50	2
7	V	**ELECTRICITY, MAGNETISM & ELECTRONICS**	3	60	40	3
8	V	**ELECTRICITY, MAGNETISM & ELECTRONICS LAB**	2	--	50	2
9	V	**MODERN PHYSICS**	3	60	40	3
10	V	**MODERN PHYSICS LAB**	2	--	50	2

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAHMUNDRY
(Re-Accredited by NAAC with grade "A")

DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING ON 24 APRIL 2018

RESOLUTIONS:

1. It is resolved to approve the introduction of APSCHE recommended Choice Based Credit System [CBCS] to the III B.Sc., course from the academic year 2018-19. CBC system was implemented for the I B.Sc., course during the academic year 2016-17.

2. It is resolved to approve the syllabus designed under autonomy setup for V Semester of III B.Sc., considering the syllabus recommended by APSCHE, ANUR, local needs of Industry and students for the academic year 2018-19.

3. It is resolved to approve the prescribed books for the syllabus designed above.

4. It is resolved to assess the student's performance under Continuous Internal Assessment (CIA) and Semester End Examination (SEE) components at 40:60 ratio for the III B.Sc., course from the academic year 2018 -19 and was done for I B.Sc., course in the academic year 2016-17.

5. It is resolved to approve the Scheme of Examination and Blue print of Semester End Examination (SEE) for V Semester of III B.Sc., from the academic year 2018-19

Theory examination:

Scheme for Semester End Examination (SEE)

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 1. (A) & (B) - From Unit I 2. (A) & (B) – From Unit II 3. (A) & (B) - From Unit III 4. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 15 Not more than one question from each unit 16 17

Practical examination:

Scheme of valuation for internal & external:

S.No	Description	Marks
1	Formula	05
2	Tabular Form & Readings	10
3	Calculations & Result (Including Graph)	15
4	Precautions & Units	05
5	Viva Voce	05
6	Record**	10
7	**TOTAL**	**50**
	INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**	

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   -   10
- 4 PRACTICALS   -   08
- 3 PRACTICALS   -   06
- 2 PRACTICALS   -   05
- LESS THAN 2   -   00

6. It is resolved to approve the I Semester syllabus for the renewable energy management paper which is a part of the newly introduced re structured group as "mathematics, physics and renewable energy management" for 3 years B.Sc., course. From 2018 onwards as per the guide lines framed by Commissionerate of Collegiate Education under market oriented Job courses.

7. It is resolved to continue the scheme of paper setting for theory examinations for I and III semester for a maximum of 60 marks for external and remaining 40 marks for internal assessment.

8. It is resolved to continue the scheme of evaluation for practical examination for I and III semester for a maximum of 50 marks for internal.

9. It is resolved to approve the revised list of examiners and paper setters for the academic year 2018-19. List annexed.

10. It is resolved to offer the certificate course entitled "**Household Electrical Wiring**" for the Calendar year 2018-19.

Date: 24 April 2018

Chairman
Board of Studies
Department of PHYSICS

SYLLABI

GOVERNMENT COLLEGE (A): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR I B.Sc., PHYSICS
MODULE-I [MECHANICS AND PROPERTIES OF MATTER]
SEMESTER I
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

UNIT I

1. Vector Analysis: (8)
Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), State and proof of Gauss and Stokes theorem.

UNIT II

2. Mechanics of particles: (10)
Laws of motion, *velocity and acceleration in Cartesian, polar and cylindrical coordinates*. Motion of variable mass system, motion of a rocket. Conservation of Energy and momentum. *Application to rotating frames*. Collisions in two and three dimensions. Concept of impact parameter, scattering cross-section. Rutherford scattering-derivation

UNIT III

3. Mechanics of Rigid bodies: (10)

Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum. Euler equation, precession of a top. Gyroscope, precession of the equinoxes.

4. Mechanics of continuous media: (8)
Elastic constants of isotropic solids and their relation, Poisson's ratio and expression for Poisson's ratio in terms of y, n, k. Classification of beams, types of bending, point load, distributed load, shearing force and bending moment, sign conventions.

UNIT IV

5. Central forces: (12)
Central forces, definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force. Derivation of Kepler's laws. Motion of satellites.

UNIT V

6. Special theory of relativity: (12)
Galilean relativity, absolute frames. Michelson-Morley experiment, negative result. Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. *Verification of Einstein's mass energy relation*. Concept of four-vector formalism.

Note: Numerical problems to be solved at the end of the every chapter.

Text/ Reference Books:

1. Berkeley Physics Course. Vol 1. Mechanics by Kittle W Knight, M.A.Ruderman- Tata-McGraw Hill Company Edition 2008
2. Fundamentals of Physics Halliday/Resnick/Walker Wiley India Edition 2007
3. Waves and Oscillations by S.Badami, V.Balasubramanian and K.Rama Reddy Orient Longman
4. First Year Physics – Telugu Academy.
5. Mechanics of Particles, Waves and Oscillations. Anwar Kamal, New Age International
6. College Physics-1 by T.Bhimasankaram and G. Prasad. Himalaya Publishing House.
7. Introduction to Physics for Scientists and Engineers. F.J.Ruche. McGraw Hill.
8. Waves and Oscillations. N.Subramanaian and Brijlal Vikas Publishing House Private Limited

GOVERNMENT COLLEGE (A): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS

TOPICS INCLUDED UNDER AUTONOMOUS SET UP

CLASS   **: I B.Sc.,**
SEMESTER   **: I**
MODULE   **: I**
TITLE OF THE PAPER: MECHANICS AND PROPERTIES OF MATTER

ADDITIONAL TOPICS	JUSTIFICATION
1. Velocity and acceleration in Cartesian , polar and cylindrical coordinates	1. To familiarize the Cartesian, polar and cylindrical coordinates having significant importance in simplifying problem solving both in mathematics and physics.
2. Application to rotating frames	2. To understand non - inertial frames and concepts like centrifugal force, coriolis force.
3. verification of Einstein's mass energy relation	3. To understand relativistic mechanics having great importance in modern physics. Useful for solving problems in nuclear physics and quantum mechanics.

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PHYSICS MODULE -1
(MECHANICS AND PROPERTIES OF MATTER)
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-2019)

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY]

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08

TYPE OF QUESTION	MARKS	SCHEME

PART-A
 	
Essay Questions
	Each question carries 8 Marks
	
	4x8 = 32 M
		Answer all questions
		  1. (A) & (B) - From Unit I
		  2. (A) & (B) – From Unit II
		  3. (A) & (B) - From Unit III
		  4. (A) from Unit IV and
		       (B) from Unit V

PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 Not more than one question 15 from each unit 16 17

GOVERNMENT COLLEGE (A): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PRACTICAL MODULE -1 (I B.Sc.,) SEMESTER – I
(MECHANICS LAB)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

LIST OF EXPERIMENTS

1. Calculation of Moment of Inertia of Fly Wheel.
2. Calculation of Moment of Inertia of Bifilar pendulum.
3. Calculation of viscosity of liquid using Poiselles method.
4. Calculation of Young's Modulus by uniform bending method.
5. Calculation of Rigidity of Modulus of wire using Torsional pendulum.
6. Calculation of Surface Tension of Water.
7. Calculation of Young's Modulus by Non-uniform bending method.
8. Calculation of viscosity of highly viscous liquids by Searl's viscometer.

Note. Student has to do any six experiments at the end of I semester.

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
I B.Sc., PHYSICS

SCHEME OF VALUATION

S.No	Description	Marks
1	FORMULA	05
2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**		

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   -   10
- 04 PRACTICALS   -   08
- 03 PRACTICALS   -   06
- 02 PRACTICALS   -   05
- LESS THAN 02   -   00

GOVERNMENT COLLEGE (A): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR II B.Sc., PHYSICS
MODULE-III [OPTICS]
SEMESTER III
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

UNIT -I

1. Aberrations: (8)
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 by a separated doublet.

UNIT - II
2. Interference: (15)
Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light
Interference by division of wave front: Introduction and basics of Biprism, Determination of wavelength of light and thickness of transparent thin film. Change of phase on reflection Lloyd's mirror experiment (qualitative treatment only)
Interference by division of amplitude:– Nonreflecting 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 contact between lens and glass plate, **Newton's rings in transmitted light (Hydinger 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 -III
3. Diffraction: (10)
Introduction – Distinction between Fresnel and Fraunhofer's diffraction
Fraunhofer's diffraction:-
Diffraction due to single slit– **Diffraction due to circular aperture** Fraunhofer's diffraction due to double slit – Fraunhofer's 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 (simple method) – difference between interference and diffraction.
UNIT -IV
4. Polarizations (10)
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 (Huygens's explanation) – Quarter wave plate, Half wave plate – **Babinet's compensator** – Optical activity, analysis of light by Laurent's half shade polarimeter.
UNIT - V
5. Laser: (8)

Lasers: Introduction – Spontaneous emission – Stimulated emission –Population inversion. Laser principle – **Einstein coefficients** – **Meta stable state-**Types of Lasers –Components of LASER- He-Ne laser – Ruby laser – Applications of lasers- **Laser welding, Laser cutting, hole drilling, LADAR, Diffraction of laser beam, Determination of wavelength.**

6.Fiber Optics and Holography(9)

Fiber Optics : Introduction – Optical fibers – Types of optical fibers – Step and graded index fibers– Fiber material – Principles of fiber communication (qualitative treatment only) and advantages of fiber communication.

Holography: Basic Principle of Holography – **Gabor hologram and its limitations**, Holography applications.

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 Prasad. *S. Chand & Co*.
5. **Second Year Physics** – *Telugu Academy.*
6. **Modern Physics** by R. Murugeshan and Kiruthiga Siva Prasad (for statistical Mechanics) *S. Chand & Co*.

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.**Lasers theory and applications –** K. Thyagarajan and A.K.Ghatak

GOVERNMENT COLLEGE (A): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS

TOPICS INCLUDED UNDER AUTONOMOUS SET UP

CLASS   : II B.Sc.,
SEMESTER   : III
MODULE   : III
TITLE OF THE PAPER: OPTICS

S.No	Paper	Unit	Topics included	justification
1	OPTICS (SEMESTER III)	1. Aberrations	1. Curvature of field 2. Distortion.	1. To give a complete knowledge on all types of aberrations.
		2. Interference by division of amplitude	1.Newton's rings in transmitted light (Hydinger Fringes) 2. Difference in wavelength of sodium D_1, D2 lines.	1. Suggested by the Subject Expert. To understand the theoretical modeling behind the practical component.
		3. Diffraction	1.Diffraction due to circular aperture 2. Diffraction at a straight edge (simple method)	1. To obtain theoretical orientation on apertures normally observed in day to day life.
		5. Polarization	1.Babinet's compensator	1. To obtain the theoretical knowledge behind the practical component.
		6. Lasers	1.Einstein coefficients 2.Meta stable state 3.Applications of LASERS 4. Laser welding 5.Laser cutting, 6. Hole drilling, 7. LADAR, 8. Diffraction of laser beam, 10. Determination of wavelength. 11.Gabor hologram and its limitations	1. Suggested by industrial expert and application oriented, job oriented. Useful for higher studies also.

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PHYSICS MODULE -III
(OPTICS)
(As Approved in the BOS meeting held on 07 APRIL 2017 for 2017-2018)

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY]

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question	4x2 =08

	carries 2 Marks	
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 1. (A) & (B) - From Unit I 2. (A) & (B) – From Unit II 3. (A) & (B) - From Unit III 4. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 15 Not more than one question from each unit 16 17

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PRACTICAL MODULE – III (II B.Sc.,) SEMESTER - III
(OPTICS LAB)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION

1. Thickness of a wire – wedge method

2. Determination of wavelength of light – Fresnel's biprism

3. Determination of radius of curvature of given convex lens – Newton's rings

4. Determination of wavelength of light – diffraction at thin wire

5. Resolving power of grating

6. Study of optical rotation Polari meter

7. Dispersive power of a prism

8. Determination of wavelength of light using diffraction grating minimum
   Deviation method

9. Wavelength of light using diffraction grating –normal incidence method

10. I-d curve using spectrometer

11. Resolving power of a telescope

12. Refractive index of liquid and glass

13. Wavelength of a laser using diffraction grating

Note. Student has to do any six experiments at the end of III semester.

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
II B.Sc., PHYSICS

SCHEME OF VALUATION

S.No	Description	Marks
1	FORMULA	05
2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
	INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**	

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   -   10
- 04 PRACTICALS   -   08
- 03 PRACTICALS   -   06
- 02 PRACTICALS   -   05
- LESS THAN 02   -   00

GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR III B.Sc., PHYSICS
MODULE-V
[ELECTRICITY, MAGNETISM, ELECTRONICS]
SEMESTER V
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

UNIT-I (9)

1. **Electric field intensity and potential:**
   Gauss's law statement and its proof- Electric field intensity due to (1) Uniformly charged sphere and (2) an infinite conducting sheet of charge. Electrical potential – equipotential surfaces- potential due to i) a point charge, ii) charged spherical shell .

2. **Dielectrics:**
   Electric dipole moment and molecular polarizability- Electric displacement D, electric polarization P –relation between D, E and P- Dielectric constant and susceptibility. Boundary conditions at the dielectric surface.

UNIT-II (9)

3. **Electric and magnetic fields**
   Biot-Savart's law, explanation and calculation of B due to long straight wire, a circular current loop and solenoid – Hall effect – determination of Hall coefficient and applications.

4. **Electromagnetic induction**
   Faraday's law-Lenz's law- Self and mutual inductance, coefficient of coupling, calculation of self-inductance of a long solenoid, energy stored in magnetic field. Transformer - energy losses - efficiency.

UNIT-III (9)

5. **Alternating currents and electromagnetic waves**
   Alternating current - Relation between current and voltage in LR and CR circuits, vector diagrams, LCR series and parallel resonant circuit, Q –factor, power in ac circuits.

6. **Maxwell's equations**
   Idea of displacement current - Maxwell's equations (integral and differential forms) (no derivation), Maxwell's wave equation (with derivation). Pointing theorem (statement), production of electromagnetic waves (Hertz experiment).

UNIT-IV (9)

7. **Basic electronics:**
PN junction diode, Zener diode, I-V characteristics, PNP and NPN transistors, CB, CE and CC configurations – Relation between α, β and γ - transistor (CE) characteristics, Transistor as an amplifier.

UNIT-V: (9)

8. **Digital electronics**
   Number systems - Conversion of binary to decimal system and vice versa. Binary subtraction (2's complement methods).Laws of Boolean algebra - De Morgan's laws-statement and proof, Basic logic gates, NAND and NOR as universal gates, exclusive-OR gate, Half adder and Full adder.

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. Unified Physics Vol.3 – S.L. Gupta and Sanjeev Gupta – Jai Prakasah Nath & Co-Meerut.

TOPICS INCLUDED UNDER AUTONOMOUS SET UP

CLASS   **: I B.Sc.,**
SEMESTER   **: V**
MODULE   **: V**
TITLE OF THE PAPER: ELECTRICITY, MAGNETISM, ELECTRONICS

ADDITIONAL TOPICS	JUSTIFICATION
Unit III, IV & V are newly introduced in this semester which are previously in the VI semester.	As the Cluster system is introduced in the VI semester and new papers are introduced by removing these topics in the sixth semester hence for the benefit of the students in Post Graduate entrances these topics are included in this semester.

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PHYSICS MODULE - V
(ELECTRICITY, MAGNETISM, ELECTRONICS)
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-2019)

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY]

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 1. (A) & (B) - From Unit I 2. (A) & (B) – From Unit II 3. (A) & (B) - From Unit III 4. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 15 Not more than one question from each unit 16 17

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PRACTICAL MODULE – V (III B.Sc.,) SEMESTER - V
(ELECTRICITY, MAGNETISM & ELECTRONICS)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION

Work load: 30 hrs.   **2 hrs. /week**
Minimum of 6 experiments to be done and recorded

1. Figure of merit of a moving coil galvanometer.
2. LCR circuit series/parallel resonance, Q factor.
3. Determination of ac-frequency –sonometer.
4. Verification of Kirchhoff's laws and maximum power transfer theorem.
5. Field along the axis of a circular coil carrying current.
6. PN Junction Diode Characteristics
7. Zener Diode Characteristics
8. Transistor CE Characteristics- Determination of hybrid parameters
9. Carey Foster's Bridge – measurement of specific resistance.
10. Impedance and Power factor of LR Circuit.

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
III B.Sc., PHYSICS

SCHEME OF VALUATION

S.No	Description	Marks
1	FORMULA	05
2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**		

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   -   10
- 04 PRACTICALS   -   08
- 03 PRACTICALS   -   06
- 02 PRACTICALS   -   05
- LESS THAN 02   -   00

GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR III B.Sc., PHYSICS
MODULE-VI
[MODERN PHYSICS]
SEMESTER V
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

No. of Credits: 03
3 Hour/Week Total Hours : 45

UNIT-I (9)
1. **Atomic and molecular physics**

   Introduction –Drawbacks of Bohr's atomic model. Vector atom model and Stern- Gerlach experiment - quantum numbers associated with it. L-S and j- j coupling schemes. Zeeman Effect (Definition only) -Raman Effect, hypothesis, Stokes and Anti Stokes lines. Quantum theory of Raman Effect. Experimental arrangement – Applications of Raman effect.

UNIT-II (9)
2. **Matter waves & Uncertainty Principle**

   Matter waves, de Broglie's hypothesis - wavelength of matter waves, Properties of matter waves - Davisson and Germer experiment – Heisenberg's uncertainty principle for position and momentum (x and p) & Energy and time (E and t).

UNIT-III (9)
3. **Quantum (wave) mechanics**

   Basic postulates of quantum mechanics-Schrodinger time independent and time dependent wave equations-derivations. Physical interpretation of wave function. Eigen functions, Eigen values. Application of Schrodinger wave equation to particle in one dimensional infinite box.

UNIT-IV (9)
4. **General Properties of Nuclei**

   Basic ideas of nucleus -size, mass, charge density (matter energy), binding energy, magnetic moment, electric moments. Liquid drop model and Shell model (qualitative aspects only) - Magic numbers.

5. **Radioactivity decay**

   Alpha decay: basics of α-decay processes. Theory of α-decay, Gamow's theory, Geiger Nuttal law.β-decay, Energy kinematics for β-decay, positron emission, electron capture, neutrino hypothesis.

UNIT-V (9)
6. **Crystal Structure**

   Amorphous and crystalline materials, unit cell, Miller indices, reciprocal lattice, types of lattices, diffraction of X-rays by crystals, Bragg's law, experimental techniques, Laue's method.

7. **Superconductivity**

   Introduction - experimental facts, critical temperature - critical field - Meissner effect
   – Isotope effect - Type I and type II superconductors - applications of superconductors.

Textbooks

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

GOVERNMENT COLLEGE (A): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS

TOPICS INCLUDED UNDER AUTONOMOUS SET UP

CLASS   **: I B.Sc.,**
SEMESTER   **: V**
MODULE   **: VI**
TITLE OF THE PAPER: MODERN PHYSICS

ADDITIONAL TOPICS	JUSTIFICATION
Unit IV & V are newly introduced in this semester which are previously in the VI semester.	As the Cluster system is introduced in the VI semester and new papers are introduced by removing these topics in the sixth semester hence for the benefit of the students in Post Graduate entrances these topics are included in this semester.

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY]

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 5. (A) & (B) - From Unit I 6. (A) & (B) – From Unit II 7. (A) & (B) - From Unit III 8. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 Not more than one question 15 from each unit 16 17

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PRACTICAL MODULE – VI (III B.Sc.,) SEMESTER - V
(MODERN PHYSICS)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION

Work load: 30 hrs   **2 hrs/week**
Minimum of 6 experiments to be done and recorded
1. e/m of an electron by Thomson method.
2. Determination of Planck's Constant (photocell).
3. Verification of inverse square law of light using photovoltaic cell.
4. Study of absorption of α-rays.
5. Study of absorption of □-rays.
6. Determination of M & H.
7. Energy gap of a semiconductor using junction diode.
8. Energy gap of a semiconductor using thermister.
9. Logic Gates- OR, AND, NOT and NAND gates. Verification of Truth Tables.
10. Verification of De Morgan's Theorems.
11. Verification of Truth Tables of Universal gates
12. Verification of truth tables of Half and Full adders.
13. Hall – Probe method for measurement of magnetic field.

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
IIII B.Sc., PHYSICS

SCHEME OF VALUATION

S.No	Description	Marks
1	FORMULA	05
2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**		

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   -   10
- 04 PRACTICALS   -   08
- 03 PRACTICALS   -   06
- 02 PRACTICALS   -   05
- LESS THAN 02   -   00

SEMESTER	MODULE	SUBJECT	HRS.	CREDITS	IA	ES	TOTAL
FIRST YEAR							
SEMESTER I	I	BASICS OF FLUID MECHANICS	4	3	40	60	100
		PRACTICAL I	2	2	50	NIL	50
SEMESTER II	II	THERMODYNAMICS AND HEAT TRANSFER	4	3	40	60	100
		PRACTICAL II	2	2	NIL	50	50
SECOND YEAR							
SEMESTER III	III	ELECTRONICS AND INSTRUMENTATION	4	3	40	60	100
		PRACTICAL III	2	2	50	NIL	50
SEMESTER IV	IV	RENEWABLE ENERGY	4	3	40	60	100
		PRACTICAL IV	2	2	NIL	50	50
THIRD YEAR							
SEMESTER V	V	BIO ENEGY CONVERSION	4	3	40	60	100
		PRACTICAL V	2	2	50	NIL	50
	VI	OCEAN ENERGY AND THRMOELECTRIC POWER	4	3	40	60	100
		PROJECT/INTERNSHIP	2	2	50	NIL	50
SEMESTER VI	ELECTIVE VII A	ENERGY STORAGE DEVICES	4	3	40	60	100
		PROJECT/INTERNSHIP	2	2	NIL	50	50
	CLUSTER VIII A I,II,III	SOLAR THERMAL ENERGY CONVERSION	4	3	40	60	100
		SOLAR PHOTOVOLTAIC CONVERSION	4	3	40	60	100
		WIND ENERGY CONVERTION	4	3	40	60	100
		PROJECT/INTERNSHIP	2	2	NIL	50	50

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

1. Each theory paper is of 100 marks and practical paper is also of 50 marks. Each theory paper is 60 marks University Exam (external) + 40 marks mid Semester Exam (internal). Each practical paper is 50 marks internal in odd semesters and 50 marks external in even semesters
2. The teaching work load per week for semesters I to VI is 4 hours per paper for theory And 2 hours for all laboratory (practical) work.
3. The duration of the examination for each theory paper is 3.00 hrs.
4. The duration of each practical examination is 3 hrs with 50 marks.

Practicals	50 marks
Formula	5
Tabular form & Readings	10
Precautions & Units	5
Calculation, graph, & Result	15
Viva-Voce	5
Record	10

GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR I B.Sc., RENEWABLE ENERGY
MODULE-I
[BASICS OF ENERGY AND FLUID MECHANICS]
SEMESTER I
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

No. of Hours per week: 04   Total Lectures: 60

UNIT-I (12)

1. **Translatory Motion**: Newton's laws of motion - Applications of Newton's laws of motion - Principle of Conservation of Linear Momentum - Frictional force.
2. WORK, POWER AND ENERGY: Work done by a constant force - Work done by a variable force - Kinetic Energy - Work - Energy Theorem - Significance of work-energy theorem - Power
- Conservative forces -Potential energy - One dimensional conservative systems - Non- conservative forces - Conservation of energy

UNIT-II (12)

3. **Rotational Dynamics and Energy due to Rotation**: Rotational Dynamics-Torque acting on a particle - Angular momentum of a Particle - System of particles -kinetic energy of rotation and rotational inertia - Rigid body - Moment of inertia of a rigid body- Parallel axis theorem and perpendicular axis theorem - Angular momentum of a Rigid body - Equation of motion for rotation of a rigid body -gyroscopic motion - Kinetic energy of rotation of a rigid body - comparison of translational motion of a rigid body along a straight line with rotational motion about a fixed axis

UNIT-III (14)

4. **Viscosity**: Viscosity of a fluid - Coefficient of viscosity - stream line turbulent flow - Reynold's number - Poiseulle's equation for the flow of liquid through a tube - Volume of the liquid flowing out - Stoke's law and terminal velocity - Experimental determination of coefficient of viscosity by i) capillary flow method ii) falling sphere method and iii)comparison of viscosities - Ostwarld viscometer method - Meyer relation for flow of a gas through a capillary tube.

UNIT-IV (12)

5. **Surface Tension**: Molecular forces - Surface tension - Surface energy - Angle of contact - pressure difference across a liquid surface - excess pressure inside a liquid drop - Shape of liquid surface in a capillary tube - rise of liquids in capillary tube - determination of surface tension by capillary rise method- Effect of temperature on surface tension - Examples of surface tension and capillarity.

UNIT-V (12)

6. **Fluid Dynamics:** Fluids - Pressure and density - The variation of pressure in a fluid at rest - Pascal's principle - Archimedes' principle - Measurement of pressure, General concepts of fluid flow - stream lines - The equation of continuity - Bernoulli's equation - Applications of Bernoulli's equation and equation of continuity - dynamic lift - Torricelli's theorem - conservation of Momentum in fluid mechanics - Fields of flow

Reference:

1. Physics - Part I David Halliday and Robert Resnick Wiley Eastern Edition
2. Physics - Marcelo Alonso and Edward J Finn - Addison Wesley Longman (AWL)
3. Unified Physics, Vol. I by S.L. Gupta and Sanjeev Gupta, 1997 Jaiprakashnath and Co., Meerut
4. Engineering Physics by R.K Gaur and S L Gupta Fifth Edition 1997 Dhanpat Rai and sons, Delhi

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY]

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 1. (A) & (B) - From Unit I 2. (A) & (B) – From Unit II 3. (A) & (B) - From Unit III 4. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 Not more than one question 15 from each unit 16 17

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PRACTICAL MODULE – I (I B.Sc.,) SEMESTER - I
(BASICS OF ENERGY AND FLUID MECHANICS)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION

Practical: 2 hrs/Week

Any six experiments out of the following
1. Bifilar Suspension - Determination of Moment of Inertia
2. Fly Wheel - Determination of Moment of Inertia
3. Determination of Surface Tension of a Liquid - Capillary tube method
4. Determination of viscosity of a Liquid - Searle's method
5. Determination of Viscosity of a Liquid - Poiseulle's method
6. Determination of viscosity of liquid - Ostwald Viscometer
7. Determination of Surface tension - Stalagnometer method/Drop number method
8. Vibration of Springs - Determination of Force Constant of a Spring and
verification of laws of combination of springs (Series and parallel)
9. Torsion Pendulum - Determination of rigidity modulus of the material of a given wire

LEARNING OUTCOMES:
Working knowledge of the subject. Suggested
student Activities:
Student seminars, group discussions, assignments, field trips, study project and
experimentation using virtual lab

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
I B.Sc., PHYSICS

SCHEME OF VALUATION

S.No	Description	Marks
1	FORMULA	05
2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
	INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**	

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   - 10
- 04 PRACTICALS   - 08
- 03 PRACTICALS   - 06
- 02 PRACTICALS   - 05
- LESS THAN 02   - 00

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR I B.Sc., RENEWABLE ENERGY
MODULE-II
[THERMODYNAMICS AND HEAT TRANSFER]
SEMESTER II
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

No. of Hours per week: 04   Total Lectures: 60

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UNIT I (10Hrs)
1. **Thermodynamics I**: Zeroth law of thermodynamics - Measurement of temperature - Ideal gas
- Electrical resistance thermometer - Thermocouple - Work Transfer - Indicator diagram - specific heat and latent heat - Adiabatic and isothermal processes - Work done by an ideal gas in adiabatic and isothermal expansion - Internal energy - First law of thermodynamics - Energy a property of system -Different forms of stored energy - Specific heat at constant volume - enthalpy- Specific heat at constant pressure - energy of isolated system.

UNIT II (14Hrs)
2. **Thermodynamics II**: Qualitative difference between heat and work - cyclic heat engine - Energy reservoirs - Carnot engine and its efficiency - Second law of thermodynamics - Carnot theorem - Thermodynamic Scale of temperature - Entropy - Changes in entropy - entropy and disorder - Maxwell's thermodynamic equations - T-dS equations - Difference and ratio of specific heats - Clausius - Clapeyron equation - Joule Kelvin effect - Conditions of equilibrium of a heterogeneous system - Gibbs phase rule - types of equilibrium - local equilibrium conditions - conditions of stability

UNIT III (12Hrs)
3. **Gaseous State**: Avogadro's law - Boyle's law and Clarles' law - Equation of State of a gas - Ideal gas - Kinetic theroy of gases -Equations of State - Virial expansions - Law of corresponding states- Properties of mixtures of gases - Dalton's law of partial pressures- Internal energy, enthalpy and specific heats of gas mixtures - Entropy of gas mixtures - Gibbs function of a mixture of Inert ideal gases.

UNIT IV(12Hrs)
4. **Heat Transfer**: Conduction Heat Transfer, Various modes of Heat Transfer – Mechanisms of Different Modes of Heat Transfer Fourier's Law of Heat Conduction, Conductivity - Electrical Analogy, Concept of Thermal Resistance – Introduction to Newton's Law of Cooling – Unidirectional Heat Conduction , Heat Conduction with R Convective Environment
Convection –Basic Concepts: Convective Heat Transfer Coefficients, Boundary Layer Concept, Types of Convection, Forced Convection-Laminar and Turbulent Flow, Combined Laminar and Turbulent –Nusselt Theory – Film Wise and Drop Wise Condensation.

UNIT – V(12Hrs)

5. **Radiation Heat Transfer:** Basic Concepts, Laws of Radiation-Stefan Boltzmann Law, Kirchoff Law – Black Body Radiation Heat Exchanger & Insulation, Classification of Heat Exchangers – Overall Heat Transfer Coefficient – Fouling Factor –Design & Selection of Heat Exchanger-Practical Application of Heat Exchanger – Purpose of Insulation – Classification of Insulation – Types of Insulation Material – Economic thickness of Insulation.

TEXTBOOKS:
1. Engineering Thermodynamics/ PK Nag/TMH, III Edition
2. Fundamentals of Thermodynamics – Sonntag, Borgnakke and vanwylen/ John Wiley & sons (ASIA) Pvt.Ltd.

REFERENCES:
1.EngineeringThermodynamics–Jones&   Dugan
2.Thermodynamics–AnEngineeringApproach–
YunusCengel&Boles/TMH   3.Thermodynamics–
J.P.Holman/   Mc   Graw   Hill
4.AnintroductiontoThermodynamics/ YVCRao/ NewAge
Formoredetails, visitHttp://www.jntu.ac.in/

HEAT AND MASS TRANSFER REFERENCES:
1. Sachdeva RC,"Fundamentals of Engineering Heat and Mass Transfer" New Age International,1995
2. YadavR"HeatandMassTransfer"Central PublishingHouse,1995.
3. HeatTransfer, S.P.Sukhatme.
4. HeatTransfer,P.K.Nag,Tata McGrawHill2002Publications.
5. Heat Transfer,RCSachdeva.
6. Thermal Insulation and Refractories-PCRA.
7. Insulation and Refractories-British Energy Efficiency Office.

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
RENEWABLE ENERGY MODULE -II
(THERMODYNAMICS AND HEAT TRANSFER)
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-2019)

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY]

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 1. (A) & (B) - From Unit I 2. (A) & (B) – From Unit II 3. (A) & (B) - From Unit III 4. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 Not more than one question 15 from each unit 16 17

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PRACTICAL MODULE – II (I B.Sc.,) SEMESTER - II
(THERMODYNAMICS AND HEAT TRANSFER)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION

Practicals 2Hrs/Week
Any six experiments out of the following

1. Specific Heat of solids - Method of mixtures
2. Coefficient of conductivity of a bad conductor - Lee's method
3. Verification of Boyle's law
4. Resistance thermometer
5. Thermocouple thermometer
6. Newton's law of cooling
7. Determination of Stefan's constant
8. Efficiency of a kettle

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
I B.Sc., PHYSICS

SCHEME OF VALUATION

S.No	Description	Marks
1	FORMULA	05
2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
	INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**	

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   - 10
- 04 PRACTICALS   - 08
- 03 PRACTICALS   - 06
- 02 PRACTICALS   - 05
- LESS THAN 02   - 00

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR II B.Sc., RENEWABLE ENERGY
MODULE-III
[ELECTRONICS AND INSTRUMENTATION]
SEMESTER III
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

No. of Hours per week: 04   Total Lectures: 60

UNIT – I(10Hrs)
1. Basic Electronic Components: Definitions of resistance, capacitance and inductance-Equations defining resistance, capacitance and inductance – Concept of reactance and impedance
2. Network Theorems: Kirchhoff's laws (revision) – Voltage and current divider circuit- Thevenin's theorem - Norton's theorem - Maximum Power Transfer Theorem

UNIT – II(12Hrs)
3. Semiconductor Devices: Conductors , insulators and semiconductors - extrinsic and intrinsic semiconductors - p- type and n-type semiconductors - pn junction diode - zener diode - tunnel diode –bipolar junction transistor, types, symbols and basic action -Configurations (Common Base, Common Emitter & Common Collector) – Definition of alpha, beta and their relations. - Input, output and transfer characteristics of CE and CB configurations.-Biasing methods.

UNIT – III (14Hrs)
4. Operational Amplifiers and Oscillators: Operational amplifier: IC 741- Block diagram, Characteristics: ideal and practical – Concept of virtual ground - Inverting and non- inverting operational amplifiers with concept of gain – Barkhausein criteria for an oscillator – Phase shift oscillator and Wien bridge oscillator (Derivation for frequency and feed back factor for both oscillators expected).

UNIT –IV(12Hrs)
5. Rectifiers and power supplies: Half wave, Full wave and Bridge rectifier, ripple factor, capacitor filter- Difference between regulated and unregulated power supply- Definition of Line and Load regulation – Series and Shunt regulators – Block diagram and circuit of regulated power supply using discrete components, Simple current limiting circuit.

UNIT V (12Hrs)
6. Digital Electronics: Number systems:Binary, Binary coded decimal (BCD),

Octal, Hexadecimal - Addition and subtraction of binary numbers and binary fractions using one's and two's complement. – Basic logic gates: OR, AND, NOT, Derived gates: NOR, NAND, EXOR, EXNOR with symbols and truth tables – Boolean Algebra, Boolean Equations – De Morgan's theorems and its verification - Half and Full Adders –RS Flip-flop, J-K flip flop, ripple counter ring counter and decade counter -D/A and A/D conversion Problems

Reference Books
1. ElectronicsPrinciples,Malvino,7thEditionTaTaMc-GrawHills.
2. Principles of Electronics,V.K.Mehta,S.Chand PublicationNewDelhi.
3. OpAmp and Linearintegrated circuits,Ramakant Gaikwad, PrenticeHallofIndiaPub.
4. Integrated Circuts,Botkar, Khanna Publications,NewDelhi
5. Digital Principles and Applications, Malvino and Leech Tata McGraw Hill

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 1. (A) & (B) - From Unit I 2. (A) & (B) – From Unit II 3. (A) & (B) - From Unit III 4. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 Not more than one question 15 from each unit 16 17

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PRACTICAL MODULE – III (I B.Sc.,) SEMESTER - III
(ELECTRONICS & INSTRUMENTATION)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION

Practicals 2Hrs/Week
Any six experiments out of the following
1. Verification of Kirchoff's laws
2. Verification of network theorems
3. Junction diode characteristics
4. RC - Phase shift oscillator
5. Verification of truth tables of logic gates
6. De Morgan's theorems
7. Half adder and Full adder

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
II B.Sc., PHYSICS

SCHEME OF VALUATION

S.No	Description	Marks
1	FORMULA	05
2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
	INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**	

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   -   10
- 04 PRACTICALS   -   08
- 03 PRACTICALS   -   06
- 02 PRACTICALS   -   05
- LESS THAN 02   -   00

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR II B.Sc., RENEWABLE ENERGY
MODULE-IV
[RENEWABLE ENERGY]
SEMESTER IV
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

No. of Hours per week: 04   Total Lectures: 60

UNIT-I (12 hrs)
1. Introduction to Energy: Definition and units of energy, power, Forms of energy, Conservation of energy, second law of thermodynamics, Energy flow diagram to the earth. Origin and time scale of fossil fuels, Conventional energy sources, Role of energy in economic development and social transformation.
2. Global Energy Scenario: Energy consumption in various sectors, projected energy consumption for the next century, exponential increase in energy consumption, energy resources, coal, oil, natural gas, nuclear and hydroelectric power, impact of exponential rise in energy usage on global economy.

UNIT-II (12 hrs)
3. Indian Energy Scene: Energy resources available in India, urban and rural energy consumption, energy consumption pattern and its variation as a function of time, nuclear energy - promise and future, energy as a factor limiting growth, need for use of new and renewable energy sources.
4. Environmental Effects : Environmental degradation due to energy production and utilization, air and water pollution, depletion of ozone layer, global warming, biological damage due to environmental degradation. Effect of pollution due to thermal power station, nuclear power generation, hydroelectric power stations on ecology and environment.

UNIT-III (10 hrs)
5. Solar energy: Solar energy, Spectral distribution of radiation, Flat plate collector, solar water heating system, Applications, Solar cooker; Solar cell principle, Applications of solar PV systems.
6. Wind Energy: Introduction, Principle of wind energy conversion, Advantages and disadvantages of wind mills, Applications of wind energy.

UNIT-IV (12 hrs)
9. Geothermal energy: Introduction – Estimates of Geothermal Power – Nature of geothermal fields – Geothermal resources – Hydrothermal (convective) Resources Geo pressured resources
– Hot dry rock resources of petro-thermal systems – Magma resources-Interconnection of geothermal fossil systems – Advantages and disadvantages of geothermal energy over other energy forms

UNIT – V (14 hrs)
7. Ocean Energy: Introduction, Principle of ocean thermal energy conversion (OTEC), Tidal power generation, Tidal energy technologies, Energy from waves,

Wave energy conversion, Wave energy technologies, advantages and disadvantages.

8. Bio-Energy
Energy from biomass – Sources of biomass – Different species –
Conversion of biomass into fuels – Energy through fermentation –
Pyrolysis, gasification and combustion Biogas plants –
Properties and characteristics of biogas.

References:
1. Solar Energy Principles, Thermal Collection &Storage, S.P.Sukhatme: Tata McGraw Hill Pub., New Delhi.
2. Non-Conventional Energy Sources, G.D.Rai, New Delhi.
3. Renewable Energy, power for a sustainable future, Godfrey Boyle, 2004,
4. The Generation of electricity by wind, E.W. Golding.
7. Non-Conventional Energy Resources by B.H. Khan, Tata McGraw Hill Pub., 2009.
8. Fundamentals of Renewable Energy Resources by G.N.Tiwari,
M.K.Ghosal, Narosa Pub., 2007.

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
RENEWABLE ENERGY MODULE-IV
(RENEWABLE ENERGY)
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-2019)

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 1. (A) & (B) - From Unit I 2. (A) & (B) – From Unit II 3. (A) & (B) - From Unit III 4. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 Not more than one question 15 from each unit 16 17

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PRACTICAL MODULE – IV (II B.Sc.,) SEMESTER - IV
(RENEWABLE ENERGY)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION

Practicals 2Hrs/Week
Any six experiments out of the following

1. Preparation of copper oxide selective surface by chemical conversion method.
2. Performance testing of solar cooker.
3. Determination of solar constant using pyroheliometer.
4. Measurement of I-V characteristics of solar cell.
5. Study the effect of input light intensity on the performance of solar cell.
6. Study the characteristics of wind.
7. Solar mapping
Topics in italics are suggested by representatives of industry
LEARNING OUTCOMES: Working knowledge of the subject

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
II B.Sc., PHYSICS

SCHEME OF VALUATION

S.No	Description	Marks
1	FORMULA	05
2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**		

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   -   10
- 04 PRACTICALS   -   08
- 03 PRACTICALS   -   06
- 02 PRACTICALS   -   05
- LESS THAN 02   -   00

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR III B.Sc., RENEWABLE ENERGY
MODULE-V
[BIO ENERGY CONVERSION]
SEMESTER V
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

No. of Hours per week: 03   Total Lectures: 45

UNIT - I (9hrs)

1. Basics in Biomass Study: Biomass-types and its advantages and drawbacks – Indian scenario – Characteristics –Conversion Mechanisms – Fuel Assessment Studies, Selection of site for biogas plant.

UNIT – II (9hrs)

2. Biomethanation: Microbial systems, Phases in Biogas Production – Parameters Affecting Gas Production-Biogas Plants: Types, Design, Constructional Details and Comparison – Factors affecting the design.

UNIT – III (9hrs)

3. Methods for Maintaining Biogas Production: Insulating the Gas Plant – Composting – Hot Water circulation – Use of Chemicals –Solar energy systems, problems related to biogas plants

UNIT- IV (9hrs)

4. Commissioning and Management of Bio Gas Plant: Commissioning and Management of Biogas plant, Community Plant-Biogas Appliances – Effect of Biogas on Engine Performance - Socio-Economic Aspects of Biogas – Cost –Benefit Analysis of Biogas Plant

UNIT – V   (9hrs)

5. Biofuel: Ethanol and Methanol production from Cellulose and wood – Biomass – Biodiesel Production from Non-Edible Oil Seeds

Students are advised to visit and submit a detailed on the following
1. Production of bio gas with microbial system
2. Production of Bio diesel

Text   Books

1. DavidBoyles,BioEnergyTechnologyThermodynamic
sandcosts,Ellis Hoknood, Chichester,1984.
2. Non-ConventionalEnergySources,G.D.Rai,KhannaPublications.
3. Non-Conventional Energy Resources, B.H. Khan, Tata Mc Graw Hill Publications.

References
1. Khandelwal, K.C., Mahdi, S.S., Biogas Technology – A Practical Handbook, Tata Mc Graw – Hill, 1986.
2. R. C. Maheswari, Bio Energy for Rural Energization, Concepts Publication, 1997.

   3.   Tom, B. Reed, Biomass Gasification– Principles and Technology, Noyce Data Corporation, 1981

The following Scheme may be followed instead of practicals
for paper 6/7/8 Comprehensive Viva:1 credit

Semina
r : 1
credit
OR
Project: 2 credits
OR
Internship: 2 credits

RENEWABLE ENERGY MODULE -V
(BIO ENERGY CONVERSION)
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-2019)

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 1. (A) & (B) - From Unit I 2. (A) & (B) – From Unit II 3. (A) & (B) - From Unit III 4. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 Not more than one question 15 from each unit 16 17

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR III B.Sc., RENEWABLE ENERGY
MODULE-VI
[OCEAN ENERGY AND THRMOELECTRIC POWER]
SEMESTER V
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

No. of Hours per week: 03   Total Lectures: 45

UNIT-I (9Hrs)
Small Hydropower Systems: Overview of micro, mini and small hydro systems; Hydrology; Elements of pumps and turbine; Selection and design criteria of pumps and turbines; Site selection; Speed and voltage regulation; Investment issues load management and tariff collection; potential of small hydro power in India. Wind and hydro based stand-alone hybrid power systems.

UNIT-II (9Hrs)
Ocean Thermal Energy Conversion: Introduction, Working principle, Resource and site requirements, Location of OTEC system, Electricity generation methods from OTEC, open cycle and closed cycle OTEC systems, Advantages and disadvantages, Applications of OTEC,

UNIT-III (9Hrs)
Tidal Energy - Introduction, Origin and nature of tidal energy, Basic principle of tidal power generation, Components of tidal power plants, Tidal energy technology, Tidal range power, Basic modes of operation of tidal systems. Advantages and limitations

UNIT-IV (9Hrs)
Wave Energy – Introduction, Basics of wave motion, Power in waves, Wave energy conversion devices, Advantages and disadvantages, Applications of wave energy, Prospects of wave energy in India.

UNIT – V   (9hrs)
Thermoelectric power: Basic principles of thermoelectric power generation – Thermoelectric power generator – performance analysis of thermo electric power generator – thermoelectric materials – selection of materials, Thermionic generation- Thermionic work function – Basic thermionic generator –analysis of thermionic generator

REFERENCEBOOKS:
1. Non-ConventionalEnergySources.G.D.Ray,KhannaPublications.
2. Non-Conventional EnergyResources, B. H. Khan, TheMcGraw Hill Publication
3. Khan, B.H., "Non-Conventional Energy Resources", TMH, 2nd Edition, New Delhi, 2009.
4. Tiwari, G.N., and Ghosal, M.K, Renewable Energy Resources –
Basic Principles and applications, Narosa Publishing House,2007.

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 1. (A) & (B) - From Unit I 2. (A) & (B) – From Unit II 3. (A) & (B) - From Unit III 4. (A) from Unit IV and (B) from Unit V

PART-B
 	
Short Answer Questions
	Each question carries 4 Marks
	
	5x4= 20 M
		Answer any 5 out of 8 questions
		
		5
		6
		7 4 Theoretical Questions
		8 Not more than one question from
		           Each unit.
		
		09
		10
		11 4 Numerical Questions
		12 Not more than one question
		            From each unit.
		   At least one theoretical/ numerical to be
		asked from each unit.

PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 Not more than one question 15 from each unit 16 17

DEPARTMENT OF PHYSICS
PRACTICAL MODULE – VI (III B.Sc.,) SEMESTER - V
(Wind, Hydro and Ocean Energies)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION

Practicals 2Hrs/Week
Any six experiments out of the following

1. Estimation of wind speed using anemometer.
2. Determination of characteristics of a wind generator
3. Study the effect of number and size of blades of a wind turbine on electric power output.
4. Performance evaluation of vertical and horizontal axes wind turbine rotors.
5. Study the effect of wave amplitude and frequency on the wave energy generated.
6. Study the effect of density of water on the output power of hydroelectric generator.

LEARNING OUTCOMES:
Working knowledge of the subject Students are advised to visit and submit a detailed report on
1.   Hydrogen storage unit
2.   Thermal power stations.

Project: 2 credits
OR
Internship: 2 credits

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
III B.Sc., PHYSICS

SCHEME OF VALUATION

S.No	Description	Marks
1	FORMULA	05
2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**		

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   -   10
- 04 PRACTICALS   -   08
- 03 PRACTICALS   -   06
- 02 PRACTICALS   -   05
- LESS THAN 02   -   00

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR III B.Sc., RENEWABLE ENERGY
MODULE-VII
[ENERGY STORAGE DEVICES]
SEMESTER VI
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

No. of Hours per week: 03   Total Lectures: 45

UNIT-I (9hr)
1. Energy Storage: Need of energy storage; Different modes of energy storage, Flywheel storage, Electrical and magnetic energy storage: Capacitors, electromagnets; Chemical Energy storage: Thermo-chemical, photo-chemical, bio-chemical, electro-chemical, fossil fuels and synthetic fuels. Hydrogen for energy storage.

UNIT-II (9hrs)
2. Electrochemical Energy Storage Systems: Batteries: Primary, Secondary, Lithium, Solid-state and molten solvent batteries; Lead acid batteries; Nickel Cadmium Batteries; Advanced Batteries. Role of carbon nano-tubes in electrodes.

UNIT-III (9hrs)
3. Magnetic and Electric Energy Storage Systems: Superconducting Magnet Energy Storage (SMES) systems; Capacitor and battery: Comparison and application; Super capacitor: Electrochemical Double Layer Capacitor (EDLC), principle of working, structure, performance and application.

UNIT-IV (9hrs)
4. Fuel Cell: Fuel cell definition, difference between batteries and fuel cells, fuel cell components, principle and working of fuel cell, performance characteristics, efficiency, fuel cell stack, fuel cell power plant: fuel processor, fuel cell power section, power conditioner, Advantages and disadvantages.

UNIT-V (9hrs)
5. Types of Fuel Cells: Alkaline fuel cell, polymer electrolyte fuel cell, phosphoric acid fuel cell, molten carbonate fuel cell; solid oxide fuel cell, proton exchange membrane fuel cell, problems with fuel cells, applications of fuel cells.

REFERENCE BOOKS
1. J. Jensen and B. Squrensen, Fundamentals of Energy Storage, John Wiley, NY, 1984.
 2. M. Barak, Electrochemical Power Sources: Primary and Secondary Batteries by, P. Peregrinus,IEE,1980.
3. P.D.Dunn, Renewable Energies, Peter Peregrinus Ltd, London, 1986.
4. B.Viswanathan and M. A. Scibioh, Fuel Cells-Principles and Applications, University Press, 2006.
5. Hart, A.B and G.J.Womack, Fuel Cells: Theory and Application, Prentice Hall, NewYork, 1989.
6. Hydrogen and Fuel Cells: A comprehensive guide, Rebecca Busby, Pennwell corporation (2005)
7. Hydrogen and Fuel Cells: Emerging Technologies and Applications, B.Sorensen, Academic Press (2012).

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 1. (A) & (B) - From Unit I 2. (A) & (B) – From Unit II 3. (A) & (B) - From Unit III 4. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 Not more than one question 15 from each unit 16 17

GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PRACTICAL MODULE – VII (III B.Sc.,) SEMESTER - VI
(ENERGY STORAGE DEVICES)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION

Practicals 2Hrs/Week
Any six experiments out of the following

Minimum of 6 experiments to be

done and recorded
1. Study of charge and discharge characteristics of storage battery.
2. Study of charging and discharging behavior of a capacitor.
3. Determination of efficiency of DC-AC inverter and DC-DC converters
4. Study of charging characteristics of a Ni-Cd battery using solar photovoltaic panel.
5. Performance estimation of a fuel cell.
6. Study of effect of temperature on the

performance of fuel cell LEARNING

OUTCOMES; Working knowledge of the

subject

**GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
III B.Sc., PHYSICS**

SCHEME OF VALUATION

S.No	Description	Marks
1	FORMULA	05
2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**		

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   -   10
- 04 PRACTICALS   -   08
- 03 PRACTICALS   -   06
- 02 PRACTICALS   -   05
- LESS THAN 02   -   00

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR III B.Sc., RENEWABLE ENERGY
MODULE-VIII (A)
[SOLAR THERMAL CONVERSION]
SEMESTER VI
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

No. of Hours per week: 03   Total Lectures: 45

UNIT-I (9hrs)
1. Basics of Solar Radiation: Structure of Sun, Spectral distribution of extra terrestrial radiation, Solar constant, Concept of Zenith angle and air mass, Definition of declination, hour angle, solar and surface azimuth angles; Direct, diffuse and total solar radiation, Solar intensity measurement
– Thermoelectric pyranometer and pyrheliometer.

UNIT-II (9Hrs)
2. Radiative Properties and Characteristics of Materials: Reflection, absorption and transmission of solar radiation through single and multi covers; Kirchoff's law – Relation between absorptance, emittance and reflectance; Selective Surfaces - preparation and characterization, Types and applications; Anti-reflective coating.

UNIT-III (9hrs)
3. Flat Plate Collectors (FPC) : Description of flat plate collector, Liquid heating type FPC, Energy balance equation, Efficiency, Temperature distribution in FPC, Definitions of fin efficiency and collector efficiency, Evacuated tubular collectors.

UNIT-IV (9Hrs)
4. Concentrating Collectors: Classification, design and performance parameters; Definitions of aperture, rim-angle, concentration ratio and acceptance angle; Tracking systems; Parabolic trough concentrators; Concentrators with point focus.

UNIT-V (9Hrs)
Solar hot water system (SHWS), Types of SHWS, Standard method of testing the efficiency of SHWS; Passive space heating and cooling concepts, Solar desalinator and drier, Solar thermal power generation.

Reference Books:
1. Solar Energy Utilization, G. D. Rai, Khanna Publishers
2. Solar Energy- Fundamentals, design, modeling and applications,
   G.N. Tiwari, Narosa Pub., 2005.
3. Solar Energy-Principles of thermal energy collection & storage, S.P.
Sukhatme, Tata Mc- Graw Hill Publishers, 1999.

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
RENEWABLE ENERGY MODULE –VIII (A)
(SOLAR THERMAL CONVERSION)
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-2019)

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 1. (A) & (B) - From Unit I 2. (A) & (B) – From Unit II 3. (A) & (B) - From Unit III 4. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 Not more than one question 15 from each unit 16 17

GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PRACTICAL MODULE – VIII (A) (III B.Sc.,) SEMESTER - VI
(SOLAR THERMAL CONVERSION)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION

Practicals 2Hrs/Week
Any six experiments out of the following

1. Measurement of direct solar radiation using pyrheliometer.
2. Measurement of global and diffuse solar radiation using pyranometer.
3. Measurement of emissivity, reflectivity and transitivity.
4. Measurement of efficiency of solar flat plate collector.
5. Performance testing of solar air dryer unit.
6. Performance testing of solar cooker unit

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
III B.Sc., PHYSICS

SCHEME OF VALUATION

S.No	Description	Marks
1	FORMULA	05
2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
	INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**	

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   - 10
- 04 PRACTICALS   -   08
- 03 PRACTICALS   -   06
- 02 PRACTICALS   -   05
- LESS THAN 02   -   00

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR III B.Sc., RENEWABLE ENERGY
MODULE-VIII (B)
[SOLAR PHOTOVOLTAIC CONVERSION]
SEMESTER VI
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

No. of Hours per week: 03   Total Lectures: 45

Unit-I (9Hrs)
1. Fundamentals on Junctions: p-n junction, Type of junctions, homo, hetero and schottky junctions, depletion layer, junction in equilibrium, application of bias, energy band diagram, abrupt and graded junctions, electric field and potential distribution at the interface, calculation of built-in voltage, Expression depletion layer capacitance.

UNIT-II (9Hrs)
2. Solar cell: Photovoltaic Effect, Equivalent circuit of solar cell, homojunction, hetero-junction solar cells, advantages and drawbacks, choice of materials, Solar cell output parameters, Fill factor, conversion efficiency, Series and shunt resistances and its effect on cell efficiency; Variation of efficiency with energy band gap and temperature, effect of input intensity on the cell parameters

UNIT-III (9Hrs)
3. Crystalline silicon solar cell: Production of single crystal Silicon: Czokralski (CZ) and Float Zone (FZ) methods, advantages and drawbacks, Silicon wafer fabrication, Wafer to cell formation, Contacts – Ohmic and blocking contacts, current-voltage characteristics, Factors limiting the efficiency.

UNIT-IV (9Hrs)
4. Thin film solar cells: Thin Films, Advantages and draw backs, Preparation of thin films – Chemical bath deposition, Thermal evaporation, sputtering, close spaced sublimation, advantages and drawbacks of each technique, Substrate and superstrate configuration, CdTe/CdS solar cell structure and cell formation, Multi-junction solar cell;

UNIT-V (9Hrs)
5. Solar PV systems: Solar cell module assembly – Steps involved in the fabrication of solar module, Module performance, I-V characteristics, Modules in series and parallel, Module protection – use of Bypass and Blocking diodes, Solar PV system and its components, PV array, inverter, battery and load.

Reference Books:
1. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,
2. Science and Technology of Photovoltaics, P. Jayarama Reddy, BS Publications, 2004.

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
RENEWABLE ENERGY MODULE –VIII (B)
(SOLAR PHOTOVOLTAIC CONVERSION)
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-2019)

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 1. (A) & (B) - From Unit I 2. (A) & (B) – From Unit II 3. (A) & (B) - From Unit III 4. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 Not more than one question 15 from each unit 16 17

PRACTICAL MODULE – VIII (B) (III B.Sc.,) SEMESTER - VI
(SOLAR PHOTOVOLTAIC CONVERSION)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION

Practicals 2Hrs/Week
Any six experiments out of the following

Practical: Solar Thermal and Photovoltaic Aspects
1. Effect of tilt angle on the efficiency of solar photovoltaic panel.
2. Study on solar photovoltaic panel in series combination.
3. Study on solar photovoltaic panel in parallel combination.
4. Performance of solar module under various conditions (dusting)

LEARNING OUTCOMES:

Working knowledge of the Subject.

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
III B.Sc., PHYSICS

SCHEME OF VALUATION

S.No	Description	Marks
1	FORMULA	05
2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**		

**Award of marks for number of practicals recorded in the Record

- 05 PRACTICALS and above   -   10
- 04 PRACTICALS   -   08
- 03 PRACTICALS   -   06
- 02 PRACTICALS   -   05
- LESS THAN 02   -   00

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
SYLLABUS FOR III B.Sc., RENEWABLE ENERGY
MODULE-VIII (C)
[WIND ENERGY]
SEMESTER VI
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

No. of Hours per week: 03   Total Lectures: 45

UNIT-I (9Hrs)
1. Introduction: Nature of the wind, Power of the Wind, Forces of the Blades, Wind generation, meteorology of wind, world distribution of wind, wind speed variation with height, wind speed statistics, Wind energy conversion principles; General introduction;

UNIT-II (9Hrs)
2. Wind Measurements: Eolian features, biological indicators, rotational anemometers, other anemometers, wind measurements with balloons.

UNIT-III (9Hrs)
3. Wind Energy Conversion System: Types and classification of WECS; Power, torque and speed characteristics, Aerodynamic design principles; Aerodynamic theories; Axial momentum, blade element and combine theory; Rotor characteristics; Maximum power coefficient; Prandlt's tip loss correction.

4.UNIT-IV (9Hrs)
Design of Wind Turbine: Wind turbine design considerations; Horizontal axis machines, vertical axis machines, Advantages and drawbacks, Methodology; Theoretical simulation of wind turbine characteristics; Test methods.

UNIT-V (9Hrs)
5. Wind Energy Application: Wind pumps: Performance analysis, design concept and testing; Principle of wind energy generation; Standalone, grid connected and hybrid applications of wind energy conversion systems, Economics of wind energy utilization; Wind energy in India; Environmental Impacts of Wind farms.

Reference Books:

1. Dan Charis, Mick Sagrillo, LanWoofenden, "Power from the Wind", New Society Pub., 2009.
2. Erich Hau, "Wind Turbines-Fundaments, Technologies, Applications, Economics",
2ndEdition, Springer Verlag, BerlinHeidelberg, NY, 2006.
3. Joshue Earnest, Tore Wizelius, Wind Power and Project Developmen", PHI Pub., 2011.
4. T. Burton, D. Sharpe, N. Jenkins, E. Bossanyi, Wind Energy Handbook,
John Wiley Pub., 2001.
5. Paul Gipe, "Wind Energy Basics", Chelsea Green Publications, 1999.
6. Khan, B.H., "Non-Conventional Energy Resources", TMH, 2nd Edition, New Delhi, 2009.
7. Tiwari, G.N., and Ghosal, M.K, Renewable Energy Resources –
Basic Principles and applications, Narosa Publishing House,2007.
8. G.D.Rai, Non-conventional Energy Sources, Khanna Publishers, New Delhi (2008)

GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
RENEWABLE ENERGY MODULE –VIII (C)
(WIND ENERGY)
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-2019)

EVALUATION SCHEME

Examination	No. of Marks	Remarks
Semester end examination	60	Model of examination pattern furnished below
Internal examination	40	Pedagogy methods like Quiz, classroom seminar, Assignment or Case study, Test , puzzles, viva and few more innovative methods followed by individual lecturer

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER [THEORY

PART	DESCRIPTION	MARKS
A	Essay type questions- Four questions to be asked with internal choice in each question (A or B) from each unit. Student has to answer four questions choosing one (A or B) from each question. Each question carries 8 marks.	4x8 = 32
B	Short answer type questions - Eight questions are to be asked (4 theory + 4 numerical). Student has to answer any five questions. Each question carries 4 marks	5x4 = 20
C	Very short answer type questions – Five questions are to be asked covering the entire syllabus. Student has to answer any four questions. Each question carries 2 Marks	4x2 =08
	TOTAL MARKS	60

TYPE OF QUESTION	MARKS	SCHEME
PART-A Essay Questions	Each question carries 8 Marks **4x8 = 32 M**	**Answer all questions** 5. (A) & (B) - From Unit I 6. (A) & (B) – From Unit II 7. (A) & (B) - From Unit III 8. (A) from Unit IV and (B) from Unit V
PART-B Short Answer Questions	Each question carries 4 Marks **5x4= 20 M**	**Answer any 5 out of 8 questions** 5 6 7 4 Theoretical Questions 8 Not more than one question from Each unit. 09 10 11 4 Numerical Questions 12 Not more than one question From each unit. At least one theoretical/ numerical to be asked from each unit.
PART-C Very Short Answer Questions	Each question carries 2 Marks **4x2 = 8 M**	**Answer any four questions** 13 14 Not more than one question 15 from each unit 16 17

GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
PRACTICAL MODULE – VIII (C) (III B.Sc.,) SEMESTER - VI
(WIND ENERGY)
LIST OF EXPERIMENTS
&
SCHEME OF PRACTICAL EXAMINATION

1. Estimation of wind speed using anemometer.
2. Determination of characteristics of a wind generator
3. Study the effect of number and size of blades of a wind turbine on electric power output.
4. Performance evaluation of vertical and horizontal axes wind turbine rotors.

LEARNING OUTCOMES: Working knowledge of the subject

GOVERNMENT COLLEGE (AUTONOMOUS): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
BOARD OF STUDIES MEETING ON 24 APRIL 2018
SEMESTER END PACTICAL EXAMINATIONS
III B.Sc., PHYSICS

SCHEME OF VALUATION

S.No	Description	Marks
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2	TABULAR FORM & READINGS	10
3	CALCULATIONS & RESULT (Including Graph)	15
4	PRECAUTIONS & UNITS	05
5	VIVA VOCE	05
6	RECORD**	10
7	**TOTAL**	**50**
INTERNAL : 50 M **EXTERNAL : 50 M** **TOTAL: 100 M**		

**Award of marks for number of practicals recorded in the Record

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- 04 PRACTICALS - 08
- 03 PRACTICALS - 06
- 02 PRACTICALS - 05
- LESS THAN 02 - 00

GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSCIS
SYLLABUS FOR CERTIFICATE COURSE
HOUSE HOLD ELECTRICAL WIRING
(As Approved in the BOS meeting held on 24 APRIL 2018 for 2018-19)

UNIT- I
DOMESTIC WIRING (15hr)
Various types of house wiring and basic requirement of various utilities, estimate and format of estimation, Materials and accessories used in domestic wiring and their cost, types of loads and sub circuits, Types of service mains ,Design of number of sub circuits and distribution boards ,preparation of wiring installation plan layout with light load, power load and control point.

UNIT- II
MAIN MAINTANANCE (10Hr)
Selection of main switch cable, based on the load in circuit/sub circuits. Calculation of length of wiring cable and labor charges. Preparation of detailed estimate in standard Proforma. Estimation of wiring of small residential building, offices and Commercial establishments like shops, sales counter, stores.

UNIT- III
POWER WIRING (10hr)
Discussion on various loads and wiring methods circuits and in small industries agriculture etc., materials and accessories used in motor installation and their cost. Designing of distribution boards, cable, motor control panel.

UNIT- IV
WIRE INSTALLATION (10Hr)
        Preparation of wiring installation plan and single line diagram, calculation of length of wiring cable and labor charges detailed estimate in the standard Proforma Related problems on installation of motors for small workshops and irrigation pump sets.

Text Books:
1. *Electrical Technology, chand publishers,New Dehli- B.L.Theraja.*

2. *Electrical Technology, ELBS Publications - Edward.*

3. *D.C Fundamentals, Delman Publications - Loper*

4. *A.C Fundamentals, Delman Publications - Loper*

GOVERNMENT COLLEGE (A): RAJAMAHENDRAVARAM
DEPARTMENT OF ELECTRONICS
BLUE PRINT FOR CERTIFICATE COURSE

Time: 3 Hours   **Max. Marks: 50**

TYPE OF QUESTION	MARKS	SCHEME
SECTION-A Very Short Answer Questions	Each question carries 2 Marks **10x2= 20 M**	**Answer ALL questions** At least TWO questions to be asked from each/any unit
SECTION-B Short Answer Questions	SIX questions are to be answered out of EIGHT. Each question carries 6 Marks **5x6 = 30 M**	**Answer any FIVE questions** Not more than TWO question from each / any unit

Work load: 15 hrs

(Any Six Experiments should be done)

1. verification of ohms law by using ammeter, voltmeter in dc circuit or low voltage.
2. Verification of the characteristics of DC series circuits.
3. Verification of the characteristics of DC parallel circuits.
4. Verification of kirchhoff's law
5. Testingof lead acid battery by hydrometer and tongue tester on charging and discharging.
6. Testing of maintenance of free batteries.
7. Measurement of power by ammeter and voltmeter.
8. Verification of power factor by p.f.meter.
9. Verification of Faradays laws of electromagnetic induction.
10. Network theorems.

LIST OF EXAMINERS

S.NO	CODE	EXAMINER NAME	PAPERS	SERVICE	COLLEGE	CITY
1	202081	DR.K BALARAJU	3,4	27	GOVT.CITY COLLEGE	HYDERABAD
2	202084	P.VENKATESWARAREDDY	2	21	GOVT.CITY COLLEGE	HYDERABAD
3	202041	N RANGAJI	2	20	AMAL COLLEGE	ANAKAPALLI
4	202069	U.DHANAPATHI VARMA	1,3	20	D.N.R.COLLEGE	BHIMAVARAM
5	202040	M.R.L.GOPAL	1,2	19	AMAL COLLEGE	ANAKAPALLI
6	202013	A.S.N.MURTHY	2,4	19	GBR COLLEGE	ANAPARTHI
7	202073	K.S.R.P.KUMAR JOHN	3,2	16	SVKP COLLEGE	PENUGONDA
8	202091	S.VENKATARAJU	1,3	15	D.N.R.COLLEGE	BHIMAVARAM
9	202111	P.V.SRINIVASARAO	1,2,3	14	S.S.N.COLLEGE	NARSARAOPETA
10	202112	B.VENKATESWARARAO	ALL	14	S.S.N.COLLEGE	NARSARAOPETA
11	202074	S.SRINIVASARAO	2,4	13	SVKP COLLEGE	PENUGONDA
12	202087	DR.A.NIRMALA JYOSTHANA	1	13	ST.THERESSA'S	ELURU
13	302056	G.VENU GOPAL	ALL	13	MRS.A.V.N.COLLEGE	VISAKHAPATNAM
14	302055	DR.S.SRINIVASARAO	ALL	11	MRS.A.V.N.COLLEGE	VISAKHAPATNAM
15	202096	C.J.SOMARAJU	2	10	D.N.R.COLLEGE	BHIMAVARAM
16	202022	N.VEERA KUMAR	2	9	SRVBSJV MAHARANI	PEDDAPURAM
17	202107	P.SUBRAHMANYAM NAIDU	ALL	8	JBD COLLEGE	KAVALI
18	202047	DR.SANTHA DEVI	ALL	8	GOVT.DEGREE COLLEGE	ANANTHAPUR
19	202057	DR.B.V.H.N.SAINATH	1,2,3	8	MRS.A.V.N.COLLEGE	VISAKHAPATNAM
20	202108	D.RAMAKRISHNA REDDY	3	7	GOVT DEGREE COLLEGE	KARNOOL
21	202023	S.RAMARAO	4	7	SRVBSJV MAHARANI	PEDDAPURAM
22	202097	K.RAMAKRISHNA	ALL	6	M.G.COLLEGE	ATREYAPURAM
23	202105	P.S.S.SRINIVAS	ALL	6	GBR COLLEGE	ANAPARTHI
24	302046	M.RAVIKUMAR	ALL	6	GOVT DEGREE COLLEGE	ANANTHAPUR
25	202092	M.SATYAVANI	1,2	6	D.N.R.COLLEGE	BHIMAVARAM
26	302058	P.PRAMEELA	ALL	5	MRS.A.V.N.COLLEGE	VISAKHAPATNAM
27	202101	B.V.R.K.MURTHY	ALL	5	MAHARAJA'S	VIZIANAGARAM
28	202082	DR.I.H.PRASAD	3	4	GOVT.CITY COLLEGE	HYDERABAD
29	202083	DR.B.KRISHNA SENKAR	1,2	4	GOVT.CITY COLLEGE	HYDERABAD
30	302041	R.CHANDRA SEKHAR	ALL	4	SRVBSJV MAHARANI	PEDDAPURAM
31	202080	P.B.V.A.G.RAVI KIRAN		3	SKSD MAHILA COLLEGE	TANUKU
32	202109	M.VENKATESWARARAO	4	3	GOVT DEGREE COLLEGE	KARNOOL
33	202113	CH.VIJAYA KUMARI	1,2,4	3	SSN COLLEGE	NARSARAOPETA
34	202106	SURIBABU	ALL	3	GBR COLLEGE	ANAPARTHI
35	202114	A.SUBBARAO	1,2,3	3	SSN COLLEGE	NARSARAOPETA
36	202093	M.V.S.PRASAD	1,2	2	D.N.R.COLLEGE	BHIMAVARAM
37	202094	N.UDAYASRI	1,2	2	D.N.R.COLLEGE	BHIMAVARAM
38	202102	G.V.S.JAYAPALRAO	ALL	2	MAHARAJA'S	VIZIANAGARAM
39	202095	A.VEERAYYA	3	2	D.N.R.COLLEGE	BHIMAVARAM

40	202003	P.SREEDEVI	ELE	2	ST.THERESSA'S	ELURU
41	202004	K.SUNICYROSE	1,2,ELE	1	ST.THERESSA'S	ELURU
42	202005	K.LALITHADEVI	1,2	1	ST.THERESSA'S	ELURU
43	202006	K.SREELATHA	1,2	1	ST.THERESSA'S	ELURU
44		G.NARAYANARAO	ALL		ASDW COLLEGE	KAKINADA
45		N.R.LEELAKRISHNA PRASAD	ALL		P.R.G.COLLEGE	KAKINADA
46		K.SREENIVASARAO	ALL		V.S.M.COLLEGE	RAMACHANDRAPURAM
47		KRISHNA	ALL		SCIM GOVT COLLEGE	TANUKU
48		P.S.N.RAJU	ALL		P.R.G.COLLEGE	KAKINADA
49		P.S.BRAHMACHARI	ALL		P.R.G.COLLEGE	KAKINADA
50		D.VIJAYASREE	ALL		GOVT.DEGREE COLLEGE	MACHERLA
51		SYAMALA	ALL		ASDW COLLEGE	KAKINADA
52		P.V.RAMANA	ALL		P.R.G.COLLEGE	KAKINADA
53		MEHAR	ALL		P.R.G.COLLEGE	KAKINADA
54		D.GANGADHARUDU	ALL		SRVBSJV MAHARANI	PEDDAPURAM
55		DR.GS.NARAYANARAO	ALL		VS KRISHNA COLLEGE	VISAKHAPATNAM
56		BHASKARAPRASAD	ALL		SRR COLLEGE	VIJAYAWADA
57		A.V.RAMANAMURTHY	ALL		GOVT DEGREE COLLEGE	TANUKU
58		A.K.SURYANARAYANA	ALL		IDEAL COLLEGE	KAKINADA
59		SUBBARAJU	ALL		KGRL COLLEGE	BHIMAVARAM
60		SATYANARAYANA RAJU	ALL		KGRL COLLEGE	BHIMAVARAM
61		VENKATESWARA RAO	ALL		CRR COLLEGE	ELURU
62		DR A.R.S.KUMAR	ALL		Y.N.COLLEGE	NARASAPUR
63		K.LAKSHMINARAYANA	ALL		Y.N.COLLEGE	NARASAPUR

**** THE END ****