

**PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS),
KAKINADA**

(AN AUTONOMOUS COLLEGE WITH NAAC "B⁺⁺" GRADE)

Board of Studies for UG Programmes

RENEWABLE ENERGY

2025 – 2026



**DEPARTMENT OF
PHYSICS & ELECTRONICS**

**PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A),
KAKINADA**

DEPARTMENT OF PHYSICS & ELECTRONICS

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PROCEEDINGS OF THE PRINCIPAL (FAC), PITHAPUR RAJAH's GOVT. COLLEGE [A], KAKINADA
Present: Dr. Kandula Anjaneyulu, M.A, Ph.D.

Rc.No.9/A.C/BOS/2025-26

Dt.31 July 2025

Sub: Pithapur Rajah's Government College[A] Kakinada--Academic Cell- Conduct of BOS Meetings
for the Academic Year 2025-26 - Guidelines issued - Regarding.

ORDER:

The autonomous colleges, in alignment with their vision, mission, stated objectives, and core values, are mandated to design and develop their own outcome-based curricula. This must be done with due consideration for societal, local, and global industry requirements, employability, and the development of industry-ready and transferable skills. Accordingly, every programme shall prescribe Course Outcomes (COs), Programme Outcomes (POs), and Programme Specific Outcomes (PSOs) along with a suitable learning outcome assessment management system, supported by a robust and transparent evaluation mechanism to measure attainment levels among students.

Further, the A.P. State Council of Higher Education (APSCHE) has introduced a revised curricular framework effective from the Academic Year 2025-26, incorporating Skill Enhancement Courses, Multi-Disciplinary courses, the Indian Knowledge System and a revised credit structure.

Our institution, from the Academic Year 2022-23 onwards, has defined a renewed vision and mission along with updated objectives and core values, necessitating the design and reorientation of its academic and research administration in line with these directives.

In light of the above responsibilities prescribed by the institution's vision and mission, NEP-2020, NAAC, NIRF, and the APSCHE's revised and new UG and P.G. curricular framework, it is imperative to customize, design, and re-orient our academic and research activities to meet the expectations of students, industries, and government stakeholders.

Accordingly, the Chairpersons of the U.G and P.G Boards of Studies (BoS) of various departments are hereby requested to make necessary arrangements to convene their BoS meetings before **09 Aug 2025**.

The Chairpersons are further instructed to:

1. Prepare the curricula and extracurricular activities for the Academic Year 2025-26 in line with the institution's vision, mission, NEP-2020, and NIRF norms.
2. Devise an appropriate evaluation system to ensure effective learning outcomes and holistic student development.
3. Ensure that the curriculum design includes a mandatory *20% revision* of the syllabus each year without deviating from the APSCHE prescribed syllabus.
4. If the syllabus is not prescribed by APSCHE/Affiliating University, then the syllabus is to be

framed by the BOS committee concerned with duly following the mandate prescribed above.

5. Engage stakeholders viz employers, parents, and alumni, to obtain feedback on the existing curricula and to invite suggestions for improvements.
6. Invite the University nominee, subject experts, industry representatives, student representatives, and parent representatives well in advance. The meeting notice shall clearly specify the date, venue, and agenda, and a soft copy of the agenda and relevant documents shall be circulated for their perusal.
7. Ensure that the subject experts invited preferably hold a Doctorate with at least 10 years of teaching experience and have relevant expertise in designing industry-related, market- and job-oriented curricula.
8. Facilitate thorough deliberations on curriculum design, evaluation methods, incorporation of research components, measures to enhance learning experiences, and optimal utilization of existing human, physical, and ICT resources.
9. Conduct all BoS meetings in offline mode. Online participation shall be permitted only under exceptional circumstances.
10. Prescribe benchmarking and quality initiatives in pedagogy and learning, including strategies for curriculum design and teaching-learning processes, in collaboration with the IQAC Coordinator, prior to the BoS meeting.
11. Ensure that a minimum student attendance of **75%** shall be required for eligibility to appear for I & II Mid-Term Examinations under the CIA component; this shall be formally approved in the BoS meeting.
12. Approve any new programmes to be introduced for the Academic Year 2025–26, the number and frequency of certificate courses, and SWAYAM MOOCs courses.
13. Submit the approved BOS copies in the prescribed format, in **quadruplicate (hard copies)** to the Academic Cell for onward submission to the IQAC, Examination Cell, and Library, within **three days** of the meeting and upload the soft copy in their respective department web pages in the college website.
14. Ensure strict alignment of all recommendations and curriculum changes with the institution's vision and mission.
15. Submit a request to receive advance funds from the Examination cell through Principal for conducting BoS meetings.

The details of honorarium to be paid to the University Nominee and Subject Experts attending the Board of Studies (BOS) meeting are as follows

UG BOS for AY 2025-26

S.No	Designation	Honorarium (Rs)	TA
1	University Nominee	1000	Below 20 Km @Rs.200/- (Local Conveyance) Above 20 Km, Bus fare/Train fare (Whichever is less)
2	Subject Expert	500	Below 20 Km @Rs.200/- (Local Conveyance) Above 20 Km, Bus fare/Train fare (Whichever is less)
3	Industrialist	500	Below 20 Km @Rs.200/- (Local Conveyance) Above 20 Km, Bus fare/Train fare (Whichever is less)

PG BOS for AY 2025-26

S.No	Designation	Honorarium (Rs)	TA
1	University Nominee	1000	Below 20 Km @Rs.200/- (Local Conveyance) Above 20 Km, Bus fare/Train fare (Whichever is less)
2	Subject Expert	500	Below 20 Km @Rs.200/- (Local Conveyance) Above 20 Km, Bus fare/Train fare (Whichever is less)
3	Industrialist	500	Below 20 Km @Rs.200/- (Local Conveyance) Above 20 Km, Bus fare/Train fare (Whichever is less)

- Binding charges limited to Rs.250/- per program.
- The Bills/Vouchers shall be in compliance with applicable rules and norms.

Following contents shall be presented in the BOS document in the order

1. Proceedings of the Principal pertaining to BOS
2. Composition of BOS
3. Vision and Mission of the department
4. Agenda: It shall include ATR on the previous BOS meeting first, resolutions, etc., later.
5. Table showing the Allocation of Credits in the following table for both theory and Practicals' in case of science subjects

S. No	Semester	Title of the Course (Paper)	Hrs./week	Max. Marks (SEE)	Marks in CIA	Credits
1	III	Physical Chemistry-I	3	50	50	4

6. Resolutions adopted in the meeting with detailed discussion that took place during the meeting.
7. Each BOS Chairman shall, immediately after syllabus, tabulate the changes made in the syllabus/ paper along with justification.
8. Attendance of Members present with signatures in the tabular form.
9. List of Examiners & Paper setters (Minimum 20 members and at least 02 members from other states)
10. Syllabus for each course (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical) and allocation of CIA (50marks) for each course with structure.
11. Each student (2025-26 AB) has to complete one MOOCS course from SWAYAM in any subject per year.

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- Mid examinations are to be conducted in offline mode at college level
- Mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **three short** answer questions with five marks each out of five questions
- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Seminar- 5M	Assignment- 5M	Viva on theory- 3M	Clean & green and Attendance- 2M
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Proceedings of the Principal, Pithapur Raja's Government College [A], Kakinada

Present: Dr. Kandula Anjaneyulu, M.A, Ph.D

Rc. No: 2/A.C/BOS-Member Nomination/2025-26

Dated 31-07-2025

Sub:- Pithapur raja's Government College [A], Kakinada – UG Board of Studies (BoS) – Program Course-B.Sc/ Renewable management(REM) Nomination of members - Orders Issued.

Ref:-Proc.R.C.No.1A.C/BOS/2025-26 Dated: 31-07-2025 of Principal, Pithapur raja's Government College [A], Kakinada.

ORDER:

The Principal, Pithapur raja's Government College [A], Kakinada is pleased to constitute UG **Board of studies in REM** for framing the syllabi in REM subject for all semesters duly following the norms of the UGC Autonomous guidelines.

S. No	Name of the Nominee	Designation
1.	Dr. M. Surekha Head of the Department	Chairman
2.	Dr. M V K Meher,	University Nominee, Principal, GDC, Perumallapuram
3.	Sri.U.V.B.B.K.Prasad	Subject Expert,Lecturer in Physics, Govt. Degree College, Pithapuram
4.	Sri.D. Gangadharudu	Subject Expert,Lecturer in Electronics,MR government college,Peddapuram
5.	Sri.A.V.V.Prasad,	Representative from Industry, Solar Systems,Kakinada
6.	Dr.K.Jayadev	Member
7.	Ms G. Sridevi	Member
8.	Smt.A.Padmavathi	Member
9.	Dr S V G V A Prasad	Member
10.	Dr P Himakar	Member
11.	Dr K. Durga Rao	Member
12.	Ms.D.Sravani	Member
13.	Ms M.Geetha Sri	Member
14.	Ravi Teja	Student Alumini Member
15.	G.Udaya Sri	Student Member-II REM
16.	N.Akhila	Student Member-III REM

The above members are requested attend the BOS meeting on 07-08-2025 and share their valuable views, suggestions on the following functionaries:

- Prepare syllabi for the subject keeping in view the objectives of the college, interest of the stake holders and national requirement for consideration and approval of the Academic Council
- Suggest methodologies for innovate teaching and evaluation techniques
- Suggest panel of names to the Academic council for appointment of examiners
- Coordinate research, teaching, extension and other activities in the department.

The Chairman of the BoS (HoD/lecturer In-Charge of the department) are hereby instructed to comply with these directives in letter and sprit to ensure the height standreds of academic and administrative excellence.

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ADIKAVI NANNAYA UNIVERSITY RAJAMAHENDRAVARAM
OFFICE OF THE DEAN, ACADEMIC AFFAIRS

No.ANUR PR (A)/BoS/2025/38

Dt.17.06.2025

PROCEEDINGS OF THE VICE-CHANCELLOR

Sub: ANUR – University Nominees – UG Board of Studies of Pithapur Rajah's Government College (A) Kakinada – Orders – Issued
Read: -Note orders of the Vice-Chancellor dated 13.06.2025

ORDER:

With reference to above, the Vice-Chancellor is pleased to order that the following members be nominated as University Subject Experts for constitution of UG Board of Studies of Pithapur Rajah's Government College (A) Kakinada, for a period of 3 years from the date of orders issued as detailed against each subject.

Sl. No	BOS	Name of the expert nominated
1	English	Prof.S.Prasanthi Sree, M.S.N Campus Kakinada
2	Telugu	Dr.S.Gopalayya, GDC Tadepalligudem
3	Hindi	Dr.N.V.Ramana, GDC Ramachandrapuram
4	Sanskrit	Dr.P.Umamaheswara Rao, Dr.V.S Krishna GDC (A), Visakhapatnam
5	Mathematics	Ms.Y.Padmaja GDC Ramachandrapuram
6	Statistics	Dr.N.Madavi GDC(A) RJY
7	Physics, Electronics & Renewable energy	Dr.M.V.K.Mehar, GDC, K.Perupalem
8	Chemistry, Organic Chemistry, Analytical Chemistry	Dr.T.Narasimha Murthy, GDC (A) RJY
9	Pharmaceutical Chemistry	P.Sai Kiran, Adithya University Kakinada
10	Botany	Dr.K.Usha sri GDC Pithapuram
11	Zoology	Dr.K.Ramaneswari, AKNU, RJY
12	Aquaculture	Dr.D.Kalyani, AKNU, RJY
13	Biotechnology	Dr.B.Nageswari, GDC (A) RJY
14	Microbiology	Dr.D.Aruna, SRR & CVR GDC (A) Vijayawada
15	Artificial Intelligence	N.Naga Subrahmanyeswari, ASD College for Women (A), Kakinada
16	Data Science	Sri.K.Rasmi Ranjan, GDC(A), Tuni
17	Internet of Things	Smt.Dr.K.Sobha Rani, GDC, Ramachandrapuram
18	Computer Applications	Smt.Dr.K.Sobha Rani, GDC, Ramachandrapuram
19	Information Technology	Smt.N.Naga Subrahmanyeswari, ASD College for Women (A), Kakinada
20	Economics	Dr.K.Yamuna, ASD GDC(W), Kakinada
21	History	Ch.Padmavathi, GDC, Pithapuram
22	Political Science & International relations	Dr.K.Swamiji, Ideal DC(A), Kakinada
23	Commerce & Management	Dr.G.Arun Kumar, Dr.VS Krishna GDC(A) Visakhapatnam
24	Philosophy	Dr.Ch.Lalitha, GDC(A) Tuni

(BY ORDER)


Dean,
Academic Affairs 17.6.25

To
The Principal, Pithapur Rajah's Government College (A) Kakinada
The Above Members
The Principals concerned
PS to VC,
PA to R,
OOF

Vision & Mission of the College

VISION: To contribute its might for holistic and quality human capital formation for modern economy with focus on developing employment opportunity – enhancing skilling ecosystem, through integration of research, value system and technology into teaching – learning process.

MISSION:

- To provide conducive and outcome-based skill development environment in the institution to brighten prospects for progression to higher education, employment opportunities in Government and Private agencies, for personal growth and enhanced productivity and economic growth.
- To collaborate with coaching centers or skill development institutions for skill development.
- To develop systems for quality enhancement in learning by student through promotion of ICT integration into learning, deployment of learning resources at the door steps of students for optimum utilization.
- Designing and implementing student-centric, inquisitive, practical-rich and research based curricula, including project works, problem-solving & applications oriented TLPs, field trips, etc., that facilitate experiential and participative learning.
- To strengthen research and development and create new research knowledge through intense research, collaborations, knowledge and technology transfer.
- To foster innovation among students through trainings and forging collaborations with outside organizations
- To turn each student into a wholesome personality through initiatives in Community Service, Gender equity initiatives, Environment protection, personality development, transferable skills, understanding constitution and its spirit and their role in nation building.
- To mold the character of each constitutional provisions-abiding and inquisition- arousing

DETAIL OF COURSE TITLES&CREDITS (A.Y.20235-26)

Sem	Course no.	Course Name	Course type (T/L/P)	Hrs./Wk .(Science)	Credits (Science: 4+1)	Max. Marks Cont/Internal/ MidAssessment	Max.Marks Semend Exam
I	1	Renewable energy resources-1	T	3	3	50M	50M
		Renewable energy resources-1 Practical Course	L	2	1		50M
	2	Basic Electronics	T	3	3	50M	50M
		Basic Electronics – Practical Course	L	2	1		50M
II	3	Renewable energy resources-2	T	3	3	50M	50M
		Renewable energy resources-2 Practical Course	L	2	1		50M
	4	Applied Optics	T	3	3	50M	50M
		Applied Optics - Practical course	L	2	1		50M

Sem	Course no.	Course Name	Course type (T/L/P)	Hrs./Wk .(Science)	Credits (Science: 4+1)	Max. Marks Cont/Internal/ MidAssessment	Max.Marks Sem end Exam
III	5	Renewable energy systems analysis	T	3	3	50M	50M
		Renewable energy systems analysis Lab	L	2	1		50M
	6	Sustainable Energy and Environmental protection	T	3	3	50M	50M
		Sustainable Energy and Environmental protection Lab	L	2	1		50M
	7	Waves & Oscillations	T	3	3	50M	50M
		Waves & Oscillations Lab	L	2	1		50M

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	8	Heat & Thermodynamics	T	3	3	50M	50M
		Heat & Thermodynamics Lab	L	2	1		50M
IV	9	Electronic devices and circuits	T	3	3	50M	50M
		Electronic devices and circuits Lab	L	2	1		50M
	10	Solar Energy and applications	T	3	3	50M	50M
		Solar Energy and applications Lab	L	2	1		50M
	11	Energy Storage Systems for Renewable Energy	T	3	3	50M	50M
		Energy Storage Systems for Renewable Energy Lab	L	2	1		50M
V	12	Wind, Hydro and Ocean Energies	T	3	3	50M	50M
		Wind, Hydro and Ocean Energies Lab	L	2	1		50M
	13	Biomass and Hydrogen Energies	T	3	3	50M	50M
		Biomass and Hydrogen Energies Project	L	2	1		50M
	14	Analog and Digital Electronics	T	3	3	50M	50M
		Analog and Digital Electronics Lab	L	2	1		50M
	15	Energy Management & Auditing	T	3	3	50M	50M
		Energy Management & Auditing Project	L	2	1		50M
VI		Long Term Internship					

Note: *Course type code: T: Theory, L: Lab

Pithapur Rajah's Government College (Autonomous), Kakinada

Board of Studies–Department of Physics & Electronics

Resolutions of the Meeting - PHYSICS

The Board of Studies meeting was convened by the Physics & Electronics Department on 07-08-2025 at 10 a.m. under the chairmanship of Dr. M. Surekha, In-charge of the Department., Dr. M V K Meher, University Nominee, Sri.U.V.B.B.K.Prasad, Subject expert, and Dr. D. Gangadharudu, Sri.A.V.V.Prasad representative for industry solar systems, Kakinada, all the faculty members of Physics & Electronics and student representatives attended the meeting. The following agenda items are discussed and resolutions are made

Agenda : Action taken report (ATR) of the A.Y.2024-25

Proposal: Presented before the BOS members to discuss on the above agenda 1.

Discussion: Discussed the action taken report (ATR) of the A.Y.2024-25

Resolution Adopted: Appreciated and approved as all the activities were successfully completed in the proposed time line.

Agenda 1: Single major system for the Ist year is continued as per the guidelines of APSCHE

Proposal: Put before the BOS members to discuss on the above agenda 1.

Discussion: Discussed to follow the syllabus given by the APSCHE for the First Year semester -I.

Resolution Adopted: All the BOS members have approved the above.

Agenda 1(a): Continuation of Single minor system for the Ist year as per the guidelines of APSCHE

Proposal: Put before the BOS members to discuss on the above agenda

Discussion: Discussed to continue the Single minor system in our undergraduate program as per the guidelines issued by APSCHE

Resolution Adopted: All the BOS members have approved the above agenda

Agenda 2 : Revised-common program structure and semester wise curriculum.**Proposal:**

Placed before the BOS members to discuss on the above agenda 2. **Discussion:**

Discussed the entire program structure

Resolution Adopted: Resolved to adopt the revised common program structure and verified course wise syllabi as per guidelines issued by APSCHE and ANUR. Also discussed and approved the revised course wise structure, Syllabi, Blue print and model papers of **Semesters I – V** for the academic year 2025-26.

Agenda 3: Adoption of regulations on scheme of examination and marks/grading system.

Proposal: It is put before the BOS members to discuss on the above agenda 3.

Discussion: Discussed the Continuous Internal Assessment (CIA):Examination pattern.

Resolution Adopted: Approved the Mode of internal assessment, pattern of examination of internal assessment and scheme of evaluation of practical exams of Semesters II -V as external 50Marks and internal assessment 50Marks. All the practical classes of Semesters I-V will be conducted for 2Hrs. It is resolved to approve the split up of Continuous Comprehensive Evaluation CCE – 50 Marks for **Semesters I-V**as follows:

Examination	Mode of Assessment	Marks allotted
(CIA) Continuous Internal Assessment SEM I-V	Student study Project	10
	Viva Voce	3
	Seminar and Group Discussion	5
	Assignment	5
	Clean & Green and attendance	2
	Average of 2 Mid examinations conducted @25marks	25
TOTAL MARKS		50

- It is resolved to conduct 2 mid examinations @ 25 marks of each for **Semesters I-V** and the student should attend at least one internal exam. It is also resolved to conduct one mid exam through ICT platform (Online)
- Discussed and approved the scheme of evaluation of practical examinations for all the I –V semesters.
- It is resolved to approve the conduct of semester end practical exams only with internal examiners for odd semester and with both internal and external examiners for even semesters at the end of each semester.
- Resolved and approved the blue print, model papers of semester end examinations for all the I –V semesters.

Agenda 4: Streamlining of regularity in attendance.

Proposal: It is put before the BOS members to discuss the above agenda point 5.

Discussion: Discussed the measures to be taken for improving the regularity of the students

Resolution Adopted: Resolved to make the **75% of attendance is mandatory** to appear for both the **1st and 2nd mid term examinations** and also it is resolved that the student should attend at least one internal exam to appear for the Semester end examination.

Agenda 5: Certificate courses viz. add on courses and skill development courses to be conducted by the department during the academic year 2025-26.

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Proposal: It is placed before the BoS members to discuss on the above agenda 6.

Discussion: Discussed the LSCs and SDCs to be included.

Resolutions Adopted:

- Resolved to start a value-added certificate course “
- **Lab equipment trouble shooting” for Sem III @30 hrs. for 2 credits having 5units @ 2 theory hrs. per week and one Study Project at the end of the course, designed by the Department.**
- Resolved to adopt Community Service Project for all the students at the end of **Sem –II.**

Agenda 6: Collaboration with industry and third-party sector organization in view of industrial internship.

Proposal: It is placed before the BoS members to discuss on the above agenda

Discussion: Discussed on collaboration with industry and third-party sector organization in view of industrial internship

Agenda 7: Make students access to ICT infrastructure for enhanced quality in higher education.

Proposal: It is placed before the BoS members to discuss on the above agenda

Discussion: Discussed on making the students access to ICT infrastructure for enhanced quality in higher education.

Resolutions Adopted: By identifying various modules and topics for ICT platform and to develop e-content in 4- quadrants method to the students and upload in the college website.

Agenda 8: Remedial coaching for slow learners and project/ research work for advanced learners

Proposal: It is placed before the BoS members to discuss on the above agenda

Discussion: Discussed on remedial coaching for slow learners and project/ research work for advanced learners

Resolutions Adopted: Resolved to adopt a benchmark from previous appeared examinations to divide the students into three categories

- Resolved to take ‘**O**’ as benchmark for advanced learners to assign critical assignments, project/research works and ICT based class seminars
- Resolved to take ‘**B**’ as benchmark for moderate learners to assign assignments and class seminars
- Resolved to take ‘**F**’ as benchmark for slow learners to conduct remedial coaching

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Agenda 9: Allocation of extra credits for extracurricular activities.

Proposal: It is presented before the BOS members to discuss on the above agenda

Discussion: Discussed the allocation of extra credits for extracurricular activities

Resolution Adopted: Approved to give extra credits for MOOCS courses, N.S.S., N.C.C., winners of zonal level sports and games competitions, participation in state level/ National level competitions, blood donations camps, environmental programs like extending services in facing the natural calamities etc.as mentioned in the following table.

Agenda10: Conduct of parent teacher meeting.

Proposal: It is presented before the BOS members for the discussion on this agenda

Discussion: Discussed the conduct of parent teacher meeting

Resolution Adopted: Approved and resolved to conduct parent teacher meeting twice in the academic year at each semester and to make them aware of their role as stakeholders in the college administration.

Agenda 11: Panel of examiners to be approved in BOS.

Proposal: It is presented before the BOS members to discuss on the above agenda

Discussion: Discussed the panel of Question paper setters and examiners.

Resolution Adopted: Approved and resolved.

Agenda 12: Action plan for the academic year 2025-26.

Proposal: It is put before the BOS members to discuss on the above agenda 14.

Discussion: Discussed the action plan to implement the departmental activities more effectively as per the plan.

Resolution Adopted: It is resolved to approve Department Action Plan for the Academic Year 2025-26

Agenda 13: Departmental budget proposal for the academic year 2025-26

Proposal: It is presented before the BOS members to discuss on the above agenda

Discussion: Discussed the budget proposal

Resolution Adopted: Approved the budget proposal for the academic year 2025-26

Action Taken Report 2024-25

The Department of Physics conducted the BOS meeting for the academic year 2024-25 on 30-04-2024 in the Department of Physics. All the activities according to the plan of action were successfully completed in the proposed time line. By taking the valuable recommendations of the members for enhancement of knowledge and to enrich the skills of the students, the department took initiatives and implemented various innovative steps viz.

1. We take MOU with Trontech Lab Pvt. Ltd. on 25-06-2024.
 2. Distribution of Kasarabada Scholarship to merit students on 02-07-2024.
 3. Low temperature Physics & Refrigeration Practical demonstration by Technician Mahesh, A-Z Technical services.
 4. Awareness program on Ill effects of Tobacco was conducted on 02-08-2024.
 5. Invited talk on Career Guidance conducted on 08-08-2024.
 6. Invited talk on Career Guidance & Motivational talk conducted on 23-09-2024.
 7. Essay writing competitions on Swarnandhra @ 2047 on 01-10-2024.
 8. Student exchange program with GDC, Yeleswaram on Solar Energy and It's Applications practicals on 22-10-2024.
 9. Sir C.V.Raman Birthday celebrations on 07-11-2024.
 10. Inauguration of certificate course on Basic Electronics on 18-11-2024.
 11. Inauguration of certificate course on Sensor based Smart wiring on 18-11-2024.
 12. Physics Faculty Forum Started on 21-11-2024.
 13. Attended Drone Development Workshop along with Final year students at JNTUK, Kakinada on 06-12-2024.
 14. Inauguration of certificate course on Smart materials on 06-01-2025.
 15. Inauguration of certificate course on Troubleshooting and Fixing of Laboratory Instruments on 06-01-2025.
 16. ISRO 100th Rocket Mission (i.e., GSLV-F15, NVS-02 Satellite) celebrations on 30- 01-2025.
 17. Inauguration of certificate course on "Harnessing Solar Power-Solar panels Technology and Applications" 30-01-2025.
 18. Extension activity i.e., student exchange program to Jr. college students of GJC, Kirlampudi.
 19. Distribution of Upkar Scholarship to the poor and merit students on 31-01-2025.
 20. MOU with EMF Institutions (venous solutions & Research, Visakhapatnam) on 03-02-2025.
 21. Swarna Andhra & Swachh Andhra clean & Green activity conducted on 15-02- 2025.
 22. Parent Teacher meeting was conducted on 17-02-2025.
- Renewable Energy BOS 2024-25

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

23. Inauguration of Online Coaching for APPGCET on 17-02-2025.

24. National Science Day celebrations conducted on 28-02-2025.

25. Interactive secession by Kasarabada Chalapathi garu with students on Importance of Education on 18-03-2025.

26. Field trip was conducted to final year students to Doppler weather RADAR station & AU Nuclear Physics department lab, Visakhapatnam on 27-03-2025.

27. Awareness program on Community service Project (CSP) on 10-04-2025.

Proceedings of the Principal, Pithapur raja's Government College [A], Kakinada

Present: Dr. Kandula Anjaneyulu, M.A, Ph.D

Rc. No: 2/A.C/BOS-Member Nomination/2025-26

Dated 31-07-2025

Sub:- Pithapur raja's Government College [A], Kakinada – UG Boards of Studies (BoS) – Program Course- B.Sc/ Renewablmanagement(REM) Nomination of members - Orders Issued.

Ref:-Proc.R.C.No.1A.C/BOS/2025-26 Dated: 31-07-2025 of Principal, Pithapur raja's Government College [A], Kakinada.

ORDER:

The Principal, Pithapur raja's Government College [A], Kakinada is pleased to constitute UG **Board of studies in REM** for framing the syllabi in REM subject for all semesters duly following the norms of the UGC Autonomous guidelines.

S. No	Members of the Boar Of Studies	Designation	Signature
1.	Dr. M. Surekha Head of the Department	Chairman	
2.	Dr. M V K Meher,	University Nominee, Principal, GDC, Perumallapuram	
3.	Sri.U.V.B.B.K.Prasad	Subject Expert,Lecturer in Physics, Govt. Degree College, Pithapuram	
4.	Sri.D. Gangadharudu	Subject Expert,Lecturer in Electronics,MR government college,Peddapuram	
5.	Sri.A.V.V.Prasad,	Representative from Industry, Solar Systems,Kakinada	
6.	Dr.K.Jayadev	Member	
7.	Ms G. Sridevi	Member	
8.	Smt.A.Padmavathi	Member	
9.	Dr S V G V A Prasad	Member	
10.	Dr P Himakar	Member	
11.	Dr K. Durga Rao	Member	
12.	Ms.D.Sravani	Member	
13.	Ms M.Geetha Sri	Member	
14.	Ravi Teja	Student Alumini Member	
15.	G.Udaya Sri	Student Member-II REM	
16.	N.Akhila	Student Member-III REM	

The above members are requested attend the BOS meeting on 07-08-2025 and share their valuable views, suggestions on the following functionaries:

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

- (a) Prepare syllabi for the subject keeping in view the objectives of the college, interest of the stake holders and national requirement for consideration and approval of the Academic Council
- (b) Suggest methodologies for innovate teaching and evaluation techniques
- (c) Suggest panel of names to the Academic council for appointment of examiners
- (d) Coordinate research, teaching, extension and other activities in the department.

The Chairman of the BoS (HoD/lecturer In-Charge of the department) are hereby instructed to comply with these directives in letter and spirit to ensure the height standreds of academic and administrative excellence.



PRINCIPAL
P.R. Govt. College (Autonomous)
Pithapur Rajah's Government College (A),
Kakinada
KAR/2024/533 001

Principal
Pithapur raja's Government College [A],
Kakinada.

Certificate

The syllabus and model question papers including blueprint in physics subject for 3 years BSc course (REM Major) for the semesters I,II,III, IV and V for the academic years 2025-

26. list of examiners and paper setters' departmental activities which contains pages is approved in the board of studies meeting held on 07-08-2025.

S. No	Name of the Nominee	Designation	Signature
1.	Dr. M. Surekha Head of the Department	Chairman	M. Surekha
2.	Dr. M V K Meher	University Nominee	M. V. K. Meher
3.	Sri.U.V.B.B.K.Prasad	Subject Expert	S. U. V. B. B. K. Prasad
4.	Sri.D. Gangadharudu	Subject Expert	D. Gangadharudu
5.	Sri.A.V.V.Prasad,	Representative from Industry, Solar Systems,Kakinada	A. V. V. Prasad
6.	Dr.K.Jayadev	Member	K. Jayadev
7.	Ms G. Sridevi	Member	G. Sridevi 7.8.25
8.	Smt.A.Padmavathi	Member	A. Padmavathi 7.8.25
9.	Dr S V G V A Prasad	Member	S. V. G. V. A. Prasad
10.	Dr P Himakar	Member	P. Himakar 7.8.25
11.	Dr K. Durga Rao	Member	K. Durga Rao
12.	Ms.D.Sravani	Member	D. Sravani
13.	Ms M.Geetha Sri	Member	M. Geetha Sri
14.	Ravi Teja	Student Alumini Member	R. Teja
15.	G.Udaya Sri	Student Member-II REM	G. Udaya Sri
16.	N.Akhila	Student Member-III REM	N. Akhila

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)Kakinada

Blue print for the model paper – REM

Semester End External Examination

For I to IV Semester core courses

2025– 2026

S. No.	Type of question	Given in the Question paper			To be answered		
		No. of Questions	Marks allotted To each question	Total marks	No. of Questions	Marks allotted To each question	Total marks
1	Section – A Essay question	6	10	60	3	10	30
2	Section – B Short answer Question	7	5	35	4	5	20
TOTAL		13		95	07		50

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)Kakinada

Blue Print for Internal Theory (Mid) Examination**For Single Major system**

S. No.	Type of question			No. of Questions Given			No. of Questions to be answered		
		Unit	No. of Questions	Total Questions	Marks allotted To each question	Total marks	No. of Questions	Marks allotted To each question	Total marks
1	<u>Section – A</u> Essay question	I	1	2	10	20	1	10	10
		II	1						
2	<u>Section – B</u> Short answer Questions	III	2	4	5	20	2	5	10
		IV	2						
3	<u>Section – C</u> Objective type questions	One question from each unit	5	5	1	5	5	5	5
TOTAL						45			25

$$\text{Percentage of Choice given} = \frac{45-25}{45} \times 100 = 44.44 \%$$

The total of two internals is reduced to 25 marks and the other 25 marks allocated for CCE are further divided as follows

Study project	= 10 marks
(Theoretical for odd Sem / Practical for even Sem)	
Viva on subject	=3 marks
Assignment	= 5marks
Seminar	= 5 marks
Clean & Green and Attendance	=2 marks
Total	= 25 marks

Blue print for Semester End Practical examination
For I, II Year

Practical Paper

Scheme of Valuation for Practicals

Time: 2 hrs.

Max. Marks: 50

- | | |
|---|------------|
| 1. Formulae & Explanation | - 10 Marks |
| 2. Tabular form + graph + circuit diagram | - 10 Marks |
| 3. Observations | - 10 Marks |
| 4. Calculation, graph, precaution and results | - 10 Marks |
| 5. Viva voice | - 05 Marks |
| 6. Record | - 05Marks |

Note: Minimum of 6 experiments to be done and recorded.

Scheme of Valuation for Project of C15 Energy Management and Auditing

Time: 2 hrs

Max. Marks 50M

- | | |
|-------------------------|------|
| 1. Project Report | -30M |
| 2. Project Presentation | -10M |
| 3. Viva voice | -10M |



P.R. Government College (Autonomous) Kakinada

Department of Physics

B.Sc. Program outcomes

PO 1	Domain Expertise	- Acquire comprehensive domain knowledge and skills. - Make use of the knowledge in an innovative manner
PO 2	Life-long Learning and Research:	- Learn “how to learn”- Self-motivated and self-learning. - Adopt to the ever-emerging demands of work place and life. - Investigate the problem and report in a proper manner.
PO 3	Modern Equipment Usage	- Adopt ICT mode of learning effectively. - Access, retrieve and use authenticated information. - Have knowledge of software applications to analyze data - Usage of technology without deviating from the dedication of learning.
PO 4	Computing Skills and Ethics	- Develop rational and scientific thinking - Ensure the human values & ethics and to follow them throughout the life.
PO 5	Complex problem Investigation & Solving	- Predict and analyze problems. - Frame hypotheses. - Investigate and interpret empirical data. - Plan and execute action.
PO 6	Perform effectively as Individuals and in Teams	- Work efficiently as an individual - Cooperate, coordinate and perform effectively in diverse teams/groups.
PO 7	Efficient Communication & Life Skills	- To face challenges and self-sustainability in overcoming the psychological problems. - Listen, understand and express views in a convincing manner. - Develop skills to present information clearly and concisely to interested groups.
PO 8	Environmental Sustainability	- Following the green energy measures. - Understand sensibly the environmental challenges. - Think critically on preventing of

		• environmental pollution. • Propagate and follow environment friendly practices.
PO 9	Societal contribution	• Involve voluntarily in social development activities at Regional, National levels. • Voluntary participation in serving the society from natural calamities viz. disasters, cyclones, epidemics. • Be a patriotic citizen to uphold the constitutional values of the Nation.
PO 10	Effective Project Management	• Adoption of changes time to time in accordance with the situations. • Identify the goals, objectives and components of a project for its completion. • Plan, organize and direct the endeavors of teams to achieve the targets in time. • Be competent in identifying opportunities and develop strategies and decision making for contingencies.

New Courses introduced during the year 2025 – 26

It is resolved to introduce the following new courses in the programmes in Department of Physics & Electronics, from the AY 2025-26

S.No	Course Code	Title of the new course	Programmes in which it is introduced
1	1	Renewable Energy Sources 1	First Year B.Sc. Honors (Renewable Energy)
2	2	Basic Electronics	
3	3	Renewable Energy Sources 2	
4	4	Applied Optics	
5	12	Wind, Hydro & Ocean Energies	Third Year B.Sc. Honors (Renewable Energy)
6	13	Biomass and Hydrogen Energies	
7	14	Analog and Digital Electronics	
8	15	Energy Management and Auditing	

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester I B.Sc. (II Sem) W.e.f. 2023 - 24 ADMITTED BATCH			
Course -1	RENEWABLE ENERGY RESOURCES-1				
Teaching	Hours Allocated: 45 (Theory)	L	T	P	C
Pre-requisites:	Units of Energy & Power, Primary & Secondary, Commercial & Non Commercial, EM Spectrum, and Photo Electric effect, Bureau of Energy Efficiency, Wind energy, Ocean energy, Bio-energy.	3	0	-	3

UNIT-I (10hrs)

Introduction to Energy: Definition and units of energy - Joule, Erg, Calorie, Ton of Coal Equivalent, Ton of oil equivalent, Ton of TNT, KWH, electron Volt, British Thermal Unit, Definition and Units of Power – Watt, Horse power, Ton of refrigeration, Ton of air cooling.

Classification of energy resources: Primary-Secondary, Conventional-Non conventional, Renewable-Nonrenewable, Green energy, Clean energy (Definitions and examples), Green Foot print, Carbon Foot print Concepts.

Bureau of Energy Efficiency–Actions and Activities, BE Star label, ISEER introduction.

UNIT-II (10 hrs)

Solar constant, Solar Radiation spectrum, Classification of Solar cells - First generation, Second Generation, Third Generation. Key elements of Silicon Solar cell, PV Solar cell, Module, panel and array. Solar Thermal systems types, applications of Solar PV and Solar Thermal systems.

UNIT-III (8 hrs)

Wind Energy: Origin of winds, Wind turbine site selection (Shobh Nath Singh 6.5), Wind Turbine Types and Their Construction (B H Khan 7.8)

UNIT-IV (10 hrs)

Ocean Energy: Origin and nature of tidal energy, Ocean tidal energy conversion schemes, Wave energy technology, Ocean thermal energy conversion technology (Open cycle, closed cycle and Hybrid cycle).(BH Khan Ch.10,ShobhNathSingh Ch.11,12,13)

UNIT-V (7 hrs)

Bio-Energy: Photosynthesis, Usable forms of Biomass, Biomass resources, Biomass conversion technologies – Wet processes, Dry processes.

References:-

1. Non- Conventional Energy Sources, G. D. Rai, New Delhi.
2. Non-conventional Energy Resources, B.H.Khan, 3rd Ed, Tata McGrawHill (2017)
3. Nonconventional Energy Resources, Shobh Nath Singh, Pearson India (2017)

PITHAPUR RAJAHS GOVERNMENT COLLEGE (A), KAKINADA

B.Sc., SEMESTER-II PAPER 3 W.e.f. 2023 - 24 ADMITTED BATCH

Renewable Energy resources-1

Course Code: 03 Hours/Week Total hours: 45 hrs

Course Code: **No. of Credits: 04**
Answer **ANY THREE** questions by choosing at least one from each Section

Section	Questions to be given	Questions to be answered	Marks
A	6	3	3 x 10M = 30M
B	7	4	4 x 5 M = 20M
Total	13	7	50M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I	2	1	25
II	1	1	15
III	1	1	15
IV	1	2	25
V	1	2	15
			95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

Renewable Energy resources-1

Course Code: **No. of credits: 03** Hours/Week

Total hours: 45hrs

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: 2 $\frac{1}{2}$ Hours

Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks

SECTION-A

1. Essay question from UNIT- I
2. Essay question from UNIT- I
3. Essay question from UNIT- II

SECTION-B

4. Essay question from UNIT-III
5. Essay question from UNIT-IV
6. Essay question from UNIT- V

PART-II

Answer **any Four** Questions from the following

4 X 5= 20 Marks

7. Short answer question from UNIT - I
8. Short answer question from UNIT - II
9. Short answer question from UNIT - III
10. Short answer question from UNIT - IV
11. Short answer question from UNIT - IV
12. Short answer question from UNIT - V
13. Short answer question from UNIT - V

LIST OF EXPERIMENTS

Minimum of 6 experiments to be done and recorded

I-V Characteristics of Solar cell. fill factor.

1. P-V Characteristics of solar cell. Efficiency.

2. Spectral characteristics of solar cell

3. Intensity characteristics of solar cell

4. Area characteristics of solar cell

5. Effect of temperature on the efficiency of the solar cell.

6. Effect of tilt angle on the efficiency of the solar cell.

7. Determination of Planck's constant using photocell

Scheme of Evaluation for Practicals

Time: 2 hrs

Max.Marks:50

- | | |
|---|------------|
| 1. Formulae & Explanation | - 10 Marks |
| 2. Tabular form + graph + circuit diagram | -10 Marks |
| 3. Observations | - 10 Marks |
| 4. Calculation, graph, precaution and results | - 10 Marks |
| 5. Viva Voce | -5 Marks |
| 6. Record | - 5 Marks |

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

	Pithapur Rajahs Government College (Autonomous) Kakinada	Program & Semester W.e.f. 2023 - 24 ADMITTED BATCH			
Course 2 Code: RES2-24	BASIC ELECTRONICS				
Teaching	Hours Allocated: 45 (Theory)	L	T	P	C
Pre-requisites:	Different Forms of Energy.	3	0	-	3

Theory Credits: 3

3hrs/week

COURSE OBJECTIVES

This course aims to introduce undergraduate physics students to the fundamental principles of electronics. It covers passive components, semiconductor physics, diode and transistor operation, DC power supplies, and the basics of digital logic. The goal is to build a solid foundation in circuit analysis and electronic devices for students with minimal prior background.

LEARNING OUTCOMES:

By the end of the course, students will be able to:

1. Identify and explain the function and types of resistors, capacitors, and inductors.
2. Understand the basic concepts of semiconductors and diode characteristics.
3. Analyze simple transistor circuits and their applications.
4. Describe the functioning of rectifiers, filters, and voltage regulators.
5. Perform basic binary arithmetic and construct simple digital logic circuits.

UNIT I: PASSIVE COMPONENTS AND CIRCUIT FUNDAMENTALS (9 hrs)

Resistors: Types (carbon, wire-wound, metal film), color coding, tolerance, power ratings
- Capacitors: Types (ceramic, electrolytic, film), applications, charge/discharge behavior -
Inductors: Basic structure and applications - Series and parallel combinations: Equivalent resistance/capacitance/inductance - Basic laws: Ohm's Law, Kirchhoff's Voltage and Current Laws (KVL, KCL) with simple applications

UNIT II: SEMICONDUCTOR PHYSICS AND DIODES (9 hrs)

Intrinsic vs extrinsic semiconductors - Doping, energy band diagrams, charge carriers - PN junction diode: Construction, working, forward/reverse biasing, I-V characteristics -
Special diodes: Zener diode, LED, photodiode, solar cell – construction, characteristics and uses

UNIT III: TRANSISTORS AND THEIR OPERATION (9 hrs)

BJT: Structure, current components, working of NPN/PNP - Configurations: CB, CE, CC
- input/output characteristics - Applications: Transistor as switch and amplifier (qualitative understanding)

UNIT IV: POWER SUPPLIES AND REGULATION (9 hrs)

Need for DC power supply: Block diagram - Rectifiers: Half-wave, full-wave, bridge with waveforms - Filter circuits: RC, LC, and π filters – working principle - Voltage regulation: Zener diode regulation, IC regulators (brief intro)

UNIT V: INTRODUCTION TO DIGITAL ELECTRONICS (9 hrs)

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

Analog vs Digital signals - Number systems: Binary, decimal, hexadecimal – conversions, binary arithmetic - Logic gates: AND, OR, NOT – symbols, truth tables, simple logic circuits, Universal gates (NAND, NOR) – brief introduction

Textbooks / References:

1. V.K. Mehta & Rohit Mehta – Principles of Electronics, S. Chand
2. R.S. Sedha – A Textbook of Applied Electronics, S. Chand
3. D. Chattopadhyay & P.C. Rakshit – Electronics: Fundamental Concepts, New Central
4. Malvino & Leach – Digital Principles and Applications, McGraw-Hill
5. A.K. Maini – Digital Electronics, Wiley India

Practicals on Basic Electronics

Credits: 1

2 hrs/week

COURSE OBJECTIVE:

To develop practical skills in handling basic electronic components and circuits by constructing, testing, and analyzing simple electronic systems such as rectifiers, filters, diode/transistor configurations, and digital logic gates using fundamental measurement tools.

Learning Outcomes

After successful completion of the lab course, students will be able to:

1. Measure and verify the behavior of passive components in circuits.
2. Construct and test diode and transistor-based circuits.
3. Analyze rectifier output and filter performance using basic instruments.
4. Build and verify logic gate circuits using ICs or trainer kits.
5. Practice circuit debugging, use of multimeters, and interpretation of waveforms using a CRO.

Minimum of 6 experiments to be done and recorded

Experiments (Practical List)

1. Verification of Ohm's Law using resistive networks (series and parallel combinations).
2. Series and Parallel Combination of Capacitors and Inductors
3. Capacitor charging and discharging curves using RC circuits and a stopwatch/multimeter.
4. V-I characteristics of a PN junction diode (forward and reverse bias)
5. Temperature Dependence of Resistance (Using Thermistor).
6. Zener diode characteristics and voltage regulation behavior.
7. Study of LED and photodiode characteristics under different light conditions.
8. BJT transistor as a switch: ON/OFF control of an LED.
9. Construction of half-wave and full-wave rectifiers and measurement of output voltage.

10. Design and analysis of simple π -filtered power supply circuits.

11. Verification of logic gates (AND, OR, NOT, NAND, NOR) using digital ICs or simulation.

Scheme of Evaluation for Practicals

Time: 2hrs

Max.Marks:50

1. Formulae & Explanation	- 10 Marks
2. Tabular form + graph + circuit diagram	-10 Marks
3. Observations	- 10 Marks
4. Calculation, graph, precaution and results	- 10 Marks
5. Viva Voce	-5 Marks
6. Record	- 5 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) KAKINADA.**I B.Sc., REM-Semester – I, Paper – II****Basic Electronics**
w.e.f. 2021-22 ADMITTED BATCH**Course Code:****No. of Credits: 03**Answer **ANY THREE** questions by choosing at least one from each Section

Section	Questions to be given	Questions to be answered	Marks
A	6	3	3 x 10M = 30M
B	7	4	4 x 5 M = 20M
Total	13	7	50M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I			
II			
III			
IV			
V			
			95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

PITHAPUR RAJAHS GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER-II PAPER 2

W.e.f. 2023 - 24 ADMITTED BATCH

Basic Electronics

Course Code: **No. of credits: 03 Hours/Week**

Total hours: 45hrs

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: $2\frac{1}{2}$ Hours

Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks
SECTION-A

- 3. Essay question from UNIT- I
- 4. Essay question from UNIT- I
- 14. Essay question from UNIT- II

SECTION-B

- 15. Essay question from UNIT-III
- 16. Essay question from UNIT-IV
- 17. Essay question from UNIT- V

PART-II

Answer **any Four** Questions from the following

4 X 5= 20 Marks

- 18. Short answer question from UNIT - I
- 19. Short answer question from UNIT - II
- 20. Short answer question from UNIT - III
- 21. Short answer question from UNIT - IV
- 22. Short answer question from UNIT - IV
- 23. Short answer question from UNIT - V
- 24. Short answer question from UNIT - V

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

	Pithapur Rajahs Government College (Autonomous) Kakinada	Program & Semester W.e.f. 2023 - 24 ADMITTED BATCH			
Course 3 Code: RES2-24	Renewable Energy resources-2				
Teaching	Hours Allocated: 45 (Theory)	L	T	P	C
Pre-requisites:	Different Forms of Energy.	3	0	-	3

Theory Credits: 3

3hrs/week

UNIT-I(7hrs)

Global Energy Scenario: Energy demand and Energy Trilemma index, Indian Energy Scenario: Energy resources available in India, Governance of energy sector in India, National Green Tribunal (NGT) act, NGT activities.

UNIT-II(7hrs)

Geothermal energy: Origin of geothermal energy, Types of geothermal resources and basic extraction mechanisms-Hydrothermal Resources, Geo-pressured resources, Hot dry rock resources, Magma resources. (BH Khan Chapter 9)

UNIT-III(10hrs)

Introduction to Hydropower, Hydrology – descriptive hydrology, hydro graph, mass curve, storage, dams. Classification of Hydropower Plants, Small Hydropower, Systems: Overview of micro, mini and small hydro systems Status of Hydropower Worldwide Advantages and Disadvantages of Hydropower, Selection of site for hydroelectric plant, Hydrological cycle, Essential elements of a hydroelectric power plant.

UNIT-IV(10hrs)

Radioactivity; Mass defect and binding energy; Chain reaction; Materials used in nuclear plants; Classifications of nuclear reactors, Construction and working of conventional nuclear reactor, pressurized water reactor, boiling water reactor, supercritical water reactor, Fast breeder reactor-types, Gas cooled reactor-types, Nuclear fusion reactor schematic, Nuclear power plant.

UNIT -V (11 hrs.)

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.

Environmental effects of thermal power station, Geothermal power, Ocean energy harvesting. Wind energy harvesting, Solar energy harvesting, Bioenergy.(Frank R Spellman)

<https://sci-hub.ru/10.1016/b978-0-08-098330-1.00017-x> and Wikipedia

<https://libgen.rs/scimag/?q=nuclear+power+paul+breeze>

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) KAKINADA.

II B.Sc., Physics-Semester – II, Paper – III

Renewable Energy resources-2
w.e.f. 2021-22 ADMITTED BATCH

Course Code:

No. of Credits: 04

Answer **ANY THREE** questions by choosing at least one from each Section

Section	Questions to be given	Questions to be answered	Marks
A	6	3	3 x 10M = 30M
B	7	4	4 x 5 M = 20M
Total	13	7	50M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I			
II			
III			
IV			
V			
			95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

PITHAPUR RAJAHS GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER-II PAPER 3

W.e.f. 2023 - 24 ADMITTED BATCH

Renewable Energy resources-2

Course Code: **No. of credits: 03 Hours/Week**

Total hours: 45hrs

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: 2 $\frac{1}{2}$ Hours

Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks

SECTION-A

- 5. Essay question from UNIT- I
- 6. Essay question from UNIT- I
- 25. Essay question from UNIT- II

SECTION-B

- 26. Essay question from UNIT-III
- 27. Essay question from UNIT-IV
- 28. Essay question from UNIT- V

PART-II

Answer **any Four** Questions from the following

4 X 5= 20 Marks

- 29. Short answer question from UNIT - I
- 30. Short answer question from UNIT - II
- 31. Short answer question from UNIT - III
- 32. Short answer question from UNIT - IV
- 33. Short answer question from UNIT - IV
- 34. Short answer question from UNIT - V
- 35. Short answer question from UNIT - V

SEMESTER-II

COURSE 3: Renewable Energy resources-2

Practical Credits: 1

2hrs/week

Minimum of 6 experiments to be done and recorded

Experiments

- . 1.Effect of wind speed on windmill efficiency.
2. Effect of tilt on wind mill efficiency.
3. Effect of water source height on turbine power generation.
4. Wind-rose analysis
<https://www.climate.gov/maps-data/dataset/wind-roses-charts-and-tabular-data>
<https://www.wikihow.com/Read-a-Wind-Rose>
5. Spectral analysis of intensities on selective absorbers in solar cookers.
6. Biomass conversion analysis
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9160279/>

Scheme of Evaluation for Practicals

Time: 2hrs

Max.Marks:50

- | | |
|---|--|
| 7. Formulae & Explanation | - 10 Marks |
| 8. Tabular form + graph + circuit diagram | -10 Marks |
| 9. Observations | - 10 Marks |
| 10. | Calculation, graph, precaution and results |
| 10 Marks | |
| 11. | Viva Voce -5 Marks |
| 12. | Record - 5 Marks |

	Pithapur Rajahs Government College (Autonomous) Kakinada	Program & Semester W.e.f. 2023 - 24 ADMITTED BATCH			
Course 4	Applied Optics				
Teaching	Hours Allocated: 45 (Theory)	L	T	P	C
Pre-requisites:	Basics of Optics	3	0	-	3

COURSE OBJECTIVE:

This course aims to introduce students to the core principles of optics and the functioning of various optical instruments. The objective is to provide a clear understanding of ray optics, aberrations, lasers, optical fibers, holography, and their applications in modern optical systems such as microscopes and telescopes.

LEARNING OUTCOMES:

On successful completion of this course, the students will be able to:

1. Understand the fundamentals of geometrical optics using ray matrices and apply them to complex lens systems.
2. Analyze and distinguish various types of optical aberrations and methods to minimize them.
3. Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields.
4. Understand the basic principles of fibre optic communication and explore the field of Holography and Nonlinear optics and their applications.
5. Gain knowledge of various optical instruments including microscopes and telescopes, their types, and real-world applications

UNIT-I: GEOMETRICAL OPTICS (9 hrs.)

Ray optics assumptions, Fermat principle, Translation matrix, Reflection matrix, Refraction matrix, ABCD matrices system matrix, Thick lens formula, Thin lens formula, Ramsden eyepiece, Huygens eyepiece, Two lens formula - (i) separated by a distance and (ii) in contact.

UNIT-II: ABERRATIONS (9 hrs.)

Fresnel theory of Reflection and Refraction. Monochromatic aberrations, Spherical aberration, Methods of minimizing spherical aberration, Coma, Astigmatism and Curvature of field, Distortion; Chromatic aberration-the achromatic doublet; Achromatism for two lenses (i) in contact and (ii) separated by a distance.

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UNIT-III: LASERS (9 hrs.)

Lasers: Introduction, Spontaneous emission, Stimulated emission, Population Inversion, Laser principle, Einstein coefficients, Types of lasers: He-Ne laser, Ruby laser, Semiconductor laser, Applications of laser.

UNIT-IV: OPTICAL FIBERS AND HOLOGRAPHY (9 hrs.)

Principle of Optical fibers, Acceptance angle, Acceptance cone, Numerical aperture, Types of optical fibers - Graded and Stepped index, Types Signal attenuation mechanisms in optical fibers, Applications of Optical fibers - Sensors, Imaging, Communication. Holography: Basic principle of holography-Gabor hologram and its limitations, Applications of holography.

UNIT-V: APPLICATIONS OF OPTICAL INSTRUMENTS (9 hrs.)

Introductory ideas and applications of various microscopes viz., (i) Optical microscopes (Compound microscope, Confocal microscope) (ii) Electron microscopes – SEM, Introductory ideas and applications of various telescopes viz., (i) Optical telescopes (ii) Radio telescopes (iii) Solar telescopes (iv) Infrared telescope (v) Ultraviolet telescope

REFERENCE BOOKS:

1. BSc Physics, Vol.2, Telugu Akademy, Hyderabad.
2. Optics - principles and applications Kailash K. Sharma
3. An introduction to Lasers M N Avadhanulu
4. Lasers Tyagarajan Ghatak 2nd Ed.
5. Introduction to Fiber Optics Tyagarajan Ghatak
6. Principles of Laser material processing Elijah Kannatey Asibu
7. Quantum optics An introduction Mark Fox

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I B.Sc., REM-Semester – II, Paper – IV

Applied Optics
w.e.f. 2021-22 ADMITTED BATCH

Course Code: _____ **No. of Credits: 03**
Answer **ANY THREE** questions by choosing at least one from each Section

Section	Questions to be given	Questions to be answered	Marks
A	6	3	3 x 10M = 30M
B	7	4	4 x 5 M = 20M
Total	13	7	50M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I			
II			
III			
IV			
V			
			95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

PITHAPUR RAJAHS GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER-II PAPER 4

W.e.f. 2023 - 24 ADMITTED BATCH

Applied Optics

Course Code: No. of credits: 03 Hours/Week

Total hours: 45hrs

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: 2 $\frac{1}{2}$ Hours

Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks

SECTION-A

- 7. Essay question from UNIT- I
- 8. Essay question from UNIT- I
- 36. Essay question from UNIT- II

SECTION-B

- 37. Essay question from UNIT-III
- 38. Essay question from UNIT-IV
- 39. Essay question from UNIT- V

PART-II

Answer **any Four** Questions from the following

4 X 5= 20 Marks

- 40. Short answer question from UNIT - I
- 41. Short answer question from UNIT - II
- 42. Short answer question from UNIT - III
- 43. Short answer question from UNIT - IV
- 44. Short answer question from UNIT - IV
- 45. Short answer question from UNIT - V
- 46. Short answer question from UNIT - V

APPLIED OPTICS

Practical

Credits: 1

2 hrs/week

COURSE OBJECTIVE:

To provide hands-on experience with optical components and instruments, and to reinforce theoretical concepts through practical applications involving lasers, optical fibers, microscopes, and ray optics techniques.

LEARNING OUTCOMES:

1. Understand and apply geometrical optics principles through practical experiments involving lens combinations, matrix methods, and measurement of focal lengths using systems like the two-lens setup.
2. Demonstrate hands-on understanding of monochromatic and chromatic aberrations by working with diffraction gratings and measuring resolving powers of optical components like gratings and telescopes.
3. Explore the operational principles and characteristics of lasers, including wavelength measurement using diffraction gratings and analysis of laser beam behavior through reflection and refraction experiments.
4. Operate and analyze optical fiber systems by determining the numerical aperture, acceptance angle, and exploring their applications in communication and light guiding.
5. Investigate holographic concepts by understanding the role of laser light in interferencebased techniques and identifying the limitations of basic holographic setups.
6. Examine and interpret the working of various optical instruments such as microscopes and telescopes by studying resolution, power, and optical limitations through practical experiments and simulations.

Minimum of 6 experiments to be done and recorded

1. Wavelength of laser using Diffraction grating
2. Refractive index of liquid using Hollow prism
3. Resolving power of telescope
4. Resolving power of grating
5. Spectrometer: i-d curve
6. Laser Reflection grating using metal scale
7. Optical fiber - Numerical Aperture
8. Rabi Oscillations Octave program
9. Two lens system power pairs plot (Python/Octave)
10. Focal length and verification of matrix method for thick and thin lenses
11. Achromatic combination of two lenses – in contact and at a distance
12. Measurement of beam divergence and spot size of a laser
13. Verification of Malus' Law using a laser and polarizers
14. Study of diffraction pattern from circular aperture (Airy disk) – resolving limit
15. Young's double-slit experiment using laser – interference fringes and fringe width
16. Study of bending losses in optical fiber

Scheme of Evaluation for Practicals

Time: 2 hrs

Max.Marks:50

- | | |
|---|--|
| 7. Formulae & Explanation | - 10 Marks |
| 8. Tabular form + graph + circuit diagram | -10 Marks |
| 9. Observations | - 10 Marks |
| 10. | Calculation, graph, precaution and results |
| 10 Marks | |
| 11. | Viva Voce -5 Marks |
| 12. | Record - 5 Marks |

	Pithapur Rajahs Government College (Autonomous) Kakinada	Program & Semester III W.e.f. 2023 - 24 ADMITTED BATCH			
Course 5	Renewable Energy Systems Analysis				
Teaching	Hours Allocated: 45 (Theory)	L	T	P	C
Pre-requisites:	System analysis	3	0	-	3

Course - 5 Title: Renewable Energy Systems Analysis

Total Hours: 45

Chapter 1: Introduction to Renewable Energy Systems (8 hours)

Overview of renewable energy sources. Importance and benefits of renewable energy systems.

Basic principles of energy conversion: Introduction to energy conversion processes: conversion of one form of energy into another. Overview of energy conversion technologies used in renewable energy systems.

Energy balance and system boundaries.

Chapter 2: Modeling Techniques for Renewable Energy Systems (10 hours)

Mathematical modeling of renewable energy sources. Simulation techniques and software tools. Data collection and analysis methods. Uncertainty and sensitivity analysis.

Chapter 3: Techno-Economic Analysis of Renewable Energy Systems (12 hours)

Cost-benefit analysis. Levelized cost of energy (LCOE). Financial metrics: NPV, IRR, ROI

Project feasibility assessment. Case studies and real-world examples.

Chapter 4: Optimization Methods for Renewable Energy Systems (8 hours)

Optimization techniques: linear programming, nonlinear optimization. Multi-objective optimization.

Optimization algorithms and software applications. Design optimization for renewable energy systems

Chapter 5: Environmental Protection Policy: (7 hours)

The Clean Air Act, The Clean Water Act, The Safe Drinking Water Act, Setting Environmental Standards, Balancing Statutory Goals and Costs, Setting Quality Standard.

Reference Books:

1. "Renewable and Efficient Electric Power Systems" by Gilbert M. Masters
2. "Renewable Energy Systems: A Smart Energy Systems Approach to the Choice and Modeling of 100% Renewable Solutions" by Henrik Lund.
3. "Modeling and Simulation of Renewable Energy Systems" by David W. Wood
4. "Renewable Energy Systems: Simulation with Simulink® and Sim Power Systems™" by Viktor Perelmuter
5. "Renewable Energy Finance: Powering the Future" by Charles W. Donovan
6. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
7. "Optimization of Renewable Energy Systems: A Review" by Petros Aristidou et al.
8. "Renewable Energy System Design" by Ziyad Salameh
9. "Renewable Energy Systems: The Choice and Modeling of 100% Renewable Solutions" by Henrik Lund
10. "Renewable Energy Systems: Engineering, Analysis, and Sustainability" by Gary D. Price and Robert A. Fleming

<https://www.youtube.com/watch?v=JgNpfs6IRTA>

EE8712 RENEWABLE ENERGY SYSTEMS LABORATORY

OBJECTIVES:

- To train the students in Renewable Energy Sources and technologies.
- To provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- To recognize current and possible future role of Renewable energy sources.

LIST OF EXPERIMENTS

- Simulation study on Solar PV Energy System.
- Experiment on "VI-Characteristics and Efficiency of 1kWp Solar PV System".
- Experiment on "Shadowing effect & diode based solution in 1kWp Solar PV System".
- Experiment on Performance assessment of Grid connected and Standalone 1kWp Solar Power System.
- Simulation study on Wind Energy Generator.
- Experiment on Performance assessment of micro Wind Energy Generator.
- Simulation study on Hybrid (Solar-Wind) Power System.
- Experiment on Performance Assessment of Hybrid (Solar-Wind) Power System.
- Simulation study on Hydel Power.

S.No	Name of the Practical	Objective	Description	Software
1	Simulation of Solar PV Systems	Simulate the performance of a solar PV system.	Students will design a simple solar PV system, simulate its performance under various irradiance and temperature conditions, and analyze the output power.	PVsyst, MATLAB/Simulink
2	Wind Turbine Performance Simulation	Model and analyze the performance of a wind turbine.	Students will create a wind turbine model, simulate it under different wind speeds, and evaluate the power output and efficiency.	QBlade, MATLAB/Simulink
3	Biomass Energy Conversion Simulation	Simulate the conversion process of biomass to energy.	Students will model a biomass gasification process, simulate the energy output, and analyze the efficiency of the conversion process.	Aspen Plus
4	Hydroelectric Power Plant Simulation	Model a small hydroelectric power plant.	Students will design a hydroelectric power plant model, simulate its performance under different water flow rates, and analyze the generated power.	MATLAB/Simulink
5	Energy Storage System Simulation	Simulate an energy storage	Students will design and simulate an energy storage system (e.g.,	HOMER Pro, MATLAB/Simulink

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

		system integrated with renewable energy sources	battery storage) connected to a renewable energy source and analyze the system's performance	
6	Techno-Economic Analysis of a Solar PV System	Perform a techno-economic analysis of a solar PV system.	Students will use software tools to perform a cost-benefit analysis, calculate the Levelized Cost of Energy (LCOE), and assess the financial viability of a solar PV project.	RETScreen, HOMER Pro
7	Optimization of Renewable Energy Systems	Optimize the design of a renewable energy system.	Students will apply optimization techniques to a renewable energy system (e.g., solar PV or wind turbine) to maximize efficiency or minimize costs.	GAMS, MATLAB
8	Simulation of Hybrid Renewable Energy Systems	Simulate a hybrid renewable energy system combining solar, wind, and storage.	Students will design and simulate a hybrid system, analyze the performance, and evaluate the system's reliability and cost-effectiveness.	HOMER Pro
9	Uncertainty and Sensitivity Analysis	Perform uncertainty and sensitivity analysis on a renewable energy project.	Students will analyze the impact of varying input parameters on the performance and economic feasibility of a renewable energy project.	Crystal Ball, MATLAB
10	Policy Impact Simulation on Renewable Energy Adoption	Simulate the impact of policy changes on renewable energy adoption.	Students will model and simulate the effect of different policy scenarios (e.g., subsidies, tax incentives) on the adoption rates of renewable energy technologies.	System Dynamics Software (e.g., Vensim)

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA Pithapur
Rajah's Government College (Autonomous), Kakinada
II B.Sc., SEMESTER-III

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 5: Renewable Energy Systems Analysis BLUE PRINT

Course Code:

No. of hours: 03 Hours/Week Total

hours: 45hrs

No. of Credits: 03

Answer ANY THREE questions by choosing at least one from each Section

Section	Questions to be given	Questions to be answered	Marks
A	6	3	3 x 10M = 30M
B	7	4	4 x 5 M = 20M
Total	13	7	50M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	-	15
II	1	-	1	15
III	2	-	1	25
IV	1	2	-	20
V	1	1	1	20

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

PITHAPUR RAJAH'S GOVERNMENT

COLLEGE (A), KAKINADA II

B.Sc., SEMESTER-III

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 5

Total hours: 45hrs

Course Code:

No. of credits: 03

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: 2hours

Max Marks: 50

**PART
-I**

Answer **any Three** questions by attempting at least one question from each section 3 X 10 = 30 Marks

SECTION-A

1. Essay question from UNIT- I
2. Essay question from UNIT- II
3. Essay question from UNIT- III

SECTION-B

4. Essay question from UNIT-IV
5. Essay question from UNIT-IV
6. Essay question from UNIT- V

PART-II

Answer any Four Questions from the following

4 X 5 = 20 Marks Short

7. Short answer question from UNIT - I
8. Short answer question OR PROBLEM from UNIT- II
9. Short answer question from UNIT - III
10. Short answer question from UNIT - III
11. Short answer question OR PROBLEM from UNIT- IV
12. Short answer question OR PROBLEM from UNIT - V
13. Short answer question from UNIT - V

Course 5: Renewable Energy Systems Analysis
Model Question Paper
PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA
II B.Sc., SEMESTER-III

W.e.f. 2023 - 24 ADMITTED BATCH

Time: 2 Hours

Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question from each section

3 X 10= 30 Marks

Section-A

1. Analyse the Environmental and Economic Benefits of Renewable Energy Systems
2. Analyse the importance of mathematical modelling in renewable energy systems.
3. Discuss the importance of Levelized Cost of Energy (LCOE) in the techno-economic analysis of renewable energy systems. How does LCOE help in comparing different energy technologies?

Section-B

4. Define linear and nonlinear optimization techniques and list their applications in renewable energy systems.
5. Explain how multi-objective optimization is applied in renewable energy systems.
6. Evaluate the impact of the Clean Air Act and the Clean Water Act on public health and the environment. How have these landmark legislations shaped environmental policies in the United States?

PART-II

Answer **any Four** Questions from the following

4 X 5= 20 Marks

What are the primary benefits of renewable energy systems?

7. A solar panel has an efficiency of 15% and receives an average solar irradiance of 800 W/m². If the area of the solar panel is 20 m², calculate the expected daily energy output of the solar panel in kWh, assuming 5 hours of peak sunlight per day.
8. What is Levelized Cost of Energy (LCOE), and why is it critical in comparing renewable energy technologies?
9. Define Net Present Value (NPV) and explain its significance in assessing renewable energy projects.
10. A wind farm is looking to place three wind turbines in a designated area to maximize energy production. The energy output from a turbine can be modeled as a nonlinear function of its height h (in meters):
 $E(h) = 5h^2 - 20h + 25$

Determine the optimal height of each turbine to maximize energy output.

11. Discuss the role of the Safe Drinking Water Act in ensuring water quality. What challenges arise in balancing the statutory goals of this Act with the economic and technical costs of implementation?
12. Smaller municipalities face significant challenges in complying with the Safe Drinking Water Act (SDWA) due to the high costs of infrastructure upgrades and advanced water treatment technologies. How can these communities meet drinking water standards without incurring excessive financial strain?

Course 5: Renewable Energy Systems Analysis

Question bank

UNIT-I

Essay Questions:

1. Analyse the Environmental and Economic Benefits of Renewable Energy Systems (BL-2)
2. Evaluate the Efficiency and Challenges of Different Energy Conversion Technologies in Renewable Energy Systems (BL-3)
3. Design a Sustainable Energy Plan Utilizing Multiple Renewable Energy Sources (BL-4)

Short Questions:

1. What are the primary benefits of renewable energy systems? (BL-1)
2. Describe the basic principle of energy conversion in the context of renewable energy systems. (BL-1)
3. Identify and briefly describe three energy conversion technologies used in renewable energy systems. (BL-1)
4. How does energy balance affect the efficiency of renewable energy systems?

UNIT-II

Essay Questions:

4. Analyse the importance of mathematical modelling in renewable energy systems. (BL2).
5. Evaluate the effectiveness of different simulation techniques and software tools used in renewable energy systems. (BL1)
6. Discuss the methods of data collection and analysis in the context of renewable energy systems. (BL1 & BL2)
7. Critically examine the role of uncertainty and sensitivity analysis in the modelling of renewable energy systems. (BL1 & BL2).

Problems:

5. A solar panel has an efficiency of 15% and receives an average solar irradiance of 800 W/m². If the area of the solar panel is 20 m², calculate the expected daily energy output of the solar panel in kWh, assuming 5 hours of peak sunlight per day. BT4
6. A wind turbine is modeled to analyze its energy production over a year based on historical wind speed data. The turbine has a power curve described by the following equations:
For wind speeds $v < 3$ m/s, $P = 0$ W
For $3 \text{ m/s} \leq v < 15$ m/s, $P = 0.5 \times v^3$
For $v \geq 15$ m/s, $P = \text{Rated Power} = 1500$ W
Given the following wind speed data for 10 days (in m/s): [4, 6, 10, 15, 2, 12, 3, 7, 14, 16]
Calculate the total energy produced by the turbine over these 10 days, assuming it operates 24 hours each day. BT4

7. A researcher is conducting a sensitivity analysis for a hybrid renewable energy system consisting of solar panels and a wind turbine. The expected energy production can be affected by the following uncertainties:
- Solar irradiance ($\pm 10\%$ variability)
 - Wind speed ($\pm 15\%$ variability)
- Assuming the base case yields 1000 kWh from solar and 800 kWh from wind, determine how sensitive the total energy output is to these uncertainties. BT4

UNIT-III

Essay Questions:

8. Discuss the importance of Levelized Cost of Energy (LCOE) in the techno-economic analysis of renewable energy systems. How does LCOE help in comparing different energy technologies? BT3
9. Evaluate the financial metrics of renewable energy projects, such as Net Present Value (NPV), Internal Rate of Return (IRR), and Return on Investment (ROI). How do these metrics influence decision-making in project feasibility assessments? BT3
10. Conduct a detailed cost-benefit analysis of a renewable energy system of your choice. Analyze its economic feasibility by considering capital costs, operating costs, energy output, and market factors. Support your argument with relevant case studies. BT3

Short Answer Questions:

8. What is Levelized Cost of Energy (LCOE), and why is it critical in comparing renewable energy technologies? BT1
9. Define Net Present Value (NPV) and explain its significance in assessing renewable energy projects. BT2
10. How does Internal Rate of Return (IRR) help in determining the financial viability of renewable energy projects? BT2

UNIT-IV

Essay Questions:

11. Discuss the role of linear and nonlinear optimization techniques in the design and development of renewable energy systems. BT2
12. Define linear and nonlinear optimization techniques and list their applications in renewable energy systems. BT1
13. Examine the use of multi-objective optimization in renewable energy systems. BT2
14. Explain how multi-objective optimization is applied in renewable energy systems. BT1
15. Analyse the key optimization algorithms and software applications used in renewable energy system design. BT2
16. List and describe the key optimization algorithms and software applications used in renewable energy system design. BT1
17. Critically evaluate the impact of design optimization on the performance of renewable energy systems. BT3
18. Design a comprehensive strategy to implement design optimization in renewable energy systems and propose innovative approaches to enhance their performance. BT4

Problems

11. A solar energy company wants to maximize the energy output from solar panels installed on two rooftops of a building. Rooftop A can accommodate up to 100 panels, and Rooftop B can accommodate up to 150 panels. Each panel produces 300 kWh per month. The

installation cost for panels on Rooftop A is \$100 per panel, while it is \$80 per panel on Rooftop B. The company has a budget of \$12,000 for installation. Formulate the linear programming problem and find the optimal number of panels to install on each rooftop to maximize energy output. BT4

12. A wind farm is looking to place three wind turbines in a designated area to maximize energy production. The energy output from a turbine can be modeled as a nonlinear function of its height h (in meters):

$$E(h) = 5h^2 - 20h + 25$$

Determine the optimal height of each turbine to maximize energy output. BT4

13. A hybrid energy system integrates solar and wind energy sources. The objective is to minimize cost and maximize efficiency. The cost function is given by:

$$C(x, y) = 1000x + 1500y \text{ (where } x \text{ is solar capacity in kW and } y \text{ is wind capacity in kW)}$$

The efficiency function is:

$$E(x, y) = 0.9x + 0.8y$$

Use a multi-objective optimization approach to find the optimal capacities of solar and wind. BT4

UNIT-V

Essay Questions:

19. "Evaluate the impact of the Clean Air Act and the Clean Water Act on public health and the environment. How have these landmark legislations shaped environmental policies in the United States?" BT3
20. "Discuss the role of the Safe Drinking Water Act in ensuring water quality. What challenges arise in balancing the statutory goals of this Act with the economic and technical costs of implementation?" BT2
21. "How do environmental standards set by legislation such as the Clean Air Act, Clean Water Act, and Safe Drinking Water Act reflect the balance between environmental quality and economic considerations? Provide examples of how this balance is achieved or compromised." BT2

Short Answer Questions:

14. Evaluate the impact of the Clean Air Act and the Clean Water Act on public health and the environment. How have these landmark legislations shaped environmental policies in the United States? (BT3)
15. Discuss the role of the Safe Drinking Water Act in ensuring water quality. What challenges arise in balancing the statutory goals of this Act with the economic and technical costs of implementation? (BT2)
16. How do environmental standards set by the Clean Air Act, Clean Water Act, and Safe Drinking Water Act balance environmental quality and economic considerations? Provide examples of how this balance is achieved or compromised. (BT2)

Problem:

17. The Clean Air Act (CAA) and Clean Water Act (CWA) have greatly reduced pollutants, but some industries argue that stringent regulations lead to job losses and increased operational costs. How can the U.S. continue improving air and water quality while addressing economic concerns? BT4

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18.Smaller municipalities face significant challenges in complying with the Safe Drinking Water Act (SDWA) due to the high costs of infrastructure upgrades and advanced water treatment technologies. How can these communities meet drinking water standards without incurring excessive financial strain? BT4

19. While environmental standards are crucial for protecting public health, industries often face high compliance costs, which can lead to economic challenges such as job losses or increased consumer prices. How can the government strike a balance between environmental protection and economic feasibility in laws like the CAA, CWA, and SDWA? BT4

Pithapur Rajah's Government College (Autonomous), Kakinada

II B.Sc., SEMESTER-III

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 5 BLUE PRINT

Course Code: RESA24 **No. of credits:** 03 Hours/Week

Total hours: 45hrs

No. of Credits: 03

Answer **ANY THREE** questions by choosing at least one from each Section

Section	Questions to be given	Questions to be answered	Marks
A	6	3	3 x 10M = 30M
B	7	4	4 x 5 M = 20M
Total	13	7	50M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	-	15
II	1	-	1	15
III	2	-	1	25
IV	1	2	-	20
V	1	1	1	20
Total Marks				95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

COURSE 5

Course Code: RESA24 No. of credits: 03 3Hours/Week

Total hours: 45hrs

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: 2 Hours

Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks

SECTION-A

9. Essay question from UNIT- I

10. Essay question from UNIT- II

25. Essay question from UNIT- III

SECTION-B

26. Essay question from UNIT-IV

27. Essay question from UNIT-IV

28. Essay question from UNIT- V

PART-II

Answer **any Four** Questions from the following

29. Short answer question from UNIT - I

30. Short answer question from UNIT - II

31. Short answer question from UNIT - III

32. Short answer question from UNIT - III

33. Short answer question from UNIT - IV

34. Short answer question from UNIT - V

35. Short answer question from UNIT - V

	Pithapur Rajahs Government College (Autonomous) Kakinada	Program & Semester III W.e.f. 2023 - 24 ADMITTED BATCH			
Course 6 Code : RESEEP24	Sustainable Energy and Environmental protection				
Teaching	Hours Allocated: 45 (Theory)	L	T	P	C
Pre-requisites:	Different Forms of Energy.	3	0	-	3

Course - 6 Title: Sustainable Energy and Environmental protection

Total Hours: 45

Chapter 1: Energy for sustainability: (9 hours)

Energy and Civilization, Global Energy Supply and Consumption, Criteria for Sustainable Energy, The Environmental Limits of Fossil Fuels, types of mechanical energies, solar energy and solar spectrum, Some Fundamentals of Market Transformation

Chapter 2: The Challenges in crafting U.S. Energy Policy : (9 hours)

A Good Fuel for Generating Electricity, Understanding the Scale of Energy, The Function of Energy Policy, Factors Influencing U.S. Energy Use, The Threat of Climate Change, The Role of Technical Experts in Policy Making, Visible Lack of Consensus, Multiple Stakeholders.

Chapter 3: The Evolution of Environmental Policy and Politics (9 hours)

The Modern Environmental Movement and Policy Achievements, Public Opinion and the Environment, Environmental Issues in Election Campaigns, The History of U.S. Energy Policy since 1945, The Climate Change Challenge, Changing Energy Investment Strategies.

Chapter 4: Energy systems and Sustainability Metrics: (9 hours)

Introduction and Historical Notes, Life-cycle analysis, Simulation models, General indicators of sustainability, Drivers of Societal Change, Some General Principles of Sustainable Development.

Chapter 5: Environmental Protection Policy: (9 hours)

The Clean Air Act, The Clean Water Act, The Safe Drinking Water Act, Setting Environmental Standards,

Balancing Statutory Goals and Costs, Setting Quality Standard.

Reference Books:

- "Energy Policy in the U.S.: Politics, Challenges, and Prospects for Change" by Marilyn A. Brown and Benjamin K. Sovacool
- "Sustainable Energy: Choosing Among Options" by Jefferson W. Tester et al. Page-54

3. "Energy Poverty: Global Challenges and Local Solutions" by Antoine Halff et al.
4. "Energy and Human Development" by Tariq Banuri and Juliet B. Schor
5. "Climate Change and Energy Insecurity: The Challenge for Peace, Security and Development" by Felix Dodds et al.
6. "Energy for sustainability" John Randolph and Gilbert M. Masters
7. "Energy Justice: Rebalancing the Trilemma of Security, Poverty, and Climate Change" by Darren McCauley
8. "Social Policies and Programs on Sustainable Energy: Implementation and Outcomes" edited by Pedro Ramos and Manuel Pérez Henríquez
9. "Policy Instruments for Sustainable Energy Transition: A Framework for Analysis" by Ivetta Gerasimchuk et al.
10. "Energy Policy Making in the EU: Building the Agenda" by Per Olof Busch and Dominique Finon

Pithapur Rajah's Government College (Autonomous), Kakinada

II B.Sc., SEMESTER-III

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 6 BLUE PRINT

Course Code: RESEEP24 No. of credits: 03 Hours/Week Total hours: 60hrs

No. of Credits: 04

Answer **ANY THREE** questions by choosing at least one from each Section

Section	Questions to be given	Questions to be answered	Marks
A	6	3	3 x 10M = 30M
B	7	4	4 x 5 M = 20M
Total	13	7	50M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	-	15
II	1	1	1	15
III	1	2	-	20
IV	2	1	1	25
V	1	2	1	20
Total Marks				95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A),

KAKINADA II B.Sc., SEMESTER-III

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 6

Course Code: RESEEP24 No. of credits: 03 3Hours/Week Total hours: 60hrs

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: 2 $\frac{1}{2}$ Hours

Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks
SECTION-A

1. Essay question from UNIT- I
2. Essay question from UNIT- II
3. Essay question from UNIT- II

SECTION-B

4. Essay question from UNIT-III
5. Essay question from UNIT-IV
6. Essay question from UNIT- V

13. Short answer question UNIT-V

Answer **any Four** Questions from the following

7. Short answer question from UNIT - I
8. Short answer question from UNIT - II
9. Short answer question from UNIT - III
10. Short answer question from UNIT - III
11. Short answer question from UNIT - IV
12. Short answer question from UNIT - V

Course 6 : Sustainable Energy and Environmental protection Experiments

1. Identifying the energy efficient hous
 - a.) Incandescent bulb
 - b.) Fluorescent tube light
 - c.) LED bulb
 - d.) CFL bulb
2. Identifying the high energy value fu
 - a.) Petrol
 - b.) Diesel
 - c.) Coal
 - d.) Camphor
3. Study of energy investment in
 - a.)Hydro power
 - b.) Solar energy
 - c.) Wind energy
 - d.) Biomass energy
4. Air quality measurement experiment using indoor air quality mea in different conditions.
5. TDS measurement of different sources of water and identifying b
6. Identifying Simulation models for solar energy experiments
7. Identifying Simulation models for Wind energy experiments

Sustainable Energy and Environmental protection Lab

S.No	Name of the Practical	Objective	Description	Equipment required
1	Identifying the energy efficient household items	To identify the bulb which consumes less power for the same intensity of light	Study the Power consumption for incandescent bulb , CFL and Fluorescent Lamps and LED	Digital Multimeter, and Bulbs
2	Identifying the high energy value fuel	To calculate the high calorific value of different fuels	Students will identify high calorific value fuel among petrol, coal, camphor, and any other fuel.	Joule's calorimeter Mercury thermometer connecting wire and multimeter
3	Study of energy investment	To know the right investment for house hold electrical energy	Students will collect cost estimation for different types of energies like solar, wind and hydro power etc.. and will analyse the expenditure for longer period and will find out the best one.	Collect estimation forms for solar energy, wind energy and Grid
4	Air quality measurement experiment	To study the quality of air in different surroundings	Students will measure the PPM values for different surroundings and estimate its quality	PPM meter and air quality analyzer
5	TDS measurement of different sources of water	To study the TDS levels in Municipal water, RO water and dirt water	Students will collect water from Municipality and RO plants and agriculture sewage	TDS meter , test tube and water collection beaker
6	Identifying Simulation models for solar energy experiments	Perform a techno-economic analysis of a solar PV system.	Students will use software tools to perform VI characteristics and other parameters which influence the performance of a solar panel	Desktop computer for Simulation Lab
7	Identifying Simulation models for Wind energy experiments	Optimize the design of a wind turbine system.	Students will apply optimization techniques to a renewable energy system (e.g., solar PV or wind turbine) to maximize efficiency or minimize costs.	GAMS, MATLAB

	Pithapur Rajahs Government College (Autonomous) Kakinada	Program & Semester III W.e.f. 2023 - 24 ADMITTED BATCH			
Course 7 Code : REWO24	Waves and Oscillations				
Teaching	Hours Allocated: 45 (Theory)	L	T	P	C
Pre-requisites:	Different Forms of Energy.	3	0	-	3

COURSE OBJECTIVE:

This course provides students with a broad understanding of the physical principles of the oscillations, to help them develop critical thinking and quantitative reasoning skills, to empower them to think creatively and critically about scientific problems and experiments.

LEARNING OUTCOMES:

The student should be able

1. To describe the basic characteristics of waves such as frequency, wavelength, amplitude, period, and speed.
2. To utilize mathematical relationships related to wave characteristics.
3. To compare particle motion and wave motion in different types of waves.
4. To distinguish between Longitudinal and Transverse waves.
5. To get the knowledge about how to construct and analysis the square waves, saw tooth waves, etc. from Fourier analysis

UNIT-I Simple Harmonic oscillations

Simple harmonic oscillator and solution of the differential equation-Physical characteristics of SHM, torsion pendulum-measurements of rigidity modulus, compound pendulum- measurement of 'g', Principle of superposition, beats, combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies. Lissajous figures.

UNIT-II Damped and forced oscillations

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with un-damped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance and velocity resonance.

UNIT-III Complex vibrations 9hr

Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw tooth wave, simple problems on evolution of Fourier coefficients.

UNIT-IV Vibrating Strings and Bars

Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones and harmonics. Energy

transport and transverse impedance. Longitudinal vibrations in bars-wave equation and its general solution. Special cases (i) bar fixed at both ends (ii) bar fixed at the midpoint (iii) bar fixed at one end. Tuning fork.

UNIT-V Ultrasonics:

Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magneto strictive methods, detection of ultrasonics, determination of wavelength of ultrasonic waves. Applications and uses of ultrasonic waves.

REFERENCE BOOKS:

1. BSc Physics Vol.1, Telugu Academy, Hyderabad.
2. Fundamentals of Physics. Halliday/Resnick/Walker ,Wiley India Edition 2007.
3. Waves & Oscillations. S.Badami, V. Balasubramanian and K.R. Reddy, Orient Longman.
4. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
5. Science and Technology of Ultrasonics- Baldevraj, Narosa, New Delhi,2004
6. Introduction to Physics for Scientists and Engineers. F.J. Buche. McGraw Hill.

Pithapur Rajah's Government College (Autonomous), Kakinada

II B.Sc., SEMESTER-III

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 7 BLUE PRINT

Course Code: REWO24

No. of credits: 03 Hours/Week

Total hours: 60hrs

No. of Credits: 04

Answer **ANY THREE** questions by choosing at least one from each Section

Section	Questions to be given	Questions to be answered	Marks
A	6	3	3 x 10M = 30M
B	7	4	4 x 5 M = 20M
Total	13	7	50M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	-	15
II	1	-	1	15
III	1	2	-	20
IV	2	-	1	25
V	1	1	1	20
Total Marks				95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A),

KAKINADA II B.Sc., SEMESTER-III

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 7

Course Code: REWO24

No. of credits: 03

3Hours/Week

Total hours: 60hrs

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: 2 $\frac{1}{2}$ Hours

Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks

SECTION-A

- Essay question from UNIT- I
- Essay question from UNIT- II
- Essay question from UNIT- II

- Essay question from UNIT-III
- Essay question from UNIT-IV
- Essay question from UNIT- V

Answer **any Four** Questions from the following

4 X 5= 20 Marks

- Short answer question from UNIT - I
- Short answer question from UNIT - II
- Short answer question from UNIT - III
- Short answer question from UNIT - IV
- Short answer question from UNIT - V

- Problem from UNIT - I
- Problem from UNIT – III

Minimum of 6 experiments to be done and recorded

Experiments

1. Volume resonator experiment
2. Determination of 'g' by compound/bar pendulum
3. Simple pendulum normal distribution of errors-estimation of time period and the error of the mean by statistical analysis
4. Determination of the force constant of a spring by static and dynamic method.
5. Determination of the elastic constants of the material of a flat spiral spring.
6. Coupled oscillators
7. Verification of laws of vibrations of stretched string –sonometer
8. Determination of frequency of a bar –Melde's experiment.
9. Study of a damped oscillation using the torsional pendulum immersed in liquid-decay constant and damping correction of the amplitude.
10. Formation of Lissajous figures using CRO.

Scheme of Evaluation for Practicals

Time: 2hrs

Max.Marks:50

- | | |
|---|------------|
| 1. Formulae & Explanation | - 10 Marks |
| 2. Tabular form + graph + circuit diagram | -10 Marks |
| 3. Observations | - 10 Marks |
| 4. Calculation, graph, precaution and results | - 10 Marks |
| 5. Viva Voce | -5 Marks |
| 6. Record | - 5 Marks |

	Pithapur Rajahs Government College (Autonomous) Kakinada	Program & Semester III W.e.f. 2023 - 24 ADMITTED BATCH			
Course 8 Code : PH3202P	Heat and Thermodynamics				
Teaching	Hours Allocated: 45 (Theory)	L	T	P	C
Pre-requisites:	Different Forms of Energy.	3	0	-	3

COURSEOBJECTIVE:

Eunderstandingof the principles of heat and energy transfer and their applications in various fields

Learning outcomes of the Subject:

On successful completion of this course, the student will be able to:

- Understand the basic aspects of kinetic theory of gases, Maxwell-Boltzmann distribution law, equipartition of energies, mean free path of molecular collisions and the transport phenomenon in ideal gases
- Gain knowledge on the basic concepts of thermodynamics, the first and the second law of thermodynamics, the basic principles of refrigeration, the concept of entropy, the thermodynamic potentials and their physical interpretations.
- Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency
- Develop critical understanding of concept of Thermodynamic potentials, the formulation of Maxwell's equations and its applications.
- Differentiate between principles and methods to produce low temperature and liquefy air and also understand the practical applications of substances at low temperatures.
- Examine the nature of black body radiations and the basic theories.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Students would learn about Kinetic Theory of gases, Maxwell's law of distribution of molecular velocities and its experimental verification, Mean free path, Degrees of freedom, Transport phenomenon viscosity, Thermal conductivity and diffusion of gases	Understanding & Remembrance
CO2	Students would learn about Various thermodynamic processes, entropy changes in various processes and heat engines.	Application
CO3	Students would learn about various thermodynamic potentials and joule kelvin cooling concepts using thermodynamic potentials.	Analyzation
CO4	Students would learn about Blackbody and its spectral energy distribution of black body radiation, Various theories of Black body radiation, usage of various radiation measuring instruments.	Application

Skill Development		Employability		Entrepreneurship	
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CO-PO Mapping

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	3	3	1	2	2	3	2	3	2	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	1	2
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3	3
CO4	3	2	3	2	2	2	3	3	1	1	3	1	2	1

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)Kakinada.

II B.Sc., Renewable Energy-Semester – III

Course 8

Heat and Thermodynamics

Course Code: PH3202P

No. of credits: 04

w.e.f. 2020-21 ADMITTED BATCH

Hours/Week 4[Total: 60hrs.]

UNIT I: Kinetic Theory of Gases: (12 hrs.)

Kinetic Theory of gases- Introduction, Maxwell's law of distribution of molecular velocities, Mean free path, Principle of equipartition of energy, Transport phenomenon in ideal gases: viscosity and Thermal conductivity.

UNIT II: Thermodynamics: (12hrs)

Introduction- Reversible and irreversible processes, Carnot's engine and its efficiency, Carnot's theorem, Thermodynamic scale of temperature, Second law of thermodynamics Entropy: Physical significance, Change in entropy in reversible and irreversible processes; Temperature-Entropy (T-S) diagram and its uses; change of entropy when ice changes into steam.

UNIT III: Thermodynamic Potentials and Maxwell's equations: (12hrs)

Thermodynamic potentials-Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy and their significance, Derivation of Maxwell's thermodynamic relations from thermodynamic potentials, Applications to (i) Clausius- Clapeyron's equation (ii) Value of $C_p - C_v$ (iii) Value of C_p/C_v (iv) Joule- Kelvin coefficient for ideal gases

UNIT IV: Low temperature Physics:(12hrs) Methods for producing very low temperatures, Joule Kelvin effect, porous plug experiment, Joule expansion, Distinction between adiabatic and Joule Thomson expansion, Joule Thomson cooling, Production of low temperatures by adiabatic demagnetization (qualitative)

UNIT V: Quantum theory of radiation: (12 hrs.) Spectral energy distribution of black body radiation, Wein's displacement law and Rayleigh-Jean's law (No derivations), Planck's law of black body radiation-Derivation, Deduction of Wein's law and Rayleigh- Jean's law from Planck's law, Solar constant and its determination using Angstrom pyro heliometer, Estimation of surface temperature of Sun.

Reference books:

1. BSc Physics, Vol.2, Telugu Akademy, Hyderabad
2. Thermodynamics, R.C.Srivastava, S.K.Saha & Abhay K.Jain, Eastern Economy Edition.
3. Unified Physics Vol.2, Optics & Thermodynamics, Jai Prakash Nath & Co. Ltd., Meerut
4. Fundamentals of Physics. Halliday/Resnick/Walker. C. Wiley India Edition 2007
5. Heat and Thermodynamics -N BrijLal, P Subrahmanyam, S.Chand& Co.,2012
6. Heat and Thermodynamics- MS Yadav, Anmol Publications Pvt. Ltd, 2000
7. University Physics, HD Young, MW Zemansky,FW Sears, Narosa Publishers, New Delhi

Weblinks:

1. <https://ocw.mit.edu/courses/physics/8-02-physics-ii-electricity-and-magnetism-spring-2007>
2. <http://physics.bu.edu/~duffy/classroom.html>
3. <https://nptel.ac.in/courses/115/106/115106122/>

Pithapur Rajah's Government College (Autonomous), Kakinada

II B.Sc., SEMESTER-III

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 8 BLUE PRINT

Course Code: PH3202P **No. of credits:** 03 Hours/Week

Total hours: 60hrs

No. of Credits: 04

Answer **ANY THREE** questions by choosing at least one from each Section

Section	Questions to be given	Questions to be answered	Marks
A	6	3	3 x 10M = 30M
B	7	4	4 x 5 M = 20M
Total	13	7	50M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	-	15
II	1	-	1	15
III	1	2	-	20
IV	2	-	1	25
V	1	1	1	20
Total Marks				95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A),

KAKINADA II B.Sc., SEMESTER-III

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 8

Course Code: No. of credits: 03 3Hours/Week Total hours: 60hrs

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: $2\frac{1}{2}$ Hours

Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10 = 30 Marks

SECTION-A

- Essay question from UNIT- I
- Essay question from UNIT- II
- Essay question from UNIT- II
- Essay question from UNIT-III
- Essay question from UNIT-IV
- Essay question from UNIT- V

Section-B

PART-II

Answer **any Four** Questions from the following

4 X 5= 20 Marks

- Short answer question from UNIT - I
- Short answer question from UNIT - II
- Short answer question from UNIT - III
- Short answer question from UNIT - IV
- Short answer question from UNIT - V
- Problem from UNIT – I
- Problems from UNIT – V

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (III Sem) w.e.f. 2020-21 ADMITTED BATCH			
Course 8 Course Code PH3202P	Heat and Thermodynamics Lab				
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites:	Voltmeter, Ammeter, Rheostat, steam generators, Thermometer types.	0	0	2	1

Minimum of 6 experiments to be done and recorded

1. Specific heat of a liquid –Joule's calorimeter –Barton's radiation correction
2. Thermal conductivity of bad conductor-Lee's method
3. Thermal conductivity of rubber.
4. Measurement of Stefan's constant.
5. Specific heat of a liquid by applying Newton's law of cooling correction.
6. Heating efficiency of electrical kettle with varying voltages.
7. Thermo emf- thermo couple - Potentiometer
8. Thermal behavior of an electric bulb (filament/torch light bulb)
9. Measurement of Stefan's constant- emissive method
10. Study of variation of resistance with temperature - Thermistor.

	Pithapur Rajahs Government College (Autonomous) Kakinada	Program & Semester IV W.e.f. 2023 - 24 ADMITTED BATCH			
Course 09 Code : REEDC-24	ELECTRONIC DEVICES AND CIRCUITS				
Teaching	Hours Allocated: 45 (Theory)	L	T	P	C
Pre-requisites:	Different Forms of Energy.	3	0	-	3

**B.Sc. (HONOURS) RENEWABLE
ENERGY SINGLE MAJOR**

SYLLABUS UNDER CBCS

w.e.f. 2023-24 (Revised in May 2023)

SEMESTER-IV

COURSE 9: ELECTRONIC DEVICES AND CIRCUITS

Hours: 45

Credits: 3

3 hrs/week

COURSE OBJECTIVE:

The course on Electronic Devices and Circuits aims to provide students with a fundamental understanding of electronic devices and their applications in various circuits.

LEARNING OUTCOMES:

1. Understand the behavior of P-N junction diodes in forward and reverse bias conditions and analyze the impact of junction capacitance on diode characteristics.
2. Analyze and compare the characteristics and operation of different BJT configurations (CB, CE, and CC) and demonstrate proficiency in biasing techniques.
3. Comprehend the operation and characteristics of FETs, including JFETs and MOSFETs, and explain the working principles and characteristics of UJT.
4. Describe the operation and applications of various photoelectric devices such as LEDs, photo diodes, phototransistors, and LDRs.

5. Understand the operation of rectifiers (half-wave, full-wave, and bridge), analyze the ripple factor and efficiency, and demonstrate knowledge of different filter types and three-terminal voltage regulators

UNIT I: PN JUNCTION DIODES

P-N junction Diode, Formation of depletion region, Forward and Reverse bias Ideal Diode, Diode equation – Reverse saturation current – Tunnel Diode- Construction, working, V-I characteristics and Applications, Zener diode – V I characteristics, Applications

UNIT –II: BIPOLAR JUNCTION TRANSISTOR AND ITS BIASING: (D.C)

Transistor construction, working of PNP and NPN Transistors, Active, Cutoff and Saturation conditions, Configurations of Transistor - CB, CE, and CC, Input and Output Characteristics of CB and CE configurations. Hybrid parameters of a Transistor and equivalent circuit, BJT Transistor Biasing – Need for stabilization, Thermal runaway, Stability factor, Biasing methods - Voltage-Divider Bias.

UNIT-III: FIELD EFFECT TRANSISTORS & POWER ELECTRONIC DEVICES –

Difference between JFET and BJT, Construction and working of JFET, Drain and Transfer

Characteristics, MOSFET - Depletion-type, and Enhancement-Type MOSFETs. FET Biasing: Voltage Divider Biasing. UJT- Construction, working, V-I characteristics. SCR – Construction, Working and Characteristics

UNIT IV: PHOTO ELECTRIC DEVICES:

Light-Emitting Diodes (LEDs) - Construction, working, characteristics and Applications, IR Emitters, Photo diode - Construction, working characteristics and Applications, Phototransistors - Construction, working and characteristics, Applications, Structure and operation of LDR, Applications

UNIT-V: POWER SUPPLIES:

Rectifiers: Half wave, Full wave and bridge rectifiers - Efficiency (with derivations), ripple factor- Zener diode as Voltage Regulator, Filters- choke input (inductor), L-section, π -section filters. Three terminal fixed voltage IC-regulators (78XX and 79XX)

REFERENCE BOOKS:

1. Electronic Devices and Circuit Theory --- Robert L. Boylestad & Louis Nashelsky.
 2. Electronic Devices and Circuits I – T.L.Floyd- PHI Fifth Edition
- Renewable Energy BOS 2024-25

3. Integrated Electronics – Millmam & Halkias.

4. Electronic Devices & Circuits – Bogart.

5. Sedha R.S., A Text Book Of Applied Electronics, S.Chand & Company Ltd

Pithapur Rajah's Government College (Autonomous), Kakinada

II B.Sc., SEMESTER-IV

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 9 BLUE PRINT

Course Code: REEDC-24

No. of credits: 03 Hours/Week

Total hours: 60hrs

No. of Credits: 04

Answer **ANY THREE** questions by choosing at least one from each Section

Section	Questions to be given	Questions to be answered	Marks
A	6	3	3 x 10M = 30M
B	7	4	4 x 5 M = 20M
Total	13	7	50M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	-	15
II	1	-	1	15
III	1	2	-	20
IV	2	-	1	25
V	1	1	1	20
Total Marks				95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A),

KAKINADA II B.Sc., SEMESTER-IV

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 9

Course Code: REEDC-24

No. of credits: 03

3Hours/Week

Total hours: 60hrs

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: $2\frac{1}{2}$ Hours

Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks

SECTION-A

- Essay question from UNIT- I
- Essay question from UNIT- II
- Essay question from UNIT- II

- Essay question from UNIT-III
- Essay question from UNIT-IV
- Essay question from UNIT- V

Answer **any Four** Questions from the following

4 X 5= 20 Marks

- Short answer question from UNIT - I
- Short answer question from UNIT - II
- Short answer question from UNIT - III
- Short answer question from UNIT - IV
- Short answer question from UNIT - V
- Problem from UNIT - I
- Problem from UNIT – III

**B.Sc. (HONOURS) RENEWABLE
ENERGY SINGLE MAJOR**

SYLLABUS UNDER CBCS

w.e.f. 2023-24

SEMESTER-IV

PRACTICAL COURSE 9: ELECTRONIC DEVICES AND CIRCUITS

Hours: 30 Credits: 12 hrs/week

COURSE OBJECTIVE:

The course objectives for a practical course in Electronic Devices and Circuits might provide hands-on experience with the fundamental principles of electronic devices and circuits.

LEARNING OUTCOMES:

1. Understand the principles of electronic devices and circuits and their applications in real-world scenarios.
2. Analyze and design electronic circuits using diodes, transistors, and operational amplifiers.
3. Understand the importance of biasing and stability in electronic circuits and how to achieve them.
4. Develop the skills to design and analyze amplifier circuits and to understand the concept of feedback and its application in electronic circuits.
5. Analyze and design simple oscillators, power supplies, and filters.
6. Gain hands-on experience with electronic test equipment such as multimeters, oscilloscopes, and function generators.
7. Develop skills in circuit construction, measurement, and testing.
8. Learn how to troubleshoot and diagnose electronic circuit problems.
9. Understand the safety procedures for working with electronic circuits and equipment.

Minimum of 6 experiments to be done and recorded

1. V-I Characteristics of junction diode
2. V-I Characteristics of Zener diode
3. Transistor characteristics – CB configuration
4. Transistor characteristics – CE configuration
5. FET input and output characteristics
6. UJT characteristics
7. LDR characteristics
8. Full wave and Bridge rectifier with filters

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	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course-10	TITLE OF THE COURSE Solar Energy and Applications	II Year B. Sc Semester –IV			
Teaching	Hours Allocated: 45, Max.marks 50 (Theory)	L	T	P	C
Pre-requisites	Basic idea about Latitudes and Longitudes, Introduction to semiconductors, PN junction diode and its characteristics	4	-	-	4

Learning Outcomes: After successful completion of the course, the student will be able to explain skills related to call us culture through hands on experience

1. Understand testing procedures and fault analysis of thermal collectors and PV modules.
2. Comprehend applications of thermal collectors and PV modules.

COURSE OBJECTIVES

1. Learning various radiation measurements
2. Understanding various solar thermal collectors and Solar water heaters
3. Learning various types of solar cells and modules

COURSE OUTCOME

On Completion of the course, the students will be able to		cognitive domain
CO1	Understand Sun structure, forms of energy coming from the Sun and its measurement.	Understanding
CO2	Acquire a critical knowledge on the working of thermal and photovoltaic collectors	Remembering
CO3	Demonstrate skills related to callus culture through hands on experience	Applying
CO4	Understand testing procedures and fault analysis of thermal collectors and PV modules Comprehend applications of thermal collectors and PV modules.	Understanding& Analyzing

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Total Hours: 90 Instruction hours 60, (Lab, Field Training, Unit test etc. 30 Hours)

UNIT I: BASIC CONCEPTS OF SOLAR ENERGY (10HRS)

Spectral distribution of solar radiation, Solar constant, zenith angle and Air-Mass, standard time, local apparent time, equation of time, direct, diffuse and total radiations. Pyro heliometer - working principle, direct radiation measurement, Pyrometer-working Principle, diffuse radiation measurement, Distinction between the two meters.

UNIT II: SOLAR THERMAL COLLECTORS (10hrs)

Solar Thermal Collectors-Introduction, Types of Thermal collectors, Flat plate collector –liquid heating type, Energy balance equation and efficiency, Evacuated tube collector, collector overall heat loss coefficient, Definitions of collector efficiency factor, collector heat-removal factor and collector flow factor, testing of flat-plate collector, solar water heating system, natural and forced circulation types. Concentrating collectors, Solar cookers, Solar dryers, Solar desalinators.

UNIT III: FUNDAMENTALS OF SOLAR CELLS (10Hrs)

Semiconductor interface, Types, homo junction, hetero junction and Schottky barrier, advantages and drawbacks, Photovoltaic cell, equivalent circuit, output parameters, conversion efficiency, quantum efficiency, Measurement of I-V characteristics, series and shunt resistance, their effect on efficiency, Effect of light intensity, inclination and temperature on efficiency

UNIT IV: TYPES OF SOLAR CELLS AND MODULES (10hrs)

Types of solar cells, Crystalline silicon solar cells, I-V characteristics, poly-Si cells, Amorphous silicon cells, Thin film solar cells-CdTe/CdS and CuInGaSe₂/CdS cell configurations, structures, advantages and limitations, Multi junction cells – Double and triple junction cells. Module fabrication steps, Modules in series and parallel, Bypass and blocking diodes

UNIT V: SOLAR PHOTO VOLTAIC SYSTEMS (10hrs)

Energy storage in PV systems, Energy storage modes, electrochemical storage, Batteries, Primary and secondary, Solid-state battery, Molten solvent battery, lead acid battery and dry batteries, Mechanical storage – Flywheel, Electrical storage –Super capacitor

CO – PO Mapping

1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High]; ‘-’: (No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	3	3	1	2	2	3	2	3	2	2
CO2	3	2	3	3	2	3	3	1	3	3	3	2	1	3
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3	1
CO4	3	2	3	2	2	2	3	3	1	1	3	1	2	3

REFERENCES BOOKS:

1. Solar Energy Utilization by G. D. Rai Khanna Publishers
2. Solar Energy-Fundamentals, design, modeling and applications by G.N. Tiwari, Narosa Publications, 2005.
3. Solar Energy-Principles of thermal energy collection & storage by S.P. Sukhatme, Tata Mc-Graw Hill Publishers, 1999.
4. Science and Technology of Photovoltaics, P. Jayarama Reddy, CRC Press (Taylor & Francis Group), Leiden & BS Publications, Hyderabad, 2009.
5. Solar Photovoltaics-Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,

Practical (Laboratory) Syllabus: Minimum 6 practicals must be done

1. Measurement of direct radiation using pyrheliometer.
2. Measurement of global and diffuse radiation using pyranometer.
3. Evaluation of performance of a flat plate collector
4. Evaluation of solar cell / module efficiency by studying the I – V measurements.
5. Determination of series and shunt resistance of a solar cell / module.
6. Determination of efficiency of two solar cells / modules connected in series.
7. Determination of efficiency of two solar cells / modules connected in parallel.
8. Study the effect of input intensity on the performance of solar cell / module.
9. Study the influence of cell / module temperature on the efficiency.
10. Study the effect of cell / module inclination on the efficiency.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

Solar Energy and Applications

2023-24ADMITTED BATCH

Course Code: RESEA-24

No. of credits: 04

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: 2 Hrs.

Max. Marks: 50

Answer **ANY THREE** questions by choosing at least one from each Section

Section	Questions to be given	Questions to be answered	Marks
A	6	3	3 x 10M = 30M
B	7	4	4 x 5 M = 20M
Total	13	7	50M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	2	-	1	25
II	1	1	-	15
III	1	2	-	20
IV	1	2	-	20
V	1	1	-	15
Total Marks				95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

II B.Sc Renewable Energy Semester –IV (Model Paper)

Solar Energy and Applications

2023-24 ADMITTED BATCH

Time: 2hrs

Max. Marks: 50M

Note:-Set the question paper as per the blue print given at the end of this model paper.

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks

SECTION-A

1. Essay question from UNIT- I
2. Essay question from UNIT- II
3. Essay question from UNIT- II

SECTION-B

4. Essay question from UNIT-III
5. Essay question from UNIT-IV
6. Essay question from UNIT- V

PART-II

Answer **any Four** Questions from the following 4 X 5= 20 Marks

7. Problem from UNIT - I
8. Short answer question from UNIT - II
9. Short answer question from UNIT - III
10. Short answer question from UNIT - III
11. Short answer question from UNIT - IV
12. Short answer question from UNIT - IV
13. Short answer question from UNIT – V

	P.R Government College (Autonomous) Kakinada	Program & Semester II Year B. Sc Semester –IV			
Course-11 REES-24	TITLE OF THE COURSE Energy Storage Systems for Renewable Energy				
Teaching	Hours Allocated: 60, Max.marks 50 (Theory)	L	T	P	C
Pre-requisites	Flywheel, Electro chemical energy storage working principle, Charge storage device working principle	4	-	-	4

Course 11 Title: Energy Storage Systems for Renewable Energy (45 hours)

Unit 1: Introduction to Energy Storage Systems (8 hours)

Overview of energy storage importance in renewable energy systems, Principles of energy storage technologies, Types of energy storage systems: electrochemical, mechanical, thermal, etc., Comparison of energy storage technologies based on efficiency, cost, and scalability.

Unit 2: Batteries in Energy Storage (10 hours)

Fundamentals of battery technology and operation, Types of batteries used in energy storage: lead-acid, lithium-ion, flow batteries, etc., Battery management systems and safety considerations, Applications of batteries in renewable energy systems.

Unit 3: Pumped Hydro Storage and Compressed Air Energy Storage (9 hours)

Principles and operation of pumped hydro storage systems, Design considerations and efficiency of pumped hydro storage, Overview of compressed air energy storage (CAES) technology, Applications and benefits of pumped hydro and CAES in renewable energy integration

Unit 4: Flywheels and Super capacitors (7 hours)

Working principles of flywheel energy storage systems, Materials and design considerations for flywheels, Introduction to super capacitors and their advantages, Comparison of flywheels and super capacitors with other energy storage technologies

Unit 5: Grid Integration and Future Trends (11 hours)

Role of energy storage in grid stabilization and peak shaving, Challenges and opportunities in integrating energy storage into renewable energy systems, Market trends and policy implications for energy storage deployment, Emerging technologies and research directions in energy storage for renewable energy.

Reference books

1. "Energy Storage for Smart Grids: Planning and Operation for Renewable and Variable Energy Resources" by Pengwei Du and Hanchen Xu
2. "Battery Management Systems for Large Lithium-Ion Battery Packs" by Davide Andrea
3. "Pumped Storage Hydropower: A Manual of Rigorous Requirements" by Federal Energy Regulatory Commission, Office of Energy Projects
4. "Compressed Air Energy Storage: Theory, Constraints and Opportunities for Applications" by Andreas Zeiringer
5. "Flywheel Energy Storage for Dockside Technology Integration" by Joshua Vignona
6. "Supercapacitors: Materials, Systems and Applications" by François Béguin and Elzbieta Frackowia

CO – PO Mapping

7. 1: Slight [Low]; 2: Moderate [Medium]; 3:Substantial [High]; ‘-’: (NoCorrelation)

8.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	3	3	1	2	2	3	2	3	2	2
CO2	3	2	3	3	2	3	3	1	3	3	3	2	1	3
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3	1
CO4	3	2	3	2	2	2	3	3	1	1	3	1	2	3

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

Energy Storage Systems for Renewable Energy

2023-24ADMITTED BATCH

Course Code: REESS-24

No. of credits: 04

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: 2 Hrs.

Max. Marks: 50

Answer **ANY THREE** questions by choosing at least one from each Section

Section	Questions to be given	Questions to be answered	Marks
A	6	3	3 x 10M = 30M
B	7	4	4 x 5 M = 20M
Total	13	7	50M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	2	-	1	25
II	1	1	-	15
III	1	2	-	20
IV	1	2	-	20
V	1	1	-	15
Total Marks				95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

II B.Sc Renewable Energy Semester –IV (Model Paper)

Energy Storage Systems for Renewable Energy

2023-24 ADMITTED BATCH

Time: 2hrs

Max. Marks: 50M

Note:- Set the question paper as per the blue print given at the end of this model paper.

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks

SECTION-A

14. Essay question from UNIT- I
15. Essay question from UNIT- II
16. Essay question from UNIT- II

SECTION-B

17. Essay question from UNIT-III
18. Essay question from UNIT-IV
19. Essay question from UNIT- V

PART-II

Answer **any Four** Questions from the following 4 X 5= 20 Marks

20. Problem from UNIT - I
21. Short answer question from UNIT - II
22. Short answer question from UNIT - III
23. Short answer question from UNIT - III
24. Short answer question from UNIT - IV
25. Short answer question from UNIT - IV
26. Short answer question from UNIT – V

Course 11: Energy Storage Systems for Renewable Energy
List of Experiments

- 1.) Study of charge and discharge characteristics of storage battery
- 2.) Study of charging and discharging behaviour of a capacitor
- 3.) Determination of efficiency of DC-DC converter
- 4.) Study of charging characteristics of a Ni-Cd battery using solar photovoltaic panel
- 5.) Performance estimation for a fuel cell
- 6.) Study of effect of temperature on the performance of fuel cell

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course-12	TITLE OF THE COURSE Wind, Hydro and Ocean Energies	III Year B. Sc Semester –V			
Teaching	Hours Allocated: 60, Max.marks 50 (Theory)	L	T	P	C
Pre-requisites	Law of conservation of Energy, Power, torque and speed	4	-	-	4

COURSE OUTCOMES

The students will be able to:

A. Remembers and Explains in a systematic way

1. Understanding of wind resources, principles of wind conversion technologies, ocean energy sources and geothermal resources.

B. Understands and uses

2. Ability to understand production of wind, hydro, ocean and geothermal energies energy, its mechanism of production and its applications.

C. Critically explains, judges and solves

3. Draw assumptions in understanding of grid connected & off grid connected applications of wind energy ,ocean thermal energy conversion and performance analysis of thermo electric power generator.

D. Working in out of prescribed areas under a Co-curricular activity

4. Preparation of model of wind turbine and observation of environmental impacts due to usage of ocean thermal energy and geothermal energy.

E. Practical skills 5. Understanding the design of wind turbine, energy generation. Able to know the power generation from tidal plants and geothermal sources.

CO – PO Mapping

9. 1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High]; ‘-’: (No Correlation)

10.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	3	3	1	2	2	3	2	3	2	2
CO2	3	2	3	3	2	3	3	1	3	3	3	2	1	3
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3	1
CO4	3	2	3	2	2	2	3	3	1	1	3	1	2	3

UNIT-I

1. Introduction: Wind generation, meteorology of wind, world distribution of wind, wind speed variation with height, wind speed statistics, Wind energy conversion principles; General introduction; Types and classification of WECS; Power, torque and speed characteristics.

UNIT-II

2. Wind Energy Conversion System: Aerodynamic design principles; Aerodynamic theories; Axial momentum, blade element; Rotor characteristics; Maximum power coefficient.

UNIT-III

3. Wind Energy Application: Wind pumps: Performance analysis, design concept and testing; Principle of wind energy generation; Wind energy in India; Environmental Impacts of Wind farms.

UNIT-IV

4. 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.

UNIT-V

5. Ocean Thermal, Tidal and Wave Energy Systems: Ocean Thermal - Introduction, Technology process, Working principle, Electricity generation methods from OCET, Advantages and disadvantages, Applications of OTEC.

6. Tidal Energy - Introduction, Origin and nature of tidal energy, Wave Energy – Introduction, Basics of wave motion, Power in waves, Wave energy conversion devices, Advantages and disadvantages, Applications of wave energy.

Reference Books:

1. Dan Charis, Mick Sagrillo, LanWoofenden, "Power from the Wind", New Society Pub., 2009.
2. Erich Hau, "Wind Turbines-Fundamentals, 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.

Course 11: Wind, Hydro and Ocean Energies
List of Experiments

Minimum of 6 experiments to be done and recorded

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 density of water on the output power of hydroelectric generator.
6. Study the effect of wave amplitude and frequency on the wave energy generated.

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Wind, Hydro and Ocean Energies

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Marks allotted
I	2	1	25
II	1	1	15
III	1	1	15
IV	1	1	15
V	1	3	25
Total Marks= 95			

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

II B.Sc Renewable Energy Semester –IV (Model Paper)

Wind, Hydro and Ocean Energies

2023-24 ADMITTED BATCH

Time: 2hrs

Max. Marks: 50M

Note:-Set the question paper as per the blue print given at the end of this model paper.

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA
SECTION-A

1. Essay question from UNIT- I
2. Essay question from UNIT- I
3. Essay question from UNIT- II

SECTION-B

4. Essay question from UNIT-III
5. Essay question from UNIT-IV
6. Essay question from UNIT- V

PART-II

Answer **any Four** Questions from the following 4 X 5= 20 Marks

7. Short answer question from UNIT - I
8. Short answer question from UNIT- II
9. Short answer question from UNITIII
10. Short answer question from UNIT IV
11. Short answer question from UNIT V
12. Short answer question from UNIT V
13. Short answer question from UNIT - v

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA.

III B.Sc., Renewable Energy Semester -V , Paper – C12

WIND, HYDRO AND OCEAN ENERGIES (MAJOR - 1)

Question Bank (w.e.f. 2023- 24 Admitted Batch)

UNIT – I (Introduction)

Essay Questions – 10 M

1. Explain the nature of variation of wind speed with height from the ground.
2. Describe the principles of Wind energy conversions.
3. Explain types and classification of WECS.

Short Questions – 5 M

4. Write a short note on wind energy conversion
5. Classify categories of winds.
6. Explain distribution of wind around the world.

UNIT – II (Wind Energy Conversion System) Essay Questions – 10 M

7. Explain the effect of number and size of blades of a wind turbine on electric power output.
8. Explain Rotor characteristics of a wind turbine.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

Short Questions – 5 M

9. Give a brief note on aerodynamic design principle
10. Mention the role of various parts of wind turbines

UNIT – III (Wind Energy Application)

Essay Questions – 10 M

11. Explain Performance analysis and design concept of wind pumps.
12. Describe how wind pumps are testing.
13. Explain Environmental impacts of wind farms

Short Questions – 5 M

14. Discuss wind energy in India.
15. Write the principle of wind generation.

UNIT – IV (Small Hydropower Systems)

Essay Questions – 10 M

16. Describe the hydro power generation systems
17. Explain the effect of density of water on power generated by hydro power systems

Short Questions – 5 M

18. Write about micro, mini and small hydro systems
19. write a short note on site selection of pumps and turbines.

UNIT – V (Ocean Thermal Energy Systems, Tidal Energy, Wave Energy)

Essay Questions – 10 M

20. Explain the working principle of ocean thermal energy conversion
21. Discuss the electricity generation methods from OTEC.
22. What is the effect of wave amplitude and frequency on wave energy conversion systems

Short Questions – 5 M

23. Write any five applications of OTEC. .
24. Write the advantages & disadvantages of ocean thermal energy.
25. Write a brief note on tidal energy conversion
26. what is wave energy conversion
27. What are the advantages and disadvantages of wave energy
28. Discuss the applications of wave energy.

	P.R Government College (Autonomous) Kakinada	Program & Semester III Year B. Sc Semester –V			
Course-13	TITLE OF THE COURSE Biomass and Hydrogen Energies				
Teaching	Hours Allocated: 60, Max.marks 50 (Theory)	L	T	P	C
Pre-requisites	Biomass, sources of biomass, photosynthesis process	4	-	-	4

COURSE OUTCOMES

The students will be able to:

A. Remembers and Explains in a systematic way

1. Familiarity with the main sources of biomass and hydrogen energy and productivity in a quantitative manner in order to assess the effectiveness of agricultural and other biomass production systems.

B. Understands and uses

2. Have a broad knowledge of the main sources of biomass, the origins of these sources and the means by which they can be exploited for energy generation.

C. Critically explains, judges and solves

3. Able to concise and regulate the analysis of benefits and problems relating to the use of different forms of biomass and hydrogen energies.

D. Working in out of prescribed areas under a Co-curricular activity

4. Production of biogas and bio fuels

E. Practical skills

5. Have a detailed quantitative understanding of production of biogas, bio fuels and hydrogen energy.



**Pithapur Rajahs Government College (Autonomous)
Kakinada**

B.Sc. Honours

(REM): SEMESTER-V

COURSE 13: Biomass and Hydrogen Energies (QUESTION BANK)

UNIT-I Biomass Resources

Long Answer Questions

1. What is biomass? Describe its main sources and explain how it is different from fossil fuels. Give examples from your region if possible.
2. Explain the process of photosynthesis and its importance in forming biomass. How do C3 and C4 plants differ in their efficiency of photosynthesis?
3. Discuss the global and regional potential of biomass as an energy source. Use Andhra Pradesh as an example to show how agricultural residues like rice husk are used for energy.

Short Answer Questions

1. What is biomass? List its main sources and mention how it is different from fossil fuels. Give one example from Andhra Pradesh.
2. What is photosynthesis and why is it important for biomass formation? How do C3 and C4 plants differ in their photosynthetic efficiency?
3. What is the global and regional potential of biomass as an energy source? How is rice husk used for energy in Andhra Pradesh?

UNIT-II: Production of Biogas

Long Answer Questions:

4. Explain the process of biogas production, including the basic principles, sources of raw materials, and the importance of biogas as a renewable energy source.
5. Describe the main components of a typical biogas plant. Discuss the classification of biogas plants with a detailed comparison between the floating drum type, Janatha model, and Deenabandhu biogas plants.
6. Analyse the various factors that affect the generation of biogas in a plant. Discuss how environmental, operational, and feedstock-related parameters impact the efficiency and output of biogas production.
7. Discuss the properties and applications of biogas in domestic and industrial sectors. Identify common problems associated with biogas plants and outline the steps involved in the commissioning and effective management of a biogas plant.

Short Answer Questions

4. What is the basic principle of biogas production and what types of raw materials are used?
5. Name the key components of a biogas plant and compare the floating drum type, Janatha model, and Deenabandhu biogas plants.
6. List three factors that affect biogas generation and explain how one environmental, one operational, and one feedstock-related parameter impacts output.
7. State two properties and two applications of biogas, and name one common problem and one step for the effective management of a biogas plant.

Problems

1. **Calculate daily biogas production from cow dung.**

5 cows each produce 10kg dung per day. Biogas yield is 0.04m³ per kg.

Formula: Total biogas = Number of cows × dung per cow × biogas yield

- Answer: 2.0m³ of biogas is produced per day.

Page-95

2. **Calculate power available from biogas.**

Daily biogas volume = 3m^3 , methane proportion = 0.7, calorific value of methane = 28MJ/m^3 , burner efficiency = 80%.

Formula: Power = burner efficiency $\times$ methane proportion $\times$ calorific value of methane $\times$ biogas volume

- Answer: 47.04MJ per day.

3. **Calculate the volume of a biogas digester.**

Daily cow dung feed = 50kg, retention time = 20 days.

Formula: Digester volume = daily feed $\times$ retention time

- Answer: 1,000kg (or 1m^3 if using a 1:1 dung-to-water mix) is the required digester volume.

UNIT-III: Gasification and Waste to Energy

Long Answer Questions:

8. Explain the classification of gasifiers, detailing the operating principles and comparative features of fixed bed and fluidised bed gasifiers. Discuss their advantages, limitations, and applications.
9. Describe the waste-to-energy incineration process. How does it convert urban waste into usable energy and what are its environmental and operational challenges?
10. Discuss the various technological routes for energy recovery from urban waste. Evaluate the effectiveness of landfill gas and liquid waste in power generation, including processes, efficiency, and environmental impact.
11. Analyse the role of gasification and incineration technologies in modern waste management. Compare the energy outputs, sustainability, and economic implications of generating electricity from landfill gas versus liquid waste.

Short Answer Questions

8. How are gasifiers classified, and what is one difference between fixed bed and fluidised bed gasifiers?
9. What is waste-to-energy incineration and how does it convert urban waste into energy?
10. How is power generated from landfill gas and liquid waste?
11. State one advantage of electricity generation from landfill gas compared to liquid waste.

Problems

4. **Calculate the biomass consumption rate for a gasifier.**

A gasifier produces 116.6kW thermal output, operates at 70% efficiency, and uses biomass with a heating value of $17,000\text{kJ/kg}$.

What is the biomass consumption rate in kg/s?

- Answer: 0.0098kg/s

5. **Calculate the total landfill gas volume needed per day for 1MW of power generation.**

A 1MW generator requires 700m^3 of methane per hour. Landfill gas contains 50% methane. The generator runs 24 hours per day.

What total volume of landfill gas is needed per day?

- Answer: $33,600\text{m}^3/\text{day}$

6. **Calculate the annual electricity generated from liquid waste.**

If a city generates 4,400million m^3 of liquid waste per year, and each m^3 can deliver 0.1kWh of energy, how much electricity (in GWh) is generated yearly?

- Answer: 440GWh per year

UNIT-IV: Bio Fuels

Long Answer Questions:

12. Discuss the various types of biofuels, including a detailed account of the production processes of ethanol, biodiesel, and producer gas. How do their feedstocks and conversion methods differ?
13. Examine the properties and applications of major biofuels. In what ways do these properties influence the suitability of biofuels for transportation, power generation, or other uses?
14. Describe the production process and importance of E85 fuel in the context of renewable energy. How

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

does E85 compare to traditional fuels regarding environmental impact and engine performance?

15. Analyse the current scenario of biofuels in India. What policies, challenges, and opportunities exist for increasing biofuel adoption and blending in the Indian energy sector?

Short Answer Questions

12. What are the main types of biofuels and how are ethanol, biodiesel, and producer gas produced?
13. List two properties and two applications of biofuels.
14. What is E85 fuel and why is it important in renewable energy?
15. Describe the current status and challenges of biofuels in India.

Unit-V: Hydrogen Energy

Long Answer Questions:

16. Discuss the importance of hydrogen energy in the shift towards sustainable and low-carbon energy systems. How do the chemical and physical properties of hydrogen influence its potential as a fuel in various sectors?
17. Analyze the advantages and disadvantages of hydrogen as a fuel. Consider environmental, economic, and safety aspects when comparing hydrogen with conventional fossil fuels.
18. Describe the methods of hydrogen production, with a focus on electrolysis of water. How does electrolysis work and what role does it play in clean hydrogen generation?
19. Explain the main options for hydrogen storage, including the use of compressed and liquefied gas tanks. What challenges are associated with hydrogen transport and distribution, and how do these affect the applications of hydrogen energy?

Short Answer Questions

16. Why is hydrogen considered an important energy source and what are its key properties?
17. What are two advantages and two disadvantages of using hydrogen as a fuel?
18. How is hydrogen produced by electrolysis of water?
19. What are the main hydrogen storage options and what problems are faced in hydrogen transport and distribution?

20. Problems

7. **Calculate the amount of hydrogen produced by electrolysis.**

An electrolyzer operates at 417A for 1 hour. Given that 2 moles of electrons produce 1 mole of hydrogen and Faraday's constant is 96,500C/mol, calculate the number of moles and mass of hydrogen (in grams) produced.

- **Solution:** 7.78 moles or 15.56g of hydrogen.

8. **Calculate the storage capacity of a compressed hydrogen tank.**

What is the number of moles of hydrogen that can be stored in a 1,000L tank at 700bar and 298K? (Use $R = 0.08314 \text{ L} \cdot \text{bar} / \text{mol} \cdot \text{K}$)

- **Solution:** 28,253.47 moles of hydrogen.

9. **Calculate hydrogen loss during pipeline transport.**

If 1,000kg of hydrogen is transported through a 1,000km pipeline and the loss rate is 0.5% per 1,000km, how much hydrogen is lost and how much remains at the destination?

Solution: 5kg lost; 995kg remains.

CO – PO Mapping

11. 1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High]; ‘-’: (NoCorrelation)
12.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	3	3	1	2	2	3	2	3	2	2
CO2	3	2	3	3	2	3	3	1	3	3	3	2	1	3
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3	1
CO4	3	2	3	2	2	2	3	3	1	1	3	1	2	3

Biomass and Hydrogen Energies

UNIT-I:

Biomass Resources (12 Hours) Introduction to biomass - sources of biomass - photosynthesis process -biomass conversion technologies- physical method, incineration, thermo chemical and biochemical conversion properties of biomass-applications of biomass.

UNIT-II:

Production of Biogas (12 Hours) Introduction to biogas- biogas plants - main components in biogas plant-classification of biogas plants - floating drum type , Janatha model and Deenabandhu biogas plants - factors affecting generation of biogas - properties and applications of biogas-problems related to biogas plants- commissioning and management of biogas plant.

UNIT-III:

Gasification and Waste to Energy (12 Hours) Gasifiers- classification of gasifiers -fixed bed gasifiers-fluidised bed gasifiers -waste to energy incineration process- energy from urban waste- power generation from landfill gas - power generation from liquid waste.

UNIT-IV:

Bio Fuels (12 Hours) Bio fuels -types of bio fuels - production of ethanol, biodiesel and producer gas - properties and applications of bio fuels -production and importance of E85 fuel - bio fuels in Indian scenario.

Unit-V:

Hydrogen Energy (12 Hours) Importance of hydrogen energy - properties of hydrogen-advantages and disadvantages of hydrogen as fuel- production of hydrogen - electrolysis of water- hydrogen storage options- compressed and liquefied gas tanks -problems in hydrogen transport and distribution - applications of hydrogen energy.

Reference Books

1. Bio Energy Technology Thermodynamics and costs, David Boyles, Ellis Hoknood, Chichester, 1984.
2. Non-Conventional Energy Sources, G.D.Rai, Khanna Publications.
3. Non-Conventional Energy Resources, B.H. Khan, Tata Mc Graw Hill Publications.
4. Biogas Technology –a Practical Handbook, K.C. Khandelwal, S.S. Mahdi, Tata Mc Graw Hill Publications.

Topics for study project

1. Production of Biogas using different methods
2. Production of energy from solid and liquid waste
3. Production and applications of E85 FUEL
4. Production Biodiesel from Non-Edible Oil Seeds One topic should be chosen by the student for the submission of study project

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

Biomass and Hydrogen Energies

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	2	-	20
II	2	1		25
III	1	1	-	15
IV	1	1	-	15
V	1	2	-	20
Total Marks				95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

III B.Sc Renewable Energy Semester –V (Model Paper)

Biomass and Hydrogen Energies

2023-24 ADMITTED BATCH

Time: 2hrs

Max. Marks: 50M

Note:-Set the question paper as per the blue print given at the end of this model paper.

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks

SECTION-A

- 14. Essay question from UNIT- I
- 15. Essay question from UNIT- II
- 16. Essay question from UNIT- III

SECTION-B

- 17. Essay question from UNIT-IV
- 18. Essay question from UNIT-V
- 19. Essay question from UNIT- V

PART-II

Answer **any Four** Questions from the following 4 X 5= 20 Marks

- 20. Problem from UNIT - I
- 21. Short answer question from UNIT - I
- 22. Short answer question from UNIT - II
- 23. Short answer question from UNIT - III
- 24. Short answer question from UNIT - IV
- 25. Short answer question from UNIT - IV
- 26. Short answer question from UNIT – V

Course 13: Biomass and Hydrogen Energies

Topics for study project

1. Production of Biogas using different methods
2. Production of energy from solid and liquid waste
3. Production and applications of E85 FUEL
4. Production Biodiesel from Non-Edible Oil Seeds

One topic should be chosen by the student for the submission of study project

Evaluation process for project work

Dissertation preparation:30

Student presentation:10

Viva- voce : 10 Marks

	P.R Government College (Autonomous) Kakinada	Program & Semester III Year B. ScSemester -V			
Course-14	TITLE OF THE COURSE ANALOG AND DIGITAL ELECTRONICS				
Teaching	Hours Allocated: 60, Max.marks 50 (Theory)	L	T	P	C
Pre-requisites		4	-	-	4

COURSE OBJECTIVE: The course on Analog and Digital Electronics aims to provide students with a fundamental understanding of the principles of electronic circuits and their applications in both analog and digital systems.

LEARNING OUTCOMES: On successful completion of this course, the student will be able to: 1. Understand Principles and Working of Operational Amplifier 2. Apply their knowledge on OP-Amp in different Applications 3. To understand the number systems, Binary codes and Complements. 4. To understand the Boolean algebra and simplification of Boolean expressions. 5. To analyze logic processes and implement logical operations using combinational logic circuits. 6. To understand the concepts of sequential circuits and to analyze sequential systems in terms of state machines

UNIT-I: OPERATIONAL AMPLIFIERS

- a) Concept of feedback in CE amplifier, negative and positive feedback, advantages and disadvantages of negative feedback, Basic concepts of differential amplifier, Block diagram of op amp and its equivalent circuit, IC Diagram (IC 741), Ideal voltage transfer curve, Open loop Op-Amp configurations- differential, inverting and non-inverting Op-Amps. b) Voltage Series Feedback Amplifier (Non-Inverting Op amp): Gain and Bandwidth derivations: Voltage Shunt Feedback Amplifier (Inverting Op amp): Gain and Bandwidth derivations

UNIT-II: PRACTICAL OPERATIONAL AMPLIFIER AND APPLICATIONS

- a) Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Input offset voltage, Input bias current, Input offset current, total output offset voltage, CMRR, slew rate and concept of virtual ground.

- b) Applications of Op-Amp: Linear Applications: Voltage Follower, Summing Amplifier, Subtracting Amplifier, Averaging Amplifier, Difference Amplifier, Integrator and Differentiator, Square Wave response of Integrator and Differentiator (Brief explanation only)

UNIT-III: NUMBER SYSTEMS, CODES AND LOGIC GATES

- a) Number Systems and Codes: Decimal, Binary, Octal and Hexadecimal number systems, conversions, Binary addition, Binary subtraction using 1's and 2's complement methods, BCD code and Gray code Conversions
- b) Logic Gates: Construction and truth tables of OR, AND, NOT gates, Universal gates – Basic construction and truth tables of NOR & NAND, Realization of logic gates using NAND and NOR, XOR and XNOR Logic gates symbol and their truth tables. De Morgan's Laws, Boolean Laws, Simplification of Boolean Expressions using Boolean Law

UNIT-IV: ARITHMETIC CIRCUITS & DATA PROCESSING CIRCUITS

- a) Half Adder and Full Adder: Explanation of truth tables and Circuits. Half Subtractor and Full Subtractor: Explanation of truth tables and Circuits, 4 - bit binary Adder/Subtractor.
- b) Multiplexers - 2 to 1 Multiplexer, 4 to 1 multiplexer, De-multiplexers: 1 to 2 Demultiplexer, 1 to 4 Demultiplexer, Applications of Multiplexers and Demultiplexers Decoders: 1 of 2 decoders, 2 of 4 decoders, Encoders: 4 to 2 Encoder, 8 to 3 Encoder, Applications of decoders and encoders

UNIT-V: SEQUENTIAL LOGIC CIRCUITS & CODE CONVERTERS

- a) Combinational Logic vs Sequential Logic Circuits, Sequential Logic circuits: Flip-flops, Basic NAND, NOR Latches, Clocked SR Flip-flop, JK Flip-flop, D Flip-flop, Master-Slave Flip-flop, Conversion of Flip flops.
- b) Code Converters: BCD to Decimal Converter, BCD to Gray Code Converter, BCD to 7 segment Decoders

Reference Books:

1. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall
2. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011,
3. Digital Principles and Applications, A.P. Malvino, D.P. Leach and Saha, 7th Ed., TMH
4. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.

6. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)

CO – PO Mapping

1: Slight [Low]; 2: Moderate [Medium]; 3:Substantial [High]; ‘-’: (NoCorrelation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	3	3	1	2	2	3	2	3	2	2
CO2	3	2	3	3	2	3	3	1	3	3	3	2	1	3
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3	1
CO4	3	2	3	2	2	2	3	3	1	1	3	1		2

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA
C-14:ANALOG AND DIGITAL ELECTRONICS
Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	-	15
II	1	-	1	15
III	1	2	-	20
IV	2	-	1	25
V	1	1	1	20
Total Marks				95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

III B.Sc PHYSICS QUESTION BANK
UNIT – I: OPERATIONAL AMPLIFIERS

Essay Questions

1. Explain the concept of feedback in CE amplifier. Distinguish between negative and positive feedback.
2. Explain the block diagram and equivalent circuit of an operational amplifier.
3. Describe open-loop op-amp configurations: inverting, and non-inverting amplifiers with neat diagrams.

Short Answer Questions

1. Define positive and negative feedback.
2. What is the basic concept of a differential amplifier?
3. Draw the IC 741 pin diagram and give brief explanation
4. Derive gain relation for non-inverting op-amp.
5. Derive gain relation for inverting op-amp.

UNIT – II: PRACTICAL OPERATIONAL AMPLIFIER & APPLICATIONS

Essay Questions

1. Explain the characteristics of an ideal and practical op-amp (IC 741).
2. Explain the working of an OP-AMP as adder
3. Explain in detail the applications of op-amp as integrator and differentiator.

Short Answer Questions

1. In a subtractor circuit $R_1=10K\Omega$, $R_f = 20K\Omega$, $V_1 = 5V$ and $V_2 = 10V$. Find the value of output voltage
2. An inverting amplifier has $R_1=10K\Omega$ and $R_f = 150K\Omega$. Find the output voltage, Also the input resistance and the input current for an input voltage of 1V.
3. What is meant by virtual ground in an op-amp?
4. Explain the working of an OP-AMP as Voltage follower
5. Explain the working of an OP-AMP as integrator

UNIT – III: NUMBER SYSTEMS, CODES & LOGIC GATES

Essay Questions

1. State and Explain De Morgan's laws
1. Explain BCD and Gray code with conversions.
2. With neat diagrams, explain construction and truth tables of logic gates (AND, OR, NOT, NAND, NOR, XOR).

Short Answer Questions

1. Convert $(245)_{10}$ into binary and octal systems
2. Add $(110110)_2 + (101101)_2$ and verify
3. Subtract $(101011)_2$ from $(110010)_2$ using 2's complement method.
4. Draw the truth table of XOR gate.
5. Realize the NAND gate as an Universal gate

UNIT – IV: ARITHMETIC CIRCUITS & DATA PROCESSING CIRCUITS

Essay Questions

1. Explain the working of Half Adder and Full Adder with truth tables
2. Explain the working of 2-to-1 and 4-to-1 multiplexers
3. Explain the working of 4-to-2 and 8-to-3 Encoder
4. Explain the working of 1-to-2 and 1-to-4 De multiplexers

Short Answer Questions

1. Write the truth table of a Half Adder.
2. Explain 4-bit binary Adder with neat diagram
3. Write the truth table of a Half Subtractor.
4. Draw the circuit of a 1-to-2 Decoder.
5. Give any five applications of Multiplexer.

UNIT – V: SEQUENTIAL LOGIC CIRCUITS & CODE CONVERTERS

Essay Questions

1. Explain the working of JK Flip-Flop with truth table and diagram.
2. Explain Master-Slave Flip-Flop with circuit and truth table.
3. Explain BCD to 7-segment display code conversion.

Short Answer Questions

1. Write the truth table of an SR latch.
2. Draw the circuit of a D Flip-Flop.
3. Explain the conversion of JK to D Flip-Flop.
4. Explain the working of BCD to Gray code converter
5. Draw the block diagram of BCD to Decimal Converter.

III B.Sc Renewable Energy Semester –IV (Model Paper)

ANALOG AND DIGITAL ELECTRONICS

2023-24 ADMITTED BATCH

Time: 2hrs

Max. Marks: 50M

Note:- Set the question paper as per the blue print given at the end of this model paper.

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10 = 30 Marks

SECTION-A

1. Essay question from UNIT- I

2. Essay question from UNIT- II

3. Essay question from UNIT- III

SECTION-B

4. Essay question from UNIT-IV

5. Essay question from UNIT-IV

6. Essay question from UNIT- V

PART-II

Answer **any Four** Questions from the following 4 X 5= 20 Marks

7. Problem from UNIT - I

8. Short answer question from UNIT - III

9. Short answer question from UNIT - III

10. Short answer question from UNIT - V

11. Problem from UNIT - II

12. Problem from UNIT - IV

13. Problem from UNIT – V

Course 14: List of Experiments

ANALOG AND DIGITAL ELECTRONICS

2023-24 ADMITTED BATCH

Minimum of 6 experiments to be done and recorded

1. To study the operational amplifier as inverting feedback amplifier with verifying gain
2. To study the operational amplifier as non-inverting feedback amplifier with verifying gain
3. To study operational amplifier as adder
4. To study operational amplifier as subtractor
5. To study operational amplifier as differentiator
6. To study operational amplifier as integrator
7. Logic Gates- OR, AND, NOT and NAND gates. Verification of Truth Tables.
8. Verification of De Morgan's Theorems.
9. Construction of Half adder and Full adders-Verification of truth tables
10. Flip flops
11. Multiplexer and De-multiplexer
12. Encoder and Decoder

	P.R Government College (Autonomous) Kakinada	Program & Semester III Year B. ScSemester -V			
Course-15	TITLE OF THE COURSE ENERGY MANAGEMENT AND AUDITING				
Teaching	Hours Allocated: 45, Max.marks 50 (Theory)	L	T	P	C
Pre-requisites	Voltage, Current, Resistors, Capacitors, Power, Ohm's Law, Power factor	3	-	-	3

UNIT-I

ENERGY SCENARIO: Indian Energy Scenario, Long term energy goals, Energy security, Energy conservation and its importance, Energy strategy for future, Energy conservation act 2001 and its features, Bureau of energy efficiency (BEE), Electricity act 2003.

UNIT-II

THERMAL ENERGYMANAGEMENT: boilers – Types and Classification of boilers, Performance Evaluation of boilers, Parameters for selection of boilers; Furnaces – Types and classification of furnaces, Performance analysis of typical furnace system, Furnace waste heat recovery.

Unit-III

ELECTRICAL ENERGY MANAGEMENT: Transformers energy conservation techniques, Energy conservation in transmission line, Energy conservation in distribution line, Energy conservation in lighting system, monitoring motors, Energy-efficiency improvement opportunities in electric motors, Fans and Blowers.

UNIT- IV

Building energy management and Instruments: Factors effecting climate, EC-Act-2021 Building code, Energy conservation measures, Commercial, Industrial buildings, Residential buildings. Energy auditing instruments – Wattmeter, Luxmeter, Pyranometer, Anemometer, IR Thermometer.

UNIT-V(12hrs)

ENERGY AUDIT: Introduction, Types of energy audit, Steps for conducting energy Audit, Data collection hints, Case study – Tata Energy.

Reference Books:

1. Energy conservation and Management – Dr. Akshay, A. Pujara, BIP (2013) pp: 1.11-1.44
2. Energy Conservation – S. C. Bhatia, Sarvesh Devaraj, WPI (2016)
3. Energy Conservation – S. C. Bhatia, Sarvesh Devaraj, WPI (2016)

4. Energy management – Anil kumaret. Al. CRC Press (2020)

5. Energy Conservation – S. C. Bhatia, Sarvesh Devaraj, WPI (2016) pp. 331-340, 346-350.

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1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High]; '-': (No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	3	3	1	2	2	3	2	3	2	2
CO2	3	2	3	3	2	3	3	1	3	3	3	2	1	3
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3	1
CO4	3	2	3	2	2	2	3	3	1	1	3	1	2	3

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA
C-15: ENERGY MANAGEMENT AND AUDITING
Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	-	15
II	1	1	1	20
III	2	1	-	25
IV	1	1	1	20
V	1	-	1	15
Total Marks				95

$$\text{Percentage of Choice} = \frac{(95 - 50)}{95} \times 100 = \frac{45}{95} \times 100 = 47\%$$

III B.Sc Renewable Energy Semester –IV (Model Paper)

ENERGY MANAGEMENT AND AUDITING

2023-24 ADMITTED BATCH

Time: 2hrs

Max. Marks: 50M

Note:-Set the question paper as per the blue print given at the end of this model paper.

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks

SECTION-A

- 27. Essay question from UNIT- I
- 28. Essay question from UNIT- II
- 29. Essay question from UNIT- III

SECTION-B

- 30. Essay question from UNIT-III
- 31. Essay question from UNIT-IV
- 32. Essay question from UNIT- V

PART-II

Answer **any Four** Questions from the following

4 X 5= 20 Marks

- 1. Problem from UNIT - I
- 2. Short answer question from UNIT - II
- 3. Short answer question from UNIT - III
- 4. Short answer question from UNIT - IV
- 5. Problem from UNIT - II
- 6. Problem from UNIT - IV
- 7. Problem from UNIT – V

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

III B.Sc., SEMESTER-V PAPER C15

(Model Paper)

Energy Management and Auditing

w.e.f.2023 – 24 Admitted Batch

Course Code:

No. of credits: 03

Note: -Set the question paper as per the blue print given at the end of this model paper.

Time: 2 Hours

Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question from each section 3 X 10= 30 Marks

SECTION-A

1. Discuss the present Indian energy scenario, highlighting major energy sources, consumption patterns, and challenges.
2. What is a Boiler? Classify boilers and explain any two types in detail.
3. Elaborate on achieving energy efficient lighting systems.

SECTION-B

4. Explain energy-saving techniques in fans and blowers.
5. Explain the Energy Conservation measures to be followed for Industrial Buildings.
6. Define energy audit. Explain the different types of energy audit.

PART-II

Answer **any Four** Questions from the following 4 X 5= 20 Marks

7. What is the role and initiatives of the Bureau of Energy Efficiency (BEE)?
8. Classify furnaces and explain various types of furnaces.
9. Throw light on the energy efficiency improvement opportunities in electric motors.
10. State the uses of Wattmeter and Luxmeter.
11. Measured losses for a boiler (percent of fuel energy): dry flue gas = **20%**, moisture in fuel = **1.8%**, radiation & convection = **2%**, unburnt carbon = **1.2%**, blowdown = **0.6%**. Find the boiler efficiency by the indirect method.
12. A site receives **5.4 MJ·m⁻²** over **3 h**. Find the **average irradiance**.
13. A 100 W incandescent lamp is replaced by a 20 W LED lamp. Both operate for 5 hours daily. Calculate monthly energy savings (30 days).

B.Sc. Honours (REM): SEMESTER-V

COURSE 15: ENERGY MANAGEMENT AND AUDITING (QUESTION BANK)

NIT-I Energy Scenario

Long Answer Questions

1. Discuss the present Indian energy scenario, highlighting major energy sources, consumption patterns, and challenges.
2. Discuss India's energy strategy for the future. Suggest measures to achieve sustainable and secure energy growth.
3. What is the importance of energy conservation in India? Explain the objectives, provisions, and key features of the Energy Conservation Act, 2001.

Short Answer Questions

4. What is the role and initiatives of the Bureau of Energy Efficiency (BEE)?
5. What are the objectives and recommendations of the Integrated Energy Policy?
6. What is the main objective of the Electricity Act, 2003?
7. Define Energy Security. Explain India's long-term energy goals and strategies to achieve energy security in India.

NIT-II: Thermal Energy Management

Long Answer Questions:

1. What is a Boiler? Classify boilers and explain any two types in detail.
2. Explain the performance evaluation of boilers with relevant formulas and also State the parameters to be considered in the selection of a boiler.
3. Sketch the construction of a typical industrial furnace and explain its working.

Short Answer Questions

4. Classify furnaces and explain various types of furnaces.
5. Explain the performance analysis of a typical furnace.
6. Give two methods for waste heat recovery.

Problems

1. A boiler produces **10 t/h** of saturated steam at **12 bar**. Feedwater temperature = **60°C**. Use $h_{g@12\text{bar}}=2790 \text{ kJ/kg}$, $h_{fw@60^\circ\text{C}}=251.1 \text{ kJ/kg}$. Fuel burned = **900 kg/h**, GCV = **42,000 kJ/kg**. Compute the boiler thermal efficiency (direct method).

Formula: Boiler thermal efficiency = $Q_{\text{out}}/Q_{\text{in}} \times 100$

Answer: $\approx 67.17\%$

. Measured losses for a boiler (percent of fuel energy): dry flue gas = **20%**, moisture in fuel = **1.8%**, radiation & convection = **2%**, unburnt carbon = **1.2%**, blowdown = **0.6%**. Find the boiler efficiency by the direct method.

Formula: efficiency = $100\% - (\text{sum of all percentage losses})$

Answer: 74.4%

. A reheating furnace must supply 5 MW to the load. Fuel = natural gas, fuel flow = 0.15 kg/s, GCV = 0,000 kJ/kg. Calculate furnace thermal efficiency (%) defined as useful heat delivered/ fuel energy input.

Formula: Thermal efficiency = $Q_{\text{out}}/Q_{\text{in}} \times 100$

Answer: $\approx 66.7\%$

NIT-III: Electrical Energy Management

Long Answer Questions:

1. Discuss energy conservation techniques in transformers.
2. Elaborate on achieving energy efficient lighting systems.

3. Explain energy saving techniques in fans and blowers.
4. Discuss the causes of losses in transformers and methods to reduce them.

Short Answer Questions

5. Identify the measures to improve efficiency in distribution systems.
6. Discuss the importance of monitoring motors.
7. Throw light on the energy efficiency improvement opportunities in electric motors.

NIT-IV: Building Energy Management and Instruments

Long Answer Questions:

1. Explain the EC Act 2021 Building Code and its importance in energy conservation.
2. Differentiate between the Energy Conservation measures suggested for Commercial vs Residential Buildings.
3. Explain the Energy Conservation measures to be followed for Industrial Buildings.
4. Discuss the working principle and uses of a Pyranometer or an Anemometer.

Short Answer Questions:

5. Discuss the factors affecting climate and their influence on building energy needs.
6. Describe the working principle and uses of a Wattmeter.
7. State the uses of IR Thermometer and Luxmeter.

Problems

- . A site receives **5.4 MJ·m⁻²** over **3 h**. Find the **average irradiance**.

Formula: Average Irradiance $E = \text{Energy} / \text{Time}$

Answer: 500 W·m⁻²

- . A cup anemometer makes **200 rotations in 50 seconds**. The calibration factor is **0.1 m/s per rotation per second**. Find the wind speed.

Formula: Wind speed = rps x calibration factor

Answer: 0.4 m/s

- . A classroom has an illuminance of **300 lux** on desks. If the working plane area is **20 m²**, find the total luminous flux incident.

Formula: Luminous flux, $\Phi = E \times A$

Answer: 6000 lumens.

NIT-V: Energy Audit

Long Answer Questions:

- . Define energy audit. Explain the different types of energy audit.
- . Describe the steps involved in conducting an energy audit.
- . Discuss the case study of Tata Energy audit and its findings.

Short Answer Questions:

- . List some data collection hints for an energy audit.
- . Explain the role of energy auditors in industry.

Problems

- . A room has 20 lamps of 40 W each, used for 6 hours per day. Calculate daily energy consumption in Wh.

Formula: No. of lamps x energy consumption of each x time.

Answer: 4.8 kWh

- . A motor runs at 5 kW input for 10 hours a day. Calculate its daily energy consumption.

Formula: Energy = Power x Time

Answer: 50 kWh

- . A 100 W incandescent lamp is replaced by a 20 W LED lamp. Both operate for 5 hours daily. Calculate

ENERGY MANAGEMENT AND AUDITING

2023-24 ADMITTED BATCH

Topics for study project

Domestic Energy Audit (Individually at home)

Along with this any one of the following projects of your own interest

1. Staff Room Energy Audit
2. Lab Energy Audit
3. Class Room Energy Audit in Physics Block.

Evaluation process for project work

Dissertation

preparation:30

Student

presentation:10

Viva- voce : 10

Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(AUTONOMOUS), KAKINADA
DEPARTMENT OF PHYSICS AND ELECTRONICS

Additions & Deletions
SEM II RENEWABLE ENERGY (MAJOR)

Course – 3
For the Academic Year 2025-26

S.No	Topics		Unit	Justification
	Deleted	Added		
1.	Commercial-Non- commercial Energy sources	Nil	I	Vast number of energy sources specified
2.	Ecological Foot print	Nil	I	Vast number of different types of footprints are given

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(AUTONOMOUS), KAKINADA
DEPARTMENT OF PHYSICS AND ELECTRONICS

Additions & Deletions
SEM II RENEWABLE ENERGY (MAJOR)

Course – 4
For the Academic Year 2025-26

S.No	Topics		Unit	Justification
	Deleted	Added		
1.	nuclear power generation	Nil	V	Radio activity and Nuclear power separate unit is dedicated for this purpose
2.	hydroelectric power	Nil	V	Hydro power topics are present in a separate unit

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(AUTONOMOUS), KAKINADA
DEPARTMENT OF PHYSICS AND ELECTRONICS

Percentage of Syllabi included/ Excluded – 2024-25

SI No.	Title of the Paper	% of change
1.	Renewable Energy resources-1	10
2.	Renewable Energy resources -2	10

KAKINADA LIST OF EXAMINERS/ PAPER SETTERS IN PHYSICS Page-117
2025-2026

S.No.	Name of the examiner	Subject	Name of the College
1	L. Malleswara Rao 9985137973	Physics	Y.N.College, Narsapur
2.	B,Lakshmana Rao	Physics	Govt. College (A), RJY
3	Dr.K .Srilatha	Physics	St.Theresa College (W), Eluru
4	K.AnandaRao	Physics	C.R.R. College (M), Eluru
5	K.B.S.Gopal	Physics	C.R.R. College (M),Eluru
7	N.Sudhakar	Physics	K.G.R.L.College , Bhimavaram
8	V.Mounika	Physics	K.G.R.L.College , Bhimavaram
9	ValluriSrinivasaRao	Physics	Govt. College (W) Nidadavolu
10	K.Venkateswa Rao	Physics	Govt. College, Eleswaram
11	EsubBasha Sheik	Physics	Govt. College (A), RJY
12	Ch.Ch.Srenivasu	Physics	Govt. College (A), RJY
13	K.Ganesh Kumar	Physics	Govt. College , Ganapavaram
14	M.Sudhadhar	Physics	Govt. College (A), Tuni
15	B.Durga Lakshmi	Physics	Govt. College (A), RJY
16	P. Rama Krishna Rao	Physics	Y.N. College (A), Narasapur
17	D. Gangadharudu	Physics	M.R. College, Peddapuram
18	Smt. M. Satyavani	Physics	D.N.R. College (A), Bhimavaram
19	M.V.S. Prasad	Physics	D.N.R. College (A), Bhimavaram
20	Smt. N. Udaya Sri	Physics	D.N.R. College (A), Bhimavaram
21	A. Veeraiah	Physics	D.N.R. College (A), Bhimavaram
22	N. Srinivasarao	Physics	Govt. College , Tadepalligudem
23	Dr.K.Srinivasa Rao	Physics	GDC, Mandapeta
24	B.Sreekanth	Physics	GDC, Mandapeta
25	Dr.Y.N.Ch.Ravi Babu	Physics	GDC, Avanigadda
26	Dr.P.B.sandhya Sri	Physics	GDC, Avanigadda
27	Dr.N.Krishna Mohan	Physics	GDC, Movva

PITHAPUR RAJAH'S GOVERNMENT COLLEGE [A]:: KAKINADA
PLAN OF ACTION FOR AY 2025-26

The department of Physics and Electronics is planning to conduct the following programs for the academic year 2025-26

S.No	Activity planned	Dates/Period
1	Distribution of Kasarabada Scholarship both for UG & PG Students	18-07-2025
2	Zero shadow day	05-08-2025
3	Independence Day Competitions for II & III year Physics & REM students	06-08-2025
4	Hiroshima Day	06-08-2025
5	BOS	07-08-2025
6	Nagasaki day	09-08-2025
7	Number of Publications for each faculty @ 2	01-08-2025 to 07-10-2025
8	Patent-1	01-08-2025 to 07-10-2025
9	MOU	01-08-2025 to 07-10-2025
10	Guest Lecture-1	09-09-2025
11	Michel Faraday Birthday Celebrations	22-09-2025
12	C.V. Raman Birthday Celebrations	07-11-2025
13	Workshop/webinar	17-11-2025 to 31-01-2026
14	Guest Lecture-2	09-12-2025
15	Parent-Teacher Meeting	1-12-2025 to 31-12-2025
16	UPKAR scheme – Disbursement of scholarships to Poor & merit students	1-12-2025 to 31-12-2025
17	Fieldtrip for III Physics students	1-01-2026 to 31-01-2026
18	Fieldtrip for III REM	1-01-2026 to 31-01-2026
19	Certificate course	1-01-2026 to 31-01-2026
20	National Science Day celebrations	28-02-2026

P. R. GOVERNMENT COLLEGE (A), KAKINADA Department of Physics & Electronics

Budget Proposal for the Academic Year 2025-26

S.No.	PURPOSE	EXPENDITURE ESTIMATED	REMARKS
1.	Upgradation of 1 st year Lab	Rs. 1,00,000=00	
2.	Upgradation of 2 nd year Lab and dark room	Rs. 1,00,000=00	
3.	Upgradation of final year Lab	Rs1,00,000=00	
4.	Requirement of Lab Equipment for V-SEM papers	Rs. 1,00,000=00	
5.	Research Materials and Characterization Devices for Research lab	Rs. 3,00,000=00	
6.	Student projects/Educational Tour	Rs. 1,00,000=00	
7.	National level Activity	Rs. 1,50,000=00	
8.	Departmental Activities@ National Sc.Day, Guest Lectures, Inter collegiate competitions	Rs.1,00,000=00	
9.	Miscellaneous@Stationery,Maintenance of Laboratories etc.	Rs. 50,000=00	
TOTAL:		Rs. 11,00,000=00	

Budget Estimated Rupees Eleven Lakhs only.

ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

Assessment methodology for Internships / On the Job Training / Apprenticeship under the revised CBCS (2020 – 21 onwards)

First internship (After 1st year examinations): Community Service Project

To inculcate social responsibility and compassionate commitment among the students, the summer vacation in the intervening 1st and 2nd years of study shall be for Community Service Project.

Learning outcomes:

- To facilitate an understanding of the issues that confronts the vulnerable /marginalized sections of the society.
- To initiate team processes with the student groups for societal change.
- To provide students an opportunity to familiarize themselves with urban / rural community they live in.
- To enable students to engage in the development of the community.
- To plan activities based on the focused groups.
- To know the ways of transforming the society through systematic programme implementation.

Assessment Model:

There will be only internal evaluation for this internship. Each faculty member is to be assigned with 10 to 15 students depending upon availability of the faculty members. The faculty member will act as a faculty-mentor for the group and is in-charge for the learning activities of the students and also for the comprehensive and continuous assessment of the students.

The assessment is to be conducted for 100 marks. The number of credits assigned is 4. Later as per the present practice the marks are converted into grades and grade points to include finally in the SGPA and CGPA.

Each student is required to maintain an individual logbook, where he/she is supposed to record day to day activities. The project log is assessed on an individual basis, thus allowing for individual members within groups to be assessed this way. The assessment will take into consideration the individual student's involvement in the assigned work.

While grading the student's performance, using the student's project log, the following should be taken into account -

- a. The individual student's effort and commitment.
- b. The originality and quality of the work produced by the individual student.
- c. The student's integration and co-operation with the work assigned.
- d. The completeness of the logbook.

The assessment for the **Community Service Project implementation** shall include the following components and based on the entries of Project Log and Project Report:

- a. Orientation to the community development
- b. Conducting a baseline assessment of development needs
- c. Number and Quality of Awareness Programmes organised on beneficiary programmes and improvement in quality of life, environment and social consciousness, motivation and leadership, personality development, etc.
- d. Number Quality and Duration of Intervention/service Programmes (Prevention or promotion programs that aim to promote behavioural change in defined community contexts to address social problems) organised.
- e. Follow up Programmes suggested (Referral Services, Bringing Community Participation)
- f. Developing short and mid-term action plans in consultation with local leadership and local government officers.

The **Project Report** should contain

- a) Introduction, scope, objectives, and methodology
- b) Project specifications (area / background of the work assigned).
- c) Problems identified.
- d) Analyses of the problems
- e) Community awareness programmes conducted w.r.t the problems and their outcomes.
- f) Intervention/service programmes taken up
- g) Short-term and long term action plan for implementation
- h) Recommendations and conclusions.
- i) References

The **Project Presentation** is to be made by the student after he/she reports back to the College. The components for assessment are –

- assessing the involvement in the project
- presentation skills
- final outcome of the project as evinced by the student.

For Example:

II REM

S.No.	Name of the Student	Class & Year of Study	Register Number	Project Log	Project Implementation	Project Report	Presentation	Total
				(20)	(30)	(25)	(25)	(100)

**Signature of
Project Mentor**

**Signature of
Nominated faculty**

**Signature of
HOD/ In-Charge**

ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

Assessment methodology for Internships / On the Job Training / Apprenticeship under the revised CBCS (2020 – 21 onwards)

Second Internship (After 2nd year examinations): Apprenticeship / Internship / On the job training / In-house Project / Off-site Project

To make the students employable, an Apprenticeship / Internship / On the job training / In-house Project / Off-site Project shall be undertaken by the students in the intervening summer vacation between the 2nd and 3rd years.

Learning outcomes

- Explore career alternatives prior to graduation.
- Integrate theory and practice.
- Assess interests and abilities in their field of study.
- Learn to appreciate work and its function towards future .
- Develop work habits and attitudes necessary for job success.
- Develop communication, interpersonal and other critical skills in the future job.
- Build a record of work experience.
- Acquire employment contacts leading directly to a full-time job following graduation from college.
- Acquire additional skills required for world of work.

Assessment Model

There will be only internal evaluation for this internship. Each faculty member is to be assigned with 10 to 15 students depending upon availability of the faculty members. The faculty member will act as a faculty-mentor for the group and is in- charge for the learning activities of the students and also for the comprehensive and continuous assessment of the students.

The assessment is to be conducted for 100 marks and the credits assigned are 4. Later as per the present practice the marks are converted into grades and grade points to include finally in the SGPA and CGPA.

The weightings shall be:

Project Log	20%
Project Implementation	30%
Project report	25%,
Presentation	25%

Each student is required to maintain an individual logbook, where he/she is supposed to record day to day activities. The project log is assessed on an individual basis, thus allowing for individual members within groups to be assessed this way. The assessment will take into consideration the individual student's involvement in the assigned work.

While grading the student's performance, using the student's project log, the following should be taken into account -

- The individual student's effort and commitment.
- The originality and quality of the work produced by the individual student.
- The student's integration and co-operation with the work assigned.
- The completeness of the logbook.

The assessment for Project Implementation during **second internship / Project Work / On the Job Training / Apprenticeship** shall include the following components and based on the entries of Project Log and Project Report:

- Involvement in the work assigned
- Regularity in the work assigned
- New knowledge acquired
- New skill acquired

The Project Report should contain

- Introduction.
- Project specifications (area / background of the work assigned).
- Problems taken up.
- Analysis of the problem.
- Recommendations and conclusions.

The Project Presentation is to be made by the student after he/she reports back to the College. The components for assessment are –

- assessing the involvement in the project
- presentation skills
- final outcome of the project as evinced by the student.

For Example:

I REM-MAJOR

S.No.	Name of the Student	Class & Year of Study	Register Number	Project Log	Project Implementation	Project Report	Presentation	Total
				(20)	(30)	(25)	(25)	(100)

Signature of
Project Mentor

Signature of
Nominated faculty

Signature of
HOD/ In-Charge

ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

Assessment methodology for Internships / On the Job Training / Apprenticeship under the revised CBCS (2020 – 21 onwards)

Third internship/Apprenticeship (5th/6th Semester period):

During the entire 5th /6th Semester, the student shall undergo Apprenticeship / Internship / On the Job Training. This is to ensure that the students develop hands on technical skills which will be of great help in facing the world of work.

Learning outcomes

- Explore career alternatives prior to graduation.
- Integrate theory and practice.
- Assess interests and abilities in their field of study.
- Learn to appreciate work and its function towards future .
- Develop work habits and attitudes necessary for job success.
- Develop communication, interpersonal and other critical skills in the future job.
- Build a record of work experience.
- Acquire employment contacts leading directly to a full-time job following graduation from college.
- Acquire additional skills required for world of work.

Assessment model for the semester long apprenticeship / on the job training /internships during the V/VI Semester:

The assessment for the V / VI Semester long apprenticeship is for 200 marks and credits assigned are 12.

A monthly report is to be submitted to the teacher guide online within 15 days after the completion of the every month upto four months. The last two months of internship period shall be used for preparation of final project report simultaneously undergoing on the job training / internship / apprenticeship.

The assessment for this internship / on the job training will be both internal and external assessment. The internal assessment will be for 25% of marks which will be continuous and the assessment by

the industry / enterprise / organization where the student does his/her internship will be indicated in grades. This assessment is to be conducted by a responsible person (General Manager / HR Manager / Head of the Division) in consultation with the supervisor under whom the internship was done.

The components of internal assessment during *this **third internship / Project Work / On the Job Training / Apprenticeship*** shall include the following components and based on the entries of Project Log and Project Report:

- a. Involvement in the work assigned
- b. Regularity in the work assigned
- c. New knowledge acquired
- d. New skill acquired

The Project Report should contain

- a. Introduction.
- b. Project specifications (area / background of the work assigned).
- c. Problems taken up.
- d. Analysis of the problem.
- e. Recommendations and conclusions.

The Project Presentation is to be made by the student after he/she reports back to the College. The components for assessment are –

- a. assessing the involvement in the project
- b. presentation skills
- c. final outcome of the project as evinced by the student.

There shall be a final evaluation committee comprising of Principal, Teacher Guide, Internal Expert and External Expert nominated by the affiliating University. The final evaluation committee shall consider the following for evaluation –

- A. Monthly Reports submitted by the student
- B. Final Project Report
- C. Grading given by the Company / Business unit / Enterprise where the student has undergone the training. The grades shall be converted into marks on the scale followed by the University.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

To evaluate and award marks, the Committee conducts viva voce examination at the college.

Example:

Name of the Student:	
Class & Year of Study	
Registered Number	
Internal Assessment Component	Max. Marks
1. Project Log	10
2. Project Implementation	20
3. Project Report	10
4. Presentation	10
TOTAL	50
External Assessment Component	Max. Marks
Performance Assessment by the Evaluation Committee, converting the grades awarded by the industry, enterprise, etc.	100
External Viva Voce	50
GRAND TOTAL	200