PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

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

Board of Studies Meeting for UG Programmes

PHYSICS (Major/Minor)

2025 – 2026

DEPARTMENT OF PHYSICS & ELECTRONICS

DEPARTMENT OF PHYSICS & ELECTRONICS

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PROCEEDINGS OF THE PRINCIPAL, PITHAPUR RAJAH's GOVT. COLLEGE [A] :: KAKINADA

Present: Dr. K. ANJANEYULU M.A., Ph.D.

.No.2/A.C/BOS/2025-26 Dt.01-07-2025

Sub: P.R.G.C[A] – Academic Cell - **Conduct of BOS Meetings for the Academic Year 2025-26** – Guidelines issued - Regarding.

The Autonomous colleges are, as per its vision, mission, stated objectives and core values, mandated to design and develop their own outcome -based curricula keeping in view the societal, local and global industry requirements, employability and industry – ready and transferable skills duly prescribing Course Outcomes (COs), Program Outcomes (POs) and Program Specific Outcomes (PSOs) and suitable learning outcome assessment management system through robust and transparent evaluation system to measure their attainment levels by the students.

The Sustained Developmental Goals (SDG-4) of UNEP recommended assurance of quality to students in HEIs promoting creativity, critical thinking and collaborative skills, while building curiosity, courage, resilience and gender equality among students.

Further, the NEP-2020 recommended that the HEIs shall embark upon rolling out 21st century students capable of facing challenges, adaptive to changes, creative and innovative, well rounded students equipped with inventive and creative skills, out-of-box thinking skills, problem solving skills, employability skills, etc., that translate them into leaders and potential entrepreneurs. Hence, the policy recommended internships/ apprenticeships embedded programs. Further, the policy laid much emphasis on rolling out environmentally conscious, value driven, constitution-respecting and socially responsible citizens too.

The HEIs are also, as per the Revised Accreditation Framework [RAF] of NAAC, endowed with the responsibility of rolling out quality and holistic human resources to the modern Indian Economy by ingraining quality in teaching-learning process, integrating IT into teaching-learning and help students experience and prescribed a wide range of participative and experiential learning experiences including field trips,

conferences, integration of technology, community service programmes, career guidance, certificate and value added

courses, research and inquisition based teaching, exchange programmes, gender equity programmes, collaborations, consultancies, community outreach strategies and encouraged HEIs to be distinctive and unique in practices.

Besides, the students shall have social consciousness, regard for constitutional provisions, right perspective on environmental protection, awareness on gender equity, health and hygiene, Yoga and wellness, college social responsibility, culture and values, etc., to mention a few.

Further, the Ministry of India, GoI, through NIRF, prescribes quality research, infrastructure augmentation, enhanced placement and progression to higher education, equipment of employability skills leading to enhanced public perception about the college among the public.

Further, the A.P State Council of Higher Education, in the Post Graduation eco-system has come out with a revised curricular frame work from the Academic Year 2025-26 incorporating Skill Enhancement Courses, Open Online Courses, Indian Knowledge System, projects works in VI semester, besides new credit structure (APSCHE's curricular frame enclosed).

Our institution has, from AY 2022-23, has devised its new vision and mission along with objectives and core values necessitating design and re-orientation of its academic administration in tune with them.

ORDER:

In the light of the above mandate and responsibilities prescribed by institution's vision and mission, SDG-4, NEP – 2020, NAAC, NIRF to the autonomous HEIs, to meet the expectations of industries, students, Government and in tune with the APSCHE's revised and new P.G Curricular framework we need to customize, design and re-orient our academic and research administration.

Hence, the Chairmen of U.G and P.G Boards of Studies of various Departments are requested to make necessary arrangements for the conduct of the meetings in the Third week of April 2024. They are further requested to

extracurricular activities and devise suitable evaluation system keeping in mind above recommendations to make students a wholesome personality.

Further, the Chairman of the each BOS, in association with the IQAC coordinator, preceding the BOS meeting, is requested to prescribe benchmarking, quality initiatives in pedagogy and learning; in design of curriculum (with 20% change) and optimum utilization of existing human, physical and ICT resources and adopt resolutions to the extent of benchmarks (As per SOP given in **Annexure – I)**.

Further, as the regular attendance of students to the classes is a deciding factor in enhancement of quality in learning, a minimum attendance of 75% for I & II mid-term examinations under CIA component shall be the benchmark for attendance and it shall be approved in the BOS. The Chairmen are also requested to approve the new programmes to be introduced for 2025-26, if any, number of certificate courses, their frequency, Bloom 's- Taxonomy based evaluation system for effective learning outcomes as per the Annexure – I.

Pre-BoS activity:

1. The Chairmen shall send the curricula designed for AY 2024-25 to the Industrialists, Alumni, parents and senior subject experts and get feed back and input on the quality of the syllabi, extra-curricular activities, student-centric activities by 6 April 2024.
2. The Chairmen are, therefore, requested to

- Design curricula of Odd and even semesters for the A.Y 2025-26 both for U.G (I to VIII semesters)and P.G(I to IV Semesters) courses in tune with the stated vision, mission of the institution, RAF of NAAC, NEP-2020 and NIRF.
- It is mandatory to change the syllabus every year for a maximum of 20% .
- Conduct meeting with employers, parents, alumni, shall take feedback on the existing curricula and invite suggestions and changes to be made.
- Invite the University nominee, subject experts, industrial nominees, student nominees, parents well in advance along with the date, venue, agenda, etc. A soft copy shall be communicated well in advance to the members to have an idea on the matters.

  The Subject experts should be preferably a Doctorate with more than 10 years o teaching experience. He should have experience in designing industry related, market and job oriented curriculum.

evaluation system, research component, enhancing learning experiences, resource utilization by

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staff and students, etc.,

- Each Department shall approve and recommend additional credits for additional modules, training programmes, N.S.S, N.C.C, participation in cultural programs, sports and games, environmental programs, blood donations camps, etc.

  All meetings shall be offline. Online attendance of members faculty will be permitted only in exceptional cases.

- The Chairmen shall submit minutes of the meeting in the prescribed format only (Annexure – II) in triplicate (hard copies) to the Academic cell for onward submission to the IQAC, Examination cell and library within three days from the completion of BOS meeting and besides hosting the soft copy in the college website within the period stipulated.
- Each Chairman of BOS, shall get the rough draft of the curricula verified and approved by the Principal, Academic Cell and IQAC before the actual BOS meetings to ensure uniformity and commensurate with the stated vision and mission of the college among the departments.
- The Academic Cell coordinator shall be the Chief Coordinator for the BOS meeting activity and IQAC coordinator will be the additional coordinator.
- The Academic Coordinator and IQAC coordinators will conduct a meeting with the Chairmen, BOS on 25 April 2024 and explain the structure of curricula, uniformity other modalities.
- The Controller of Examinations of the institution shall fund the BOS meetings from the available funds on the condition of reimbursement after receiving autonomous funds from UGC. Initially, he shall pay Rs. 5,000/- uniformly as an advance to each Chairman towards each course (If BOS meetings for multiple courses are held under one Chairmanship, he/ she shall be given advance amount equivalent to the number of courses x Rs.5000/-)
- The Chairman of each BOS shall apply to the principal for advance amount for meeting the BOS meetings with head-wise expenditure in the prescribed format (Annexure-III).

  The chairmen of BOS are instructed to take suggestions from Industrialist (Part of Pre BOS)who is not in the previous BOS as member from industrialist category regarding the change in syllabus for the papers in BOS 2024-25 and proposal for new courses for the Academic year 2025-26 keeping in view of the future job opportunities .

S.No	Title of the Paper	Feedback or suggestions on the curriculum designed during 2024-25 BoS(Whether industry oriented/ relevant for equipping skills for 21st century students)	Proposal of New Courses for 2025-26	Justification

Following contents shall be presented in the BOS document in order

Proceedings of the Principal pertaining to BOS

Composition of BOS

3. Vision and Mission of the college

Agenda: It shall include ATR on the previous BOS meeting first, resolutions, etc. ater.

5. Table showing the Allocation of Credits in the following table for both theory and Lab in case of science subjects

S. No	**Semester**	**Title of the Course (Paper)**	**Hrs./week**	**Max.Marks (SEE)**	**Marks in CIA**	**Credits**
1	III	Optics	4	50	50	4

6. Resolutions adopted in the meeting with detailed discussion that took place during the meeting (Activities and Bench marking as per Annexure –I)
7. At the end of each theory paper, each topic shall be mapped as per the Blooms taxonomy and scope of that topic for skill/ employability/ entrepreneurship opportunities in the following table incorporated

S. No	Subject	Semester	Title of the Course (Paper)	Topic	Parameter as per Blooms taxonomy (Knowledge/ Application/ Creativity/ Innovation	Experiential learning component	Scope (Skill/ employability/ entreprenuership)
1	III	Botany	Plant Physiology	Plant Cell	Knowledge	Shall be shown Microscope	
2	III	History	Tourism	Tourism management	Application	Apprenticeship	Employability

8. Each BOS Chairman shall, immediately after syllabus, tabulate the changes made in the syllabus/ paper along with justification, in the Proforma given in

Annexure – I.

9. Attendance of Members present with signatures in the tabular form.
10. List of Examiners & Paper setters (Minimum 20 members list)
11. 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.
12. Each student (2025-26 AB) has to complete one MOOCS course from SWAYAM in any subject per year which is mandatory.

A 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.

I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.

I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short**

objective questions to be given for each paper.

Question paper is to be given as per the following structure for the courses with 4 **units**

S. No	Unit No	Long Answer Question(10M)	Short Answer Question (5 M)	Objective Questions(1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	2	1
4	IV	0	2	1+ one question from any unit with more syllabus weightage

For I mid examination to be conducted in offline mode, Question paper is to begiven as per the following structure for the courses with **5 units**

The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory- 3M	Assignment-5M	Seminar- 5M	Clean & green and Attendance- 2M

3. Percentage of syllabus changes in each paper
4. Measure outcome attainment learning levels of students through direct and indirect methodology and mapping COs and POs
5. Text & Reference Books
6. e-content links.
7. The BoS meetings should be conducted as per the scheduled timelines given below.

S.No	Activity	Scheduled Date
1	Issuing notification for conduct of BoS meetings	
2	Pre BOS (Offline/Online)	
3	Departmental level curricula design	
4	Finalization of draft BOS	

5	Scrutiny by academic cell	
6	Correspondence with Subject experts, University nominees, Industrialists	
7	BOS for UG & PG	

Enclosures: Annexures- I, II & III
Copy to:
Lecturers-in-Charge (BOS Chairman)
of all the departments
Academic Coordinator
IQAC coordinator
Controller of

10/10/23
PRINCIPAL
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KAKINADA

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Pithapur Rajah's **Government Autonomous College**
Kakinada

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1. Text & Reference Books

2.e-content links. The BoS meetings should be conducted as per the scheduled timelines given below.

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Enclosures: Annexures- I, II & III

Copy to:

Lecturers-in-Charge (BOS Chairman)
of all the departments

Academic Coordinator

IQAC coordinator

Controller of Examinations Office

10/10/23

PRINCIPAL
P.R.Govt. College (A)
KAKINADA

PRINCIPAL

Pithapur Rajah's **Government Autonomous College**

Kakinada

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

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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

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

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

Rc. No: 12A/A.C/BOS 2025-26,Dated:

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

Ref:- UGC Guidelines for Autonomous colleges- 2018.

ORDER:

The Principal, Pithapur Raja's Government College [A], Kakinada is pleased to constitute UG **Board of studies in ELECTRONICS** for framing the syllabi in ELECTRONICS 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, Pithapuram
4.	Sri K.Venkateswara Rao	Subject Expert1, Lecturer in Physics, Yeleswaram.
5.	Mr.P.Suresh Kumar	Representative from Industry, Andhara Electronics,Kakinada.
6.	Ravi Teja	Alumni
7.	Dr.K.Jayadev	Member
8.	Ms G. Sridevi	Member
9.	Smt.A.Padmavathi	Member
10.	Dr S V G V A Prasad	Member
11.	Dr P Himakar	Member
12.	Dr K. Durga Rao	Member
13.	Ms.D.Sravani	Member
14.	Ms M.Geetha Sri	Member
15.	T.Siva Mani	Student Member—II physics
16.	N.Siri	Student Member-III Physics

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

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

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 of the college.

The term of the members will be two years from the date of the nomination. The Chairman of the BoS (HoD /lecturer

In-Charge of the department) is directed to coordinate with the Principal of the College and conduct BoS meetings as and when necessary, but at least once a year.

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.2025-26)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits	Max Marks/Internal /Mid Assessment	Max Marks Semend Exam
I	I	1	**Introduction to Mathematical Physics**	3	3	50M	50M
			Introduction to Mathematical Physics- Practical	2	1	0M	50M
		2	**Mechanics and Properties of Matter**	3	3	50M	50M
			Mechanics and Properties of Matter- Practical	2	1	0M	50M
	II	3	**Waves and Optics**	3	3	50M	50M
			Waves and Optics- Practical	2	1	0M	50M
		4	**Heat and Thermodynamics**	3	3	50M	50M
			Heat and Thermodynamics- Practical	2	1	0M	50M
II	III	5	**Optics**	3	3	50M	50M
			Optics Practical Course	2	1		
		6	**Heat and Thermodynamics**	3	3	50M	50M
			Heat and Thermodynamics Practical Course	2	1	0M	50M
		7	**Electronic Devices and Circuits**	3	3	50M	50M
			Electronic Devices and Circuits Practical Course	2	1	0M	50M
		8	**Analog and Digital Electronics**	3	3	50M	50M
			Analog and Digital Electronics Practical course	2	1	0M	50M
	IV	9	**Electricity and Magnetism**	3	3	50M	50M
			Electricity and Magnetism Practical Course	2	1	0M	50M
		10	**Modern Physics**	3	3	50M	50M
			Modern Physics Practical Course	2	1	0M	50M
		11	**Introduction to Nuclear and Particle Physics**	**3**	**3**	**50M**	**50M**

			Introduction to Nuclear and Particle Physics Practical Course	**2**	**1**	**50M**	**50M**

Year	**Semester**	**Course**	**Title of the Course**	**No. of Hrs /Week**	**No. of Credits**	**Max Marks/Internal /Mid Assessment**	**Max Marks Semend Exam**
III	V	12	**Applications of Electricity & Electronics**	3	3	50M	50M
			Applications of Electricity & Electronics Practical Course	2	1	0M	50M
		13	**Electronic Instrumentation**	3	3	50M	50M
			Electronic Instrumentation Practical Course	2	1	0M	50M
		14 A	**Optical Instruments and Optometry**	3	3	50M	50M
			Optical Instruments and Optometry Practical Course	2	1	0M	50M
			OR				
		14 B	Optical Imaging and Photography	3	3		
			Optical Imaging and Photography Practical Course	2	1		
		15 A	Low Temperature Physics & Refrigeration	3	3		

			Low Temperature Physics & Refrigeration Practical Course	2	1		
		OR					
		15 B	**Solar Energy and Applications**	3	3	50M	50M
			Solar Energy and Applications Practical Course	2	1	0M	50M
	VI	**Internship**					

P.R. Government College (Autonomous), Kakinada

Department of Physics and Electronics

BOARD OF STUDIES - PHYSICS

Resolutions of the Meeting

The Board of Studies meeting was convened by the In-Charge Physics & Electronics Department on 07-08-2025 at 10:30am. under the chairmanship of D r M. Surekha. Dr. M.V.K Mehar, University Nominee, Sri. U.V.B.B.Kristna prasad and K.Venkateswara rao Subject expert all members of the faculty 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 2: Adoption of Single major system for the Ist year as per the guidelines of APSCHE

Proposal: Put before the BOS members to discuss on the above agenda 2.

Discussion: Discussed on the introduction of Single major system in our undergraduate program as per the guidelines issued by APSCHE

Resolution Adopted: All the BOS members have approved the adoption of Single major system for the Ist year as per the guidelines of APSCHE

Agenda 2(a): Adoption of Single minor system for the Ist year in Sem II as per the guidelines of APSCHE

Proposal: Put before the BOS members to discuss on the above agenda 2.

Discussion: Discussed on the introduction of Single minor system in our undergraduate program as per the guidelines issued by APSCHE

Resolution Adopted: All the BOS members have approved the adoption of Single minor system for the Ist year in Sem II as per the guidelines of APSCHE

Agenda 3 : Revised-common program structure and semester wise curriculum. **Proposal**: Placed before the BOS members to discuss on the above agenda. 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 4: 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 Voice	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 5: 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 6: Certificate courses viz. add on courses and skill development courses to will be conducted by the department during the academic year 2025-26.

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 "Troubleshooting and fixing of laboratory Instrument's **"** for **Sem IV @**30 hrs. for 2 credits having 5units @ 2 theory hrs. per week and one Study Project at the end ofthe course, designed by the Department.
- Resolved to adopt Community Service Project for all the students at the end of **Sem –II**.

Agenda 7: Collaboration with industry and third-party sector organization in view of industrial internshi

Proposal: It is placed before the BoS members to discuss on the above agenda 7.

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

Resolutions Adopted:

- Resolved to send all the final year Physics and Electronics students for on job training apprenticeship in connection with industries for off-site Project in the end of **Sem IV and Sem VI with the following industries** in accordance with their interest of study.

S.No.	NAME OF THE INDUSTRY	LOCATION	NATURE OF SKILLS AIMED TO BE
1	PRASIGE INDIA PVT. LTD., Noida	Kakinada	Electronic vehicle technology

2	JVS Technologies	Kakinada	Electronic devices manufacturing and repairs
3	Solar Systems	Kakinada	Installation of Solar panels
4	Ramakrishna Rewinding Works	Kakinada	Rewinding of Electrical appliances

- It is also resolved to send all the students to 3 month apprenticeship program during the entire tenure of Semester VI.

Agenda 8: 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 8.

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 9: 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 9.

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

Agenda 10: Allocation of extra credits for extracurricular activities.

Proposal: It is presented before the BOS members to discuss on the above agenda10.

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.

Agenda11: Conduct of parent teacher meeting.

Proposal: It is presented before the BOS members for the discussion on this agenda point 11

Discussion: Discussed the conduct of parent teacher meeting

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

Agenda 12: Panel of examiners to be approved in BOS.

Proposal: It is presented before the BOS members to discuss on the above agenda 12.

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

Resolution Adopted: Approved and resolved.

Agenda 13: Action plan for the academic year 2025-26.

Proposal: It is put before the BOS members to discuss on the above agenda 13

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 14: Departmental budget proposal for the academic year 2025-26.

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

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 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.**
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 Educati 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.**

Certificate

The syllabus and model question papers including blueprint in physics subject for 3 years BSc course (Physics Major/minor) 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	
2.	Dr. M V K Meher	University Nominee	
3.	Sri. K.Venkateswara Rao	Subject Expert,	
4.	Sri.U.V.B.B.K.Prasad	Subject Expert	
5.	Mr.P.Suresh Kumar	Representative from Industry, JVS Technologies,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.	T.Siva Mani	Student Member-II Physics	
16.	N.Siri	Student Member-III Physics	

Certificate

The syllabus and model question papers including blueprint in physics subject for 3 years BSc course for the semesters I, II.III, IV and V for the academic years 2024- 25. list of examiners and paper setters' departmental activities which contains pages is approved in the board of studies meeting held in blended mode through the Google meet app on 23-04-2024

S.No.	Members of Board of Studies		Signature
1	Dr .M.Surekha	Chairman	
2	Dr. M.V.K. Meher	University nominee, Principal, GDC, Perumallapuram.	
3	Sri U V B B K Prasad	Subject Expert; Lec in Charge Physics, GDC, Pithapuram	
4	Sri K.Venkateswara Rao	Subject Expert, Lec.in charge/ Phy/ GDC,Yeleswaram.	
5	Mr.P.Suresh Kumar	Representative from Industry, Andhara Electronics,Kakinada.	
6	Ravi Teja	Alumni	
7	Dr. Jayadev	Member	
8	Ms. G. Sridevi	Member	
9	Smt A. Padmavathi	Member	
10	Dr. S.V.G.V.A Prasad	Member	
11	Dr. P. Himakar	Member	
12	Dr. K. Durga Rao	Member	
13	Ms. D. Sravani	Member	
14	Ms M.Geetha Sri	Member	
15	T.Siva Mani	Student Member	
16	N.Siri	Student Member	

Proposed Skill Enhancement Courses

For **Sem IV**, one Add on certificate course ""**Troubleshooting and fixing of laboratory Instrument's"** with 30 hrs. Durationfor2credits having 4units@ 2 theory hrs. per week and one Study Project at the end of the course was designed by the Department.

For **Sem IV**, in accordance with the prescribed-on job training apprenticeship, all the Physics and Electronics students are supposed to connect with the following industries for off-site Project.

S.No.	NAME OF THE INDUSTRY	LOCATION	NATURE OF SKILLS AIMED TO BE
1	ISIE INDIA PVT. LTD., Noida	Kakinada	Electronic vehicle technology
2	JVS Technologies	Kakinada	Electronic devices manufacturing and repairs
3	Solar Systems	Kakinada	Installation of Solar panels
4	Ramakrishna Rewinding Works	Kakinada	Rewinding of Electrical appliances

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)Kakinada

Blue print for the model paper – Physics

Semester End External Examination

For I toV year core courses

2024 – 2025

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

Blue print for Semester End Practical examination

For I, II & III 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.

Blue Print for Internal Theory (Mid) Examination

For Single Major/Minor system

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

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

=

The total of two internals is reduced to 25 marks and the other 25 marks allocated forCCE 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 Internal Theory Examination For Three Major system

S. No.	Type of question	Unit	No. of Questio	No. of Questions Given			No. of Questions to be answered		
				Total Quetion	Marks allotted To	Total	No. of Questio	Marks allotted To	Total ma
1	**Section – A** Essay question	I	1	2	10	20	1	10	10
		II	1						
2	**Section – B**Short answer Questions	III,IV & V One from Any of above units	4	4	5	20	2	5	10
3	**Section – C** Objective type questions	One question from each unit	5	5	1	5	5	5	5
TOTAL						**45**			**25**

Percentage of Choice given = $\frac{45-25}{45} X100 = 44.44\ \%$

The total of two internals is reduced to 25 marks and the other 25 marks allocated forCCE are furt 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

	P.R. Government College (Autonomous) Kakinada
Department of Physics	
B.Sc. Program outcomes	

PO 1	**Domain Expertise**	• Acquire comprehensive domain knowledge andskills. • Make use of the knowledge in an innovativemanner
PO 2	**Life-long Learning and Research:**	• Learn "how to learn"- Self-motivated and self-learning. • Adopt to the ever-emerging demands of workplace and life. • Investigate the problem and report in a propermanner.
PO 3	**Modern Equipment Usage**	• Adopt ICT mode of learning effectively. • Access, retrieve and use authenticatedinformation. • Have knowledge of software applications toanalyze data • Usage of technology without deviating from thededication of learning.
PO 4	**Computing Skills and Ethics**	• Develop rational and scientific thinking • Ensure the human values & ethics and to followthem 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 indiverse teams/groups.
PO 7	**Efficient Communication & Life Skills**	• To face challenges and self-sustainability inovercoming the psychological problems. • Listen, understand and express views in aconvincing manner. • Develop skills to present information clearly andconcisely to interested groups.
PO 8	**Environmental Sustainability**	• Following the green energy measures. • Understand sensibly the environmentalchallenges. • 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

S.No.	SEM	Course	Title of the Paper
1	I	1	**Introduction to Mathematical Physics**
			Introduction to Mathematical Physics-Practical
		2	**Mechanics and Properties of Matter**
			Mechanics and Properties of Matter- Practical
2	II	3	**Waves and Optics**
			Waves and Optics- Practical
		4	**Heat and Thermodynamics**
			Heat and Thermodynamics- Practical
3	V	**12**	Applications of Electricity & Electronics (MAJOR&MINOR)
			Applications of Electricity & Electronics Practical (MAJOR&MINOR)
		13	Electronic Instrumentation (MAJOR&MINOR)
			Electronic Instrumentation Practical (MAJOR&MINOR)
		14	Optical Instruments and Optometry
			Optical Instruments and Optometry Practical
		15	Solar Energy and Applications
			Solar Energy and Applications Practical

PITHAPUR RAJAHS GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

DEPARTMENT OF PHYSICS

Percentage of Syllabi included/Excluded-2025-26

Sl No	Title of Paper	% of Change
1	**Introduction to Mathematical Physics**	0
2	Mechanics and Properties of matter	0
3	**Waves and Optics**	0
4	Heat & Thermodynamics	0
5	Optics	0
6	Heat & Thermodynamics	0
7	**Electronic Devices and Circuits Practical Course**	0
8	**Analog and Digital Electronics**	0
9	Electricity, Magnetism & Electronics	0
10	Modern Physics	0
11	Nuclear and particle physics	0
12	Applications of Electricity & Electronics	10%
13	Electronic Instrumentation	10%
14	**Optical Instruments and Optometry**	0
15	**Solar energy and applications**	0

Semesterwise Additions & Deletions

Sl No	Semester	Title of Paper	Deletions	Justification
III	V	Applications of Electricity & Electronics	UNIT-III: Open circuit and short circuit tests UNIT-V: 1.Simple Design of FM Radio circuit using LCR series resonance (tuning) circuit 2.Checking the output voltage of a battery eliminator using a Multimeter.(Trouble shooting), 3.Power supply for computers (SMPS)	• Already covered in Unit-I • Already covered in Unit-I • Covered on practicals • Already covered in Unit-II
III	V	Electronic Instrumentation	UNIT-I:Sensitivity, 3½ display and 4½ display Digital Multimeter, Ultrasound scanning Ventilator Pulse oximeter.	Already coverd in practicals

	Pithapur Rajah's Government College (Autonomous) Kakinada	**Program & Semester** I B.Sc. (I Sem) W.e.f. 2025- 26 ADMITTED BATCH			
Course 1	**INTRODUCTION TO MATHEMATICAL PHYSICS**				
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites:	Vectors, Scalars, Differentiation and Integration	3	0	-	3

SEMESTER-I

COURSE 1: INTRODUCTION TO MATHEMATICAL PHYSICS

Theory Credits: 3 **3 hrs/week**

COURSE OBJECTIVE:

To equip students with foundational mathematical techniques—such as vector calculus, linear algebra, complex numbers, probability, and Fourier analysis—essential for understanding and solving problems in physics.

LEARNING OUTCOMES:

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

1. Apply concepts of vector differentiation and integration to analyze physical fields and prove integral theorems.

2. Use matrix operations and eigenvalue techniques to solve linear systems in physics.

3. Represent and manipulate complex numbers in various forms for solving AC circuit problems.

4. Interpret and apply basic probability concepts and distributions to model physical phenomena.

5. Analyze periodic signals using Fourier series and evaluate Fourier coefficients for common waveforms.

UNIT-I - VECTOR ANALYSIS (9. Hrs.)

Distinction between Ordinary and partial derivatives, Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), Statement and proof of Gauss and Stokes theorems.

UNIT-II – LINEAR ALGEBRA (9. Hrs.)

Vector and Scalar quantities in Physics, Matrices and Operations: Types, Addition and Multiplication, Identity and Inverse, Determinant (2x2 and 3x3), Trace, Transpose, Eigenvalues and Eigen Vectors, Calculation of Eigen values using characteristic equations. System of Linear Equations: Solving 2-variable system using matrices, Simple examples from physics (Current, forces)

UNIT – III COMPLEX NUMBERS (9. Hrs.)

Basic Complex numbers: Real and imaginary parts, Conjugate of complex numbers, Modulus and argument (magnitude and phase), Polar and Exponential (Euler) form of complex numbers. Addition and subtraction of complex numbers, Multiplication and division of complex numbers. Phasor representation: representation of voltage and current as phasors, Derivation of Impedance of a series LCR circuit.

UNIT – IV PROBABILITY (9. Hrs.)

Probability Theory Basics, Sample space, events, conditional probability, and Bayes' theorem. Independence and mutual exclusivity. Random Variables and Probability Distributions, Concept of random variables (discrete and continuous). Common distributions and their applications: Binomial, Poisson, and Gaussian.

UNIT V FOURIER ANALYSIS (9. Hrs.)

Introduction to periodic functions: Concept of periodicity (waves, oscillations, AC current), Graphical understanding of Sine and Cosine functions, Need for Fourier analysis, Real world signals (heartbeat, electrical signal, musical tones), Fourier theorem ad evaluation of Fourier coefficients, Analysis of periodic wave functions – Square wave, saw tooth wave and triangular wave.

Reference books

1. Mathematical methods for physics sciences (3rd edition) - Mary. L. Boas

2. First Chapter (Vector analysis) in Introduction to Electrodynamics (3rd edition) – David. J. Griffiths

3. Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier

Student Activities:

● Problem-solving sessions using real-life physics applications (e.g., using vector calculus in electromagnetism).

● Group projects on solving physical systems using matrix methods and linear algebra tools.

● Mini-lab activity on phasor diagrams and impedance using circuit simulation software (like LTspice or Tinkercad Circuits).

● Data collection and analysis task: Record physical measurements (e.g., decay times, counts) and apply statistical models (Poisson/Gaussian).

P.R. GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–I COURSE-1

W.e.f. 2025- 26 ADMITTED BATCH

INTRODUCTION TO MATHEMATICAL PHYSICS

Course Code: **Hours/Week:3** **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 10= 30
B	7	4	4 x 5 = 20
Total	13	7	50

Blue Print

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

Percentage of Choice = $\frac{(95 - 50)}{95}$ **X 100** = $\frac{45}{95}$ **x 100** **= 47%**

PITHAPUR RAJAHS GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–I PAPER: C1

W.e.f. 2025– 26ADMITTED BATCH

INTRODUCTION TO MATHEMATICAL PHYSICS

Course Code: No. of credits: 03 Hours/Week:3 Total hours: 45 hrs

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

Time: 2 hrs Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question form each section3 X 10= 30 Marks

SECTION-A

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

SEMESTER-I

COURSE 1: INTRODUCTION TO MATHEMATICAL PHYSICS

Practical **Credits: 1** **2 hrs/week**

COURSE OBJECTIVE:

To develop foundational computational and analytical skills through hands-on exercises that prepare studer for understanding and solving problems in various realms of physics.

LEARNING OUTCOMES:

1. Graphing and Visualization: Students will be able to plot mathematical functions and visualize physical phenomena using Excel, Python, or MATLAB.
2. Vector and Matrix Computations: Students will perform operations on vectors and matrices and represer them both analytically and graphically.
3. Numerical Methods: Students will apply numerical techniques like Newton-Raphson, Bisection, and Eul method to solve equations and differential equations.
4. Data Analysis and Fitting: Students will analyze experimental data using tools like least squares fitting a compute statistical quantities such as mean, standard deviation, and error.
5. Fourier and Complex Number Representation: Students will approximate functions using Fourier series graphically represent complex numbers.

List of Practical

Minimum of 6 experiments to be conducted and recorded

1. Graphing standard functions: sin(x), cos(x), ex, ln(x), x^2, $\sqrt{x}$ etc. using Excel/Python/Graph paper
2. Experimental determination and vector diagram verification of vector addition and scalar product using graphical methods.
3. Using MATLAB/Python to visualize vector fields and compute gradient, divergence, and curl.
4. Solve simple non-linear equations (e.g., x3−x−1=0) using graphical methods and bisection/newton-raphs method (Python or Excel).
5. Fit experimental data (e.g., Hooke's law) to a straight line using least squares method in Excel or Python
6. Linear equation Solution and System of linear equation solution using MATLAB/OCTAVE
7. Fourier approximation of a square wave up to 5 terms using Python/MATLAB and plotting the result.
8. Numerical solution of dy/dx=x+y, given initial condition using Euler's method.
9. Single coin tossing and four coin tossing using MATLAB/OCTAVE and verification of statistical laws
10. Use Python/Excel to perform addition, multiplication, and finding inverse of 2x2 and 3x3 matrices.
11. Simulate and plot s-t, v-t graphs using s=ut+0.5gt2s = ut + 0.5gt^2 using Excel or Python.
12. Calculate mean, standard deviation, and percentage error for a given data set using Excel/Python/Manu calculations
13. Represent the given complex numbers on graph paper
14. Determine the Eigen Values of the given matrix using characteristic equation

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 (Autonomous) Kakinada	Program & Semester			
Course 2	**MECHANICS AND PROPERTIES OF MATTER**	I B.Sc. (I Sem) W.e.f. 2025-26 ADMITTED BATCH			
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites:	Different types of Physical quantities, Basic mathematical equations & formulae, Forces and its properties, knowledge about celestial bodies	3	0	-	3

SEMESTER-I
COURSE 2: MECHANICS AND PROPERTIES OF MATTER

Theory Credits: 3 hrs/week

COURSE OBJECTIVE:

To provide students with a foundational understanding of classical mechanics and the physical properties of matter, including particle dynamics, central forces, elasticity, fluid behavior, and the basic principles of special relativity.

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

1. Apply Newton's laws to variable mass systems and analyze particle collisions using conservation laws and scattering theory.
2. Describe motion under central forces and derive orbital dynamics including Kepler's laws and satellite motion.
3. Explain elastic behavior of materials using stress-strain relations, and analyze the bending of beams and torsional motion.
4. Interpret fluid dynamics concepts such as streamline flow, Bernoulli's principle, and viscosity with practical applications.
5. Understand the key postulates of special relativity and apply Lorentz transformations to problems involving time dilation, length contraction, and mass-energy equivalence.

UNIT-I MECHANICS OF PARTICLES (9 hrs.)

Newton's Laws of motion, motion of variable mass system, Equation of motion of a rocket. Conservation of energy and momentum, collisions in two and three dimensions, concept of impact parameter, scattering cross-section, Rutherford scattering-derivation

UNIT-II CENTRAL FORCES (9 hrs.)

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, conservative force as a negative gradient of potential energy, equations of motion under a central force, derivation of Kepler's laws, motion of satellites, Geo-stationary satellites

UNIT III: ELASTICITY AND BENDING OF BEAMS (9 hrs)

Stress and strain, Hooke's Law, Elastic moduli – Young's, bulk, and shear modulus, Poisson's ratio – Physical meaning, Bending of beams – Types, point and distributed load, Cantilever and uniform bending – Qualitative treatment, Torsional pendulum – working principle and uses.

UNIT IV: FLUID MECHANICS (9 hrs)

Fluids – Properties and classification, Streamline vs turbulent flow, Reynolds number, Bernoulli's theorem – Statement, simple derivation and applications (Venturimeter, airplane lift), Equation of continuity – Concept, Viscosity – Poiseuille's law (statement and qualitative explanation), Surface tension – Examples and qualitative ideas

UNIT V: SPECIAL THEORY OF RELATIVITY (9 hrs.)

Galilean relativity, absolute frames, Michelson-Morley experiment, negative result, postulates of special theory of relativity, Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation

REFERENCE BOOKS:

1. BSc Physics -Telugu Akademy, Hyderabad
2. Mechanics - D.S. Mathur, Sulthan Chand & Co, New Delhi
3. Mechanics - J.C. Upadhyaya, Ramprasad & Co., Agra
4. Properties of Matter - D.S. Mathur, S. Chand & Co, New Delhi ,11th Edn., 2000
5. Physics Vol. I - Resnick-Halliday-Krane ,Wiley, 2001
6. Properties of Matter – Brijlal & Subrmanyam, S. Chand & Co. 1982
7. Mechanics-EM Purcell, Mc Graw Hill
8. University Physics-FW Sears, MW Zemansky & HD Young, Narosa Publications, Delhi
9. College Physics-I. T. Bhima sankaram and G. Prasad. Himalaya Publishing House.
10. Mechanics, S. G. Venkata chalapathy, Margham Publication, 2003.
11. Fluid Mechanics – Frank M. White, McGraw Hill.
12. Textbook of Fluid Dynamics – M. D. Raisinghania, S. Chand & Co.

GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–I PAPER 2

W.e.f. 2025 – 26 ADMITTED BATCH

MECHANICS AND PROPERTIES OF MATTER

Course Code: **Hours/Week:3** **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	1	
II	1	1	1	
III	1	1	-	
IV	1	1	-	
V	2	-	1	
Total Marks				**95**

Percentage of Choice = $\frac{(95 - 50)}{95}$ **X 100** = $\frac{45}{95}$ **x 100** **= 47%**

PITHAPUR RAJAHS GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–I PAPER C2

W.e.f. 2025– 26 ADMITTED BATCH

MECHANICS AND PROPERTIES OF MATTER

Course Code: No. of credits: 03 Hours/Week:3 Total hours: 45 hrs

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

Time: 2 hrs Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question form each section3 X 10= 30 Marks

SECTION-A

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

14.Essay question from UNIT- III

SECTION-B

15.Essay question from UNIT-IV

16.Essay question from UNIT-V

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. Problem from UNIT - I
23. Problem from UNIT - II
24. Problem from UNIT - V

COURSE 3: MECHANICS AND PROPERTIES OF MATTER

Practical Credits: 1 2hrs/week

COURSE OBJECTIVE:

To develop practical skills in the use of laboratory equipment and experimental techniques for measuring properties of matter and analyzing mechanical systems.

LEARNING OUTCOMES:

1. **Demonstrate a practical understanding of classical mechanics** by performing experiments on momentum, collisions, and motion under force.
2. **Analyze physical systems involving elasticity, fluid flow, and torsion** through hands-on measurements and data interpretation.
3. **Apply fundamental physics principles** to explain satellite motion, scattering phenomena, and beam bending using experiments and simulations.
4. **Use scientific simulations and digital tools** to visualize and investigate abstract concepts such as rocket motion central forces, and relativity.
5. **Develop experimental, observational, and analytical skills** including data recording, graph plotting, and error estimation in real and virtual environments.

Minimum of 6 experiments to be conducted and recorded

1. Young's modulus by uniform bending
2. Young's modulus by non-uniform bending
3. Rigidity modulus using torsional pendulum
4. Surface tension by capillary rise method
5. Flywheel – Determination of moment of inertia
6. Bifilar suspension – moment of inertia of a rectangular body
7. Radius of capillary tube by Hg thread method
8. Simulation of rocket motion using water rocket or computer simulation.
9. Verification of Kepler's third law using orbit simulation.
10. Simulation-based study of Rutherford scattering.
11. Determination of modulus of rigidity using Maxwell's needle.
12. Measurement of Poisson's ratio of a rubber tube.
13. Verification of Bernoulli's theorem using a horizontal tube setup.
14. Demonstration of lift on an airfoil using airflow setup.
15. Simulation of Michelson-Morley experiment.
16. Visualization of time dilation and length contraction using simulation.

STUDENT ACTIVITIES

Unit I: Mechanics of Particles

Activity: Collision Experiments

Students can set up simple collision experiments using marbles, carts, or other objects. They can measure the initial and final velocities, masses, and analyze the momentum conservation. By varying the conditions (e.g., masses, initial velocities), they can observe the effects on the collision outcomes.

Unit II: Central Forces

Activity: Pendulum Motion Students can investigate the motion of a simple pendulum by varying its length and measuring the time period. They can analyze the relationship between the period and the length, and discuss the concept of centripetal force and its role in circular motion.

Unit III: Elasticity and Bending of Beams

Activity: Beam Bending Experiment

Use rulers or meter sticks on supports to apply loads and measure deflection. This hands-on demo helps visualize how elasticity and loading affect real-world structures.

Unit IV: Lagrangian Mechanics

Activity: Apply Lagrangian mechanics to various physical systems

Unit V: Special Theory of Relativity

Activity: Time Measurement Students can perform a time measurement experiment using simple devices like water clocks or sand timers. They can compare the measured time between two events at different relative speeds and discuss the concept of time

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-II** W.e.f. 2025- 26 ADMITTED BATCH			
Course 3	**WAVES AND OPTICS**				
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites:	Different types of Physical quantities, Basic mathematical equations & formulae, Forces and its properties, knowledge about celestial bodies	3	0	-	3

N0 of Credits:03 hrs/week:03

COURSE OBJECTIVE:

The course aims to develop a foundational understanding of oscillatory motion, wave behavior in strings and bars, and optical phenomena like interference, diffraction, and polarization. Students will learn to mathematically analyze vibrations and light behavior through theoretical and experimental approaches.

LEARNING OUTCOMES:

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

1. Describe the basic characteristics of waves such as frequency, wavelength, amplitude, period, and speed and utilize mathematical relationships related to wave characteristics.
2. Distinguish between Longitudinal and Transverse waves.
3. Understand the phenomenon of interference of light and its formation in Thin films and Newton's rings.
4. Distinguish between Fresnel's diffraction and Fraunhoffer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating and to describe the construction and working of zone plate and make the comparison of zone plate with convex lens
5. Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.

UNIT-I: SIMPLE HARMONIC, DAMPED & FORCED OSCILLATIONS (9 Hrs.)

Simple Harmonic Oscillator: Solution of differential equation, and physical characteristics, Principle of superposition, Combination of two mutually perpendicular SHMs (1:1 and 1:2 frequencies), Lissajous figures. Damping, Damped Harmonic Oscillator: Solution of differential equation, Energy considerations, Logarithmic decrement, relaxation time, quality factor, Forced Oscillations: Solution of differential equation.

UNIT-II VIBRATING STRINGS AND BARS (9 Hrs.)

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-III: INTERFERENCE (9 hrs)

Principle of superposition – coherence Conditions for interference of light. Fresnel's biprism determination of wavelength of light, change of phase on reflection, Oblique incidence of a plane wave on a thin film due to reflected light (cosine law) –colors of thin films- Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film). Determination of diameter of wire, Newton's rings in reflected light. Determination of wavelength of monochromatic light using Newton's rings.

UNIT-IV: DIFFRACTION (9 hrs.)

Introduction, distinction between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction – Diffraction due to single slit, Fraunhofer diffraction pattern with N slits (diffraction grating), Resolving power of grating, Determination of wavelength of light in normal incidence using diffraction grating. Fresnel's half period zones-area of the half period zones-zone plate, Difference between interference and diffraction.

UNIT-V: POLARIZATION (9 hrs.)

Polarized light: methods of polarization by reflection, refraction, double refraction, Brewster's law, Mauls law, Nicol prism polarizer and analyzer, Quarter wave plate, Half wave plate, optical activity - Determination of specific rotation by Laurent's half shade Polarimeter. Idea of elliptical and circular polarization

REFERENCE BOOKS:

1. BSc Physics Vol.1, Telugu Academy, Hyderabad.
2. BSc Physics Vol.2, Telugu Akademy, Hyderabad
3. Fundamentals of Physics. Halliday/Resnick/Walker, Wiley India Edition 2007.
4. Waves & Oscillations. S. Badami, V. Balasubramanian and K.R. Reddy, Orient Longman.
5. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
6. Optics – Ajoy Ghatak, Tata McGraw Hill
7. Fundamentals of Optics – Jenkins and White, McGraw Hill
8. Wave Optics and Vibrations – N. Subrahmanyam & Brijlal, S. Chand & Co.
9. Vibrations and Waves – H. J. Pain, Wiley

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA.

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

WAVES AND OPTICS
(Blue Print)

w.e.f. 2025-26 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	Problems 5 marks	Marks allotted
I	I	1	1	
II	2		1	
III	1	1		
IV	I	1		
V	1	1	1	
Total Marks				**95**

PITHAPUR RAJAHS GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–II PAPER 3

W.e.f. 2025 - 26 ADMITTED BATCH

WAVES AND OPTICS

Course Code: **No. of credits: 03** **Hours/Week:03** **Total hours: 45 hrs**

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

Time: 2hrs Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question form each section3 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. 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. Problem from UNIT - I
12. Problem from UNIT - II
13. Problem from UNIT - III

SEMESTER-II
COURSE 3: WAVES AND OPTICS

Practical **Credits: 1** **2 hrs/week**

COURSE OBJECTIVE:

The Course Objective for a practical course in electricity and magnetism may include to develop practical skills in handling electrical and electronic components, such as resistors, capacitors, inductors, transformers, and oscillators.

LEARNING OUTCOMES:

1. Determine fundamental mechanical quantities like acceleration due to gravity and spring constant using compound pendulum and spring-based experiments, applying principles of oscillatory motion.
2. Apply statistical methods to analyze experimental data, estimate errors, and understand the importance of precision in repeated time-period measurements using a simple pendulum.
3. Explore wave phenomena through sonometer experiments, verifying laws of vibrations in stretched strings, and understand the relationship between frequency, tension, and length.
4. Analyze interference patterns in Newton's rings and wedge method to determine lens curvature and wire thickness, demonstrating coherence and phase concepts in light.
5. Examine diffraction effects using grating and prisms to determine wavelength and dispersive power, and assess optical resolving capabilities of telescopes and gratings.
6. Investigate polarization phenomena through polarimetry and understand optical activity by determining specific rotation of optically active substances.

Minimum of 6 experiments to be conducted and recorded

1. Determination of 'g' by compound/bar pendulum
2. Simple pendulum normal distribution of errors-estimation of time period and the error of the mean by statistical analysis.
3. Solving equation of motion for DHO & FHO using MATLAB/OCTAVE/Python
4. Determination of the force constant of a spring by static and dynamic method.
5. Verification of laws of vibrations of stretched string –sonometer.
6. Determination of radius of curvature of a given convex lens-Newton's rings.
7. Resolving power of grating.
8. Study of optical rotation – polarimeter.
9. Fourier transform simulation of single slit diffraction
10. Fourier transform simulation of diffraction at circular,rectangular aperture,edge
11. Dispersive power of a prism.
12. Determination of wavelength of light using diffraction grating-normal incidence method.
13. Determination of wavelength of laser light using diffraction grating.
14. Resolving power of a telescope.
15. Refractive index of a liquid-hallow prism.
16. Determination of thickness of a thin wire by wedge method.

STUDENT ACTIVITIES

UNIT-I: SIMPLE HARMONIC, DAMPED & FORCED OSCILLATIONS

Activity: Measuring the period of a simple pendulum and verifying the relationship between the period and the length of the pendulum. Students can use a stopwatch and a ruler to measure the time for a fixed number of oscillations and calculate the period.

Activity: Measuring the damping coefficient of a mass-spring system and calculating the quality factor. Students can measure the amplitude of the system as it undergoes damped oscillations and use the logarithmic decrement formula to calculate the damping coefficient.

UNIT-II VIBRATING STRINGS AND BARS

Activity: Measuring the speed of sound in a metal rod and comparing it with the theoretical value. Students can use a microphone and an oscilloscope to measure the time delay between two reflections of a sound pulse in the rod. They can then use the formula for the speed of sound in a solid to calculate the speed and compare it with the theoretical value

UNIT-III: INTERFERENCE

Ask students to measure the diameter of the central bright spot and the diameter of the nth ring for different values of n, and then calculate the wavelength of light

UNIT-IV: DIFFRACTION

Build a simple diffraction grating using a piece of cardboard and some sewing needles. Ask students to measure the distance between the needles, count the number of lines per unit length, and then calculate the grating spacing and the wavelength of light.

UNIT-V: POLARIZATION

Ask students to measure the angle of rotation of the polarized light before and after passing through the sample, and then calculate the specific rotation of the sample.

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

STUDENT ACTIVITIES

Unit-I Simple Harmonic oscillations:

Activity: Measuring the period of a simple pendulum and verifying the relationship between the period and the length of the pendulum. Students can use a stopwatch and a ruler to measure the time for a fixed number of oscillations and calculate the period.

Unit-II Damped and forced oscillations: Activity: Measuring the damping coefficient of a mass-spring system and calculating the quality factor. Students can measure the amplitude of the system as it undergoes damped oscillations and use the logarithmic decrement formula to calculate the damping coefficient. They can then use the formula for the quality factor to evaluate the quality of the system.

Unit-III Complex vibrations:

Activity: Constructing a square wave using Fourier series and analysing its Fourier coefficients. Students can use a software tool or a programming language to generate a square wave and then compute the Fourier coefficients. They can then plot the magnitude spectrum of the waveform and observe the harmonic components.

Unit-IV Vibrating Strings and Bars:

Activity: Measuring the speed of sound in a metal rod and comparing it with the theoretical value. Students ca use a microphone and an oscilloscope to measure the time delay between two reflections of a sound pulse in th rod. They can then use the formula for the speed of sound in a solid to calculate the speed and compare it with the theoretical value.

Unit-V Ultrasonics:

Activity: Measuring the wavelength of ultrasonic waves using the diffraction of light. Students can use a laser and a diffraction grating to create a diffraction pattern of an ultrasonic wave. They can then measure the distance between the diffraction fringes and use the formula for the diffraction of light to calculate the wavelength of the ultrasonic wave.

	Pithapur Rajahs Government College (Autonomous) Kakinada	**Program & Semester-II** W.e.f. 2025- 26 ADMITTED BATCH			
Course 4	**HEAT AND THERMODYNAMICS**				
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites:	Different types of Physical quantities, Basic mathematical equations & formulae, Forces and its properties, knowledge about celestial bodies	3	0	-	3

N0 of Credits:03 hrs/week:03

COURSE OBJECTIVE:

The course on Heat and Thermodynamics aims to provide students with a fundamental understanding of the principles of heat and energy transfer and their applications in various fields

LEARNING OUTCOMES:

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

1. 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
2. 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
3. Develop critical understanding of concept of Thermodynamic potentials, the formulation of Maxwell's equations and its applications.
4. Differentiate between principles and methods to produce low temperature, liquefy air, and understand the practical applications of substances at low temperatures.
5. Examine the nature of black body radiations and the basic theories.

UNIT-I: KINETIC THEORY OF GASES (9 hrs)

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

UNIT-II: THERMODYNAMICS (9 hrs)

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; Change of entropy when ice changes into steam. Temperature- Entropy (T-S) diagram and its uses.

UNIT-III: THERMODYNAMIC POTENTIALS AND MAXWELL'S EQUATIONS (9 hrs)

Thermodynamic Potentials-Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy and their significance, Derivation of Maxwell's thermodynamic relations from thermodynamic potentials, Clausius-Clayperon's equation, Joule-Kelvin coefficient for ideal and Van der Waals' gases.

UNIT-IV: LOW TEMPERATURE PHYSICS (9 hrs)

Methods for producing very low temperatures, Critical temperature, Inversion temperature, Joule Kelvin effect, Porous plug experiment, Joule expansion, Distinction between adiabatic and Joule Thomson expansion, Expression for Joule Thomson cooling, Production of low temperatures by adiabatic demagnetization (qualitative), Refrigeration – Vapour compression machine.

UNIT-V: QUANTUM THEORY OF RADIATION (9 hrs)

Black body, Ferry's black body, 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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA.

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

HEAT AND THERMODYNAMICS
(Blue Print)

w.e.f. 2025-26 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	Problems 5 marks	Marks allotted
I				
II				
III				
IV				
V				
Total Marks				**95**

PITHAPUR RAJAHS GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–II **PAPER: C4**

W.e.f. 2025– 26ADMITTED BATCH

HEAT AND THERMODYNAMICS

Course Code: **No. of credits: 03** **Hours/Week:3** **Total hours: 45 hrs**

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

Time: 2 hrs Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question form each section3 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. Short answer question from UNIT – I
8. Short answer question from UNIT – III
9. Short answer question from UNIT – IV
10. Short answer question from UNIT – V
11. Problems from UNIT -II
12. Problems from UNIT - III
13. Problems from UNIT – IV

SEMESTER-II

COURSE 4: HEAT AND THERMODYNAMICS

Practical Credits: 1 2 hrs/week

COURSE OBJECTIVE:

The objectives for practical's in Heat and Thermodynamics can vary depending on the specific course or program, but here are some general objectives that may apply, to develop practical skills in the use of laboratory equipment and experimental techniques for studying heat and thermodynamics.

LEARNING OUTCOMES:

1. Mastery of experimental techniques: Students should become proficient in using laboratory equipment and experimental techniques for studying heat and thermodynamics.

2. Application of theory to practice: Students should be able to apply theoretical concepts learned in lectures to real-world situations, and understand the limitations of theoretical models.

3. Accurate recording and analysis of data: Students should be able to accurately record and analyze experimental data, including understanding the significance of error analysis and statistical methods.

4. Critical thinking and problem solving: Students should be able to identify sources of error, troubleshoot experimental problems, and develop critical thinking skills in experimental design and analysis.

5. Understanding of physical principles: Students should develop an understanding of the physical principles governing heat and thermodynamics, including the laws of thermodynamics, heat transfer, and thermodynamic cycles.

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. Study of variation of resistance with temperature - Thermistor.

10. Thermal expansion of solids using metal ball and a ring.

STUDENT ACTIVITIES

Unit I: Kinetic Theory of Gases

Activity: Speed Distribution Analysis

Students can conduct a simple experiment using gas molecules (e.g., small balls) in a container. They can measure the speeds of the molecules using a motion sensor or stopwatch and analyze the distribution of molecular velocities. They can compare the observed distribution with the expected Maxwell's law of distribution.

Unit II: Thermodynamics

Activity: Heat Engine Efficiency Calculation

Students can work in groups to design a simple heat engine (e.g., using a syringe and a small turbine). They can measure the temperature changes and calculate the efficiency of their engine. They can compare their calculated efficiency with the theoretical Carnot efficiency to understand the limitations of real heat engines.

Unit III: Thermodynamic Potentials and Maxwell's Equations

Activity: Thermodynamic Relations Verification

Students can solve numerical problems involving different thermodynamic potentials (internal energy, enthalpy, Helmholtz free energy, and Gibbs free energy) and verify the Maxwell's thermodynamic relations. They can compare the calculated values using different relations to ensure consistency.

Unit IV: Low Temperature Physics

Activity: Adiabatic Demagnetization Experiment

They can discuss the distinction between adiabatic and Joule-Thomson expansions.

Unit V: Quantum Theory of Radiation

Activity: Black Body Radiation Spectrum Analysis

They can estimate the surface temperature of the Sun using the solar constant and Angstrom pyro heliometer data.

	Pithapur Rajahs Government College (Autonomous) Kakinada	Program & II YEAR Semester-III W.e.f. 2023- 24 ADMITTED BATCH			
Course 5	**OPTICS (MAJOR AND MINOR)**				
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites:	The course on Optics aims to provide students with a fundamental understanding of the behaviour and properties of light and its interaction with matter.	3	0	-	3

No of Credits:03 hrs/week:03

COURSE OBJECTIVE:

This course provides students with

The course on Optics aims to provide students with a fundamental understanding of the behaviour and proper of light and its interaction with matter.

Course Outcomes

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Explain about the different aberrations in lenses and discuss the methods of minimizing them	Remembering &Understanding
CO2	Understand the phenomenon of interference of light and its formation in (i) Lloyd's single mirror due to division of wave front and (ii) Thin films, Newton's rings and Michelson interferometer due to division of amplitude.	Application
CO3	Distinguish between Fresnel's diffraction and Fraunhoffer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating and to describe the construction and working of zone plate and make the comparison of zone plate with convex lens	Analyzing
CO4	Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.	Application
CO5	Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields. To understand the basic principles of fibre optic communication and explore the field of Holography and Nonlinear optics and their applications.	Application

OPTICS (MAJOR AND MINOR)

UNIT-I Aberrations

Introduction – monochromatic aberrations, spherical aberration, methods of minimizing spherical aberration, coma, astigmatism and curvature of field, distortion. Chromatic aberration-the achromatic doublet. Achromatis for two lenses (i) in contact and (ii) separated by a distance.

UNIT-II Interference

Principle of superposition – coherence Conditions for interference of light. Fresnel's biprism determination of wavelength of light –change of phase on reflection. Oblique incidence of a plane wave on a thin film due to reflected light (cosine law) – colours of thin films- Interference by a film with two non-parallel reflecting surfa (Wedge shaped film). Determination of diameter of wire, Newton's rings in reflected light. Determination of wavelength of monochromatic light using Newton's rings and Michelson Interferometer.

UNIT-III Diffraction

Introduction, distinction between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction – Diffraction due single slit-Fraunhoffer, Fraunhofer diffraction pattern with N slits (diffraction grating). Resolving power of grating, Determination of wavelength of light in normal incidence using diffraction grating. Fresnel's half peri zones-area of the half period zones-zone plate-comparison of zone plate with convex lens-difference between interference and diffraction.

UNIT-IV Polarisation

Polarized light: methods of polarization by reflection, refraction, double refraction, Brewster's law Mauls law Nicol prism polarizer and analyser, Quarter wave plate, Half wave plate-optical activity, determination of speci rotation by Laurent's half shade Polarimeter. Idea of elliptical and circular polarization

UNIT-V Lasers and Holography

Lasers: introduction, spontaneous emission, stimulated emission. Population Inversion, Laser principal Einstein Coefficients-Types of lasers-He-Ne laser, Ruby laser- Applications of lasers. Holography:
Basic principle of holography-Gabor hologram and its limitations, Applications of holography.

.

REFERENCE BOOKS:

1. BSc Physics, Vol .2, Telugu Academy, Hyderabad
2. A Text Book of Optics-N Subramanyam, L Brijlal, S. Chand& Co.
3. Unified Physics Vol. II Optics & Thermodynamics – Jai Prakash Nath & Co. Ltd., Meerut
4. Optics, F.A. Jenkins and H.G. White, Mc Graw-Hill
5. Optics, Ajay Ghatak, Tata Mc Graw-Hill.
6. Introduction of Lasers – Avadhanulu, S. Chand & Co.
7. Principles of Optics- BK Mathur, Gopala Printing Press, 1995

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA.

II B.Sc., Physics-Semester – III, Paper – C5

OPTICS (Blue Print)

w.e.f. 2023-24 ADMITTED BATCH

Course Code: PH **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	1	2	-	20
IV	2	-	1	25
V	1	1	1	20
Total Marks				**95**

Percentage of Choice = $\frac{(95 - 50)}{95}$ **X 100 =** $\frac{45}{95}$ **x 100 = 47%**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

II B.Sc., SEMESTER–III PAPER C5 (Model Paper)

OPTICS

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 $\frac{1}{2}$ Hours Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question form 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. Short answer question 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. Problems from UNIT - II
12. Problems from UNIT - IV
13. Problems from UNIT - V

SEMESTER-III COURSE 5: OPTICS Practical

Credits: 1 **2hrs/week**

COURSE OBJECTIVE:

To develop practical skills in the use of laboratory equipment and experimental techniques for studying light and its interactions with matter.

LEARNING OUTCOMES:

1. Mastery of experimental techniques: Students should become proficient in using laboratory equipment experimental techniques for studying light and its interactions with matter.
2. Application of theory to practice: Students should be able to apply theoretical concepts learned in lectures t real-world situations, and understand the limitations of theoretical models.
3. Accurate recording and analysis of data: Students should be able to accurately record and analyse experime data, including understanding the significance of error analysis and statistical methods.
4. Critical thinking and problem solving: Students should be able to identify sources of error, troublesh experimental problems, and develop critical thinking skills in experimental design and analysis.
5. Understanding of physical principles: Students should develop an understanding of the physical princi governing optics, including reflection, refraction, diffraction, interference, and polarization.

Minimum of 6 experiments to be done and recorded

1. Determination of radius of curvature of a given convex lens-Newton's rings.
2. Resolving power of grating.
3. Study of optical rotation –polarimeter.
4. Dispersive power of a prism.
5. Determination of wavelength of light using diffraction grating-minimum deviation method.
6. Determination of wavelength of light using diffraction grating-normal incidence method.
7. Determination of wavelength of laser light using diffraction grating.
8. Resolving power of a telescope.
9. Refractive index of a liquid-hallow prism
10. Determination of thickness of a thin wire by wedge method
11. Determination of refractive index of liquid-Boy's method.

STUDENT ACTIVITIES

Suggested student activities

UNIT-I Aberrations:

Ask students to observe and sketch the different images produced by the lens at different distances. Build a simple optical system with two lenses in contact and ask students to calculate the focal length and magnification of the system. Then, introduce a thin glass plate between the lenses to simulate the effects of chromatic aberration and ask students to observe and discuss the changes in the image produced.

UNIT-II Interference:

Ask students to measure the diameter of the central bright spot and the diameter of the nth ring for different values c n, and then calculate the wavelength of light.

UNIT-III Diffraction:

Build a simple diffraction grating using a piece of cardboard and some sewing needles. Ask students to measure the distance between the needles, count the number of lines per unit length, and then calculate the grating spacing and the wavelength of light.

UNIT-IV Polarisation:

Ask students to measure the angle of rotation of the polarized light before and after passing through the sample, and then calculate the specific rotation of the sample.

UNIT-V Lasers and Holography:

Demonstrate the principle of holography using a laser beam, a beam splitter, and a photographic plate. Ask students to record a hologram of a simple object and then reconstruct the image using a laser beam.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)Kakinada.

II B.Sc., Physics-Semester – III, Paper – 5

OPTICS Practicals

Scheme of Valuation for Practicals

Time: 3hrs 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

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

PHYSICS BOS 2024 - 25

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester: II B.Sc. (III Sem) COURSE-6 W.e.f. 2023 - 24			
Course Code	**HEAT AND THERMODYNAMICS**				
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites:	Drift, Diffusion, Laws of thermodynamics, Heat capacities, Gas laws Heat transfer methods, Statistics (Mean, mode, median, Standard deviation, errors)	3	0	-	3

Aim and objectives of the course:

- To know the molecular distribution of gases and random nature of gaseous molecules
- To understand the concepts and working of heat engines, refrigerators
- To know the efficiency of engines
- To study the various methods of reaching low temperatures
- To study the energy of thermal radiation.

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 phenomenonin 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.

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	

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., Physics-Semester – III, Paper – C6

Heat and Thermodynamics

Course Code: **No. of credits: 03**

w.e.f. 2023-24 ADMITTED BATCH

Hours/Week 3[Total: 45hrs.]

UNIT-I: KINETIC THEORY OF GASES:

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:

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:

Thermodynamic Potentials-Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's FreeEnergy and their significance, Derivation of Maxwell's thermodynamic relations from thermodynamic potentials, Applications to (i) Clausius-Clayperon's equation (ii) Joule-Kelvincoefficient for ideal and Van der Waals' gases.

UNIT-IV: LOW TEMPERATURE PHYSICS:

Methods for producing very low temperatures, Joule Kelvin effect, porous plug experiment, Joule expansion, Distinction between adiabatic and Joule Thomson expansion, Expression for Joule Thomson cooling, Production of low temperatures by adiabatic demagnetization (qualitative).

UNIT-V: QUANTUM THEORY OF RADIATION: .

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(A) KAKINADA.

II B.Sc., Physics-Semester – III, Paper – C6

Heat and Thermodynamics (Blue Print)

w.e.f. 2023-24 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	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**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A). KAKINADA

II B.Sc., SEMESTER–III **PAPER C6**

(Model Paper)
Heat and Thermodynamics

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 form 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.Short answer question 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.Problems from UNIT - II

12.Problems from UNIT - IV

13.Problems from UNIT - V

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (III Sem) C6 w.e.f. 2023-24 ADMITTED BATCH			
Course Code	**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.

Virtual Lab Links

- https://vlab.amrita.edu/
- http://physics.bu.edu/~duffy/classroom.html
- https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html&sort=alpha&view= grid

Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

1. **Measurable: Assignments on:**

Maxwell's law of distribution of molecular velocities, Transport phenomenon in ideal gases: viscosity, Thermal conductivity and diffusion of gases. Introduction- Isothermal and Adiabatic processes, Reversible and irreversible processes,

Carnot'sengineanditsefficiency,Carnot'stheorem,Thermodynamicscaleoftemperature, Thermodynamic potentials-Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb'sFreeEnergyandtheirsignificance,DerivationofMaxwell'sthermodynamic relations fromthermodynamic potentials, Joule Kelvin effect, Porous plug experiment ,Joule expansion, Distinction between adiabatic and Joule Thomson expansion, Expression for Joule Thomsoncooling,LiquefactionofairbyLinde'smethod,Productionoflowtemperatures by adiabatic demagnetization

1. Student seminars (Individual presentation of Courses) on topics relating to: Kinetic Theory of Gases, Carnot's Engine and its efficiency, Carnot Theorem, Entropy, Maxwell Thermodynamic Equations, Joule Kelvin effect, Production of low temperatures, Plank Radiation law, Weins law, Pyrometers,
2. Quiz Programmes on: Kinetic theory of gases, Heat and Temperature entropy, Isothermal and Adiabatic process, Thermodynamic Potentials, Low temperature Physics, Thermal Radiation.
3. Individual Field Studies/projects: Carnot's Engine, Pyrometers, Adiabatic demagnetization, Porus plug experiment. Liquification of gases.
4. Group discussion on: Kinetic theory of gases, Quantum theory of Radiation, Low temperature physics and thermodynamic potentials,
5. Group/Team Projects on: Carnot's Engine, Pyrometers, Adiabatic demagnetization, Porus plug experiment. Liquification of gases.

2. **General**

6. Collectionofnewsreportsandmaintainingarecordof Course-cuttingsrelatingto topics covered in syllabus
7. Group Discussions on:
8. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
9. Any similar activities with imaginative thinking.
10. Recommended Continuous Assessment methods

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)Kakinada.

II B.Sc., Physics-Semester – III, Paper – C6

Heat and Thermodynamics Practicals

Scheme of Valuation for Practicals

Time: 3hrs 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

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

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester: II B.Sc. (III Sem) COURSE-7 W.e.f. 2023 - 24		
Course Code	**ELECTRONIC DEVICES AND CIRCUITS**			
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P
Pre-requisites:	Semiconductors, Photoelectric effect, Ohm's law	3	0	-

OBJECTIVE:

The course on Electronic Devices and Circuits aims to provide students with a fundamental understanding of electrc 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 imp of junction capacitance on diode characteristics.
2. Analyze and compare the characteristics and operation of different BJT configurations (CB, CE, and CC) a demonstrate proficiency in biasing techniques.
3. Comprehend the operation and characteristics of FETs, including JFETs and MOSFETs, and explain working principles and characteristics of UJTs.
4. Describe the operation and applications of various photoelectric devices such as LEDs, photo dio phototransistors, and LDRs.
5. Understand the operation of rectifiers (half-wave, full-wave, and bridge), analyze the ripple factor an efficiency, and demonstrate knowledge of different filter types and three-terminal voltage regulators

NIT I: PN JUNCTION DIODES

P-N junction Diode, Formation of depletion region, Forward and Reverse bias Ideal Diode, Diode equatio
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 fo
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, Ph
diode - Construction, working characteristics and Applications, Phototransistors - Construction, working a
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 fixe 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
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(A) KAKINADA.

II B.Sc., Physics-Semester – III, Paper – C7

ELECTRONIC DEVICES AND CIRCUITS (Blue Print)

w.e.f. 2023-24 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	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**

Percentage of Choice = $\frac{(95 - 50)}{95}$ **X 100** = $\frac{45}{95}$ **x 100** **= 47%**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

II B.Sc., SEMESTER–III PAPER C7 (Model Paper)

ELECTRONIC DEVICES AND CIRCUITS

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 ½ Hours Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question form 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. Short answer question 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. Problems from UNIT - II
12. Problems from UNIT - IV
13. Problems from UNIT - V

SEMESTER-III COURSE 7:

ELECTRONIC DEVICES AND CIRCUITS

Practical Credits: 1 2 hrs/week

COURSE OBJECTIVE:

The course objectives for a practical course in Electronic Devices and Circuits might provide hands-on experience v 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 it 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 func 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

STUDENT ACTIVITIES

Unit I: PN Junction Diodes
Activity: V-I Characteristic Analysis
Students can analyze the V-I characteristics of a PN junction diode by using a simple circuit setup. They can measu the voltage across the diode for different values of forward and reverse bias currents and plot the corresponding current-voltage graph. They can discuss the behavior of the diode in different bias conditions.

Unit II: Bipolar Junction Transistor and Its Biasing
Activity: Transistor Configuration Analysis
Students can analyze the characteristics of different transistor configurations (CB, CE, CC) using a transistor tester circuit setup. They can measure and compare the input/output characteristics, gain, and voltage levels for each configuration. They can discuss the advantages and disadvantages of each configuration.

Unit III: Field effect transistors & Power electronic devices
Activity: FET Transfer Characteristic Analysis
Students can analyze the transfer characteristics of a FET by measuring the drain current (ID) for different gate-sou voltages (VGS). They can plot the transfer characteristic curve and observe the variations in ID with VGS. They ca discuss the operation modes of FETs based on the transfer characteristics.

Unit IV: Photoelectric Devices
Activity: LED and Photodiode Circuit Demonstration
Students can set up simple LED and photodiode circuits to demonstrate their operation. They can observe the emiss of light from an LED when a suitable voltage is applied and measure the current. They can also detect light using a photodiode and measure the output current for different light intensities.

Unit V: Power Supplies
Activity: Rectifier Efficiency Calculation
Students can analyze the efficiency of different rectifier circuits (half wave, full wave, and bridge rectifiers) by measuring the input and output power. They can calculate the rectifier efficiency and compare the results for differe rectifier configurations. They can discuss the factors affecting efficiency and the importance of regulation

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)Kakinada.

II B.Sc., Physics-Semester – III, Paper – 7

ELECTRONIC DEVICES AND CIRCUITS Practicals

Scheme of Valuation for Practicals

Time: 3hrs 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

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

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A), KAKINADA	**Program & Semester** II B.Sc. (III Sem) COURSE-8 W.e.f. 2023 - 24		
Course Code	ANALOG AND DIGITAL ELECTRONICS			
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P
Pre-requisites:	Transistor, Amplifier, Number systems	3	0	-

SEMESTER-III COURSE 8:
ANALOG AND DIGITAL ELECTRONICS

Theory Credits: 3 3 hrs/week

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 sta 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- different 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 bia 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 respon 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 construc 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 Laws

UNIT-IV: ARITHMETIC CIRCUITS & DATA PROCESSING CIRCUITS

a) Half Adder and Full Adder: Explanation of truth tables and Circuits. Half Subtractor and Full Subtract 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 t Demultiplexer, Applications of Multiplexers and Demultiplexers Decoders: 1 of 2 decoders, 2 of 4 decode 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 NANI NOR Latches, Clocked SR Flip-flop, JK Flip-flop, D Flip-flop, Master-Slave Flip- flop, Conversion of Fl flops.

b) Code Converters: BCD to Decimal Converter, BCD to Gray Code Converter, BCD to 7 segment Decoders

ference 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.
5. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
6. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA.

II B.Sc., Physics-Semester – III, Paper – C8

ANALOG AND DIGITAL ELECTRONICS (Blue Print)

w.e.f. 2023-24 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	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**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

II B.Sc., SEMESTER–III PAPER C8 (Model Paper)

ANALOG AND DIGITAL ELECTRONICS

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 $\frac{1}{2}$ Hours Max Marks: 50

PART-I

Answer **any Three** questions by attempting at least one question form 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. Short answer question 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. Problems from UNIT - II
12. Problems from UNIT - IV
13. Problems from UNIT - V

SEMESTER-III COURSE 8:
ANALOG AND DIGITAL ELECTRONICS

Practical Credits: 1 2 hrs/week

COURSE OBJECTIVES:

The course objectives for a practical course in Analog and Digital Electronics might provide students with hands-o experience in designing, constructing, and testing analog and digital electronic circuits.

LEARNING OUCOMES:

1. Understand the principles of analog and digital electronic circuits and their applications in real-world scena
2. Analyze and design analog electronic circuits using diodes, transistors, and operational amplifiers.
3. Analyze and design digital electronic circuits using logic gates, flip-flops, and counters.
4. Understand the importance of biasing, feedback, and stability in electronic circuits and how to achieve them
5. Develop the skills to design and analyze amplifier circuits and digital systems.

Minimum six 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

STUDENT ACTIVITIES

UNIT-I: OPERATIONAL AMPLIFIERS

Circuit Analysis: Students can be asked to analyze different operational amplifier circuits such as inverting and non-inverting amplifiers, summing amplifiers, difference amplifiers, and integrators. They can be asked to calculate the gain, input and output impedance, and frequency response of the circuits.

Circuit Design: Students can be asked to design different operational amplifier circuits such as audio amplifiers, filt and oscillators. They can be asked to select the appropriate op-amp and other components such as resistors, capacit and inductors to meet the desired specifications.

UNIT-II: PRACTICAL OPERATIONAL AMPLIFIER AND APPLICATIONS

Design an inverting amplifier circuit: Students can be asked to design and build an inverting amplifier circuit using operational amplifier and a few passive components. They can then measure the gain and frequency response of the circuit using an oscilloscope and a function generator. They can also compare the measured values with the theoreti calculations and simulation results.

Build a summing amplifier circuit: Students can be asked to build a summing amplifier circuit using an operational amplifier and several input signals. They can then measure the output voltage of the circuit and compare it with the expected value. They can also investigate the effect of changing the input signal amplitudes and the resistor values c the circuit performance.

UNIT-III: NUMBER SYSTEMS, CODES AND LOGIC GATES

Convert numbers between different bases: Students can be asked to convert numbers between binary, decimal, and hexadecimal bases. They can practice converting both integer and fractional numbers, and verify their results using online conversion tools or calculators.

Design a binary adder circuit: Students can be asked to design and build a binary adder circuit using logic gates sucl XOR, AND, and OR gates. They can then test the circuit by adding two binary numbers and comparing the result w the expected value.

UNIT-IV: ARITHMETIC CIRCUITS & DATA PROCESSING CIRCUITS

Design a data processing circuit: Students can be asked to design and build a data processing circuit that performs a specific function, such as filtering, modulation, or demodulation. They can use op-amps, filters, modulators, and demodulators to implement the circuit and test its performance using simulated or real-world signals.

Implement a digital signal processing algorithm: Students can be asked to implement a digital signal processing algorithm, such as a Fourier transform, a discrete cosine transform, or a digital filter. They can use software tools su as MATLAB or Python to simulate the algorithm and test its performance using sample signals.

UNIT-V: SEQUENTIAL LOGIC CIRCUITS & CODE CONVERTERS

Design a flip-flop circuit: Students can be asked to design and build a flip-flop circuit using logic gates and test its operation by creating a sequence of logic signals. They can also compare the performance of different types of flip-flops, such as SR, D, JK, and T, and discuss their advantages and disadvantages in sequential circuits.

Implement a counter circuit: Students can be asked to design and build a counter circuit that counts up or down usir flip-flops. They can use different types of counters, such as ripple, synchronous, or Johnson, and test their operation connecting the output to LEDs or other indicators.

Design a code converter circuit: Students can be asked to design and build a code converter circuit that converts a binary code to another code, such as Gray code, BCD, or ASCII. They can use logic gates, multiplexers, and decode to implement the circuit, and test its operation by inputting different codes

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)Kakinada.

II B.Sc., Physics-Semester – III, Paper –8
ANALOG AND DIGITAL ELECTRONICS

Practicals

Scheme of Valuation for Practicals

Time: 3hrs 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

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

	P.R. Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (IV Sem)C9 w.e.f. 2023-24 ADMITTED BATCH			
Course Code	**ELECTRICITYAND MAGNETISM (C9) (MAJOR/MINOR)**				
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites:	Differentiation, line, surface and volume integration, Coulomb's law, AC, DC, VC, RMS Value and Classification of materials based on electrical conductivity, Introduction to semiconductors.	3	0	-	3

Aim and objectives of the course:

- To learn about Gauss law and solve the electric field and magnetic field for various geometricobjectsandtolearnbasicelectronicconceptsinanalogganddigitaltheory.
- To be Explain all the topics of Experiments, Concepts and Derivations to the student
- Apply the principles of electronics in day-to-day life.
- Encourage all the students to study higher educational courses in reputed institutes and to enrich the students with creative, logical and analytical skills and to motivate the students towards research side.

Learning outcomes of the Subject:

On successful completion of this course, the students will be able to:
Understand the Gauss law and its application to obtain electric field in different cases and formulat e relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity d Dielectric constant.

1. Understand the Gauss law and its application to obtain electric field in different cases and formulate the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and Dielectric constant.
2. To learn the methods used to solve problems using loop analysis, Nodal analysis, Thvenin's theorem, Norton's theorem, and the Superposition theorem
3. Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.
4. Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.
5. Develop an understanding on the unification of electric, and magnetic fields and Maxwell's equations governing electromagnetic waves.
6. Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor and the comparative study of series and parallel resonant circuits

ɔurse Outcomes

On Completion of the course, the students will be able to-		Cognitive domain
CO1	Students would able to learn about the concepts of electric field and electric potential due to point charge, solid sphere, and cylinder. These concepts will enhance the student towards the problems come across in the real life. Students would also able to learn about the concept of dielectrics and its applications	Understanding & Remembrance
CO2	Students would able to learn about the concepts of Biot savart's law, Faraday's law and it's applications. Students would also able to learn about Faradays laws and their applications in daily life like solenoid	Application
CO3	Students would able to learn about different combinations of Inductor, capacitance and resistor and also their performance characteristics. Students would also able to learn about mathematical description of Electromagnetic Waves i.e., Maxwell's equations	Analysis
CO4	Students would able to learn about number system, Boolean algebra, basic logic gates which are more useful in digital world	Application &Understandin g

- Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

ELECTRICITYAND MAGNETISM (C9)

(MAJOR/MINOR)

UNIT-I Electrostatics and Dielectrics

Gauss's law-Statement and its proof, Electric field intensity due to (i) uniformly charged solid sphe lectrical potential–Equipotential surfaces, Potential due to a uniformly charged sphere. Dielectrics-Pc nd Non-polar dielectrics- Effect of electric field on dielectrics, Dielectric strength, Electric displacement lectric polarization Relation between D, E and P, Dielectric constant and electric susceptibility.

UNIT-II Current electricity

lectrical conduction-drift velocity-current density, equation of continuity, ohms law and limitatio Kirchhoff's Law's, Wheatstone bridge-balancing condition - sensitivity. Branch current method, No nalysis, star to delta & delta to star conversions. Superposition Theorem, Thevenin's Theorem, Norto heorem, Maximum power transfer theorem.

UNIT-III Magneto statics

Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, Ampere's Circuital Law and pplication to Solenoid, Hall effect, determination of Hall coefficient and applications.

Electromagnetic Induction:

Faraday's laws of electromagnetic induction, Lenz's law, Self-induction and Mutual induction, Se nductance of a long solenoid, Magnetic Energy density. Mutual inductance of a pair of coils. Coefficient Coupling

UNIT-IV Electromagnetic waves-Maxwell's equations:

Basic laws of electricity and magnetism- Maxwell's equations- integral and differential forms Derivati oncept of displacement current. Plane electromagnetic wave equation, Hertz experiment-Transverse nature electromagnetic waves. Electromagnetic wave equation in conducting media. Pointing vector a opagation of electromagnetic waves

UNIT-V Varying and alternating currents:

Growth and decay of currents in LR, CR, LCR circuits-Critical damping. Alternating current - A undamentals, and A.C through pure R, L and C. Relation between current and voltage in LR and CR circu hasor and Vector diagrams, LCR series and parallel resonant circuit, Q –factor, Power in ac circuits, Pov actor.

REFERENCE BOOKS

. BSc Physics, Vol.3, Telugu Akademy, Hyderabad.

. Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.

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

. "Electricity and Magnetism" by Brijlal and Subramanyam Ratan Prakashan Mandir, 1966

. "Electricity and Magnetism: Fundamentals, Theory, and Applications" by R. Murugeshan, Kiruthiga Sivarasath, and M. Saravanapandian

. "Electricity and Magnetism: Theory and Applications" by Ajoy Ghatak and S. Lokanathan

. Electricity and Magnetism: Problems and Solutions" by Ashok Kumar and Rajesh Kumar

. Electricity and Magnetism, R.Murugeshan, S. Chand & Co

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 Physics Paper – C9 – Semester – IV

Electricity, Magnetism & Electronics

w.e.f. 2023 - 24 Admitted Batch

Time: 2 ½ Hrs. Max. Marks: 50

MODEL QUESTION PAPER

Note: - Set the question paper as per the blue print given.

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	20
III	1	1	-	15
IV	1	-	1	15
V	1	1	1	20
Total Marks				**95**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

II B. Sc Physics Paper – C6 – Semester – IV

Electricity and Magnetism (Model Question Paper)

w.e.f. 2023 - 24 Admitted Batch

Time: 2 Hrs. **Max. Marks: 50**

PART-I

Answer **any Three** questions by attempting at least one question form 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 – V
11. Problem from UNIT - II
12. Problem from UNIT - IV
13. Problem from UNIT - V

	Pithapur Rajah's Government College (Autonomous) Kakinada	**Program & Semester** II B.Sc. (IV Sem)C9 w.e.f. 2023 - 24 Admitted Batch			
Course Code	**ELECTRICITYAND MAGNETISM (C9) (MAJOR/MINOR)**				
Teaching	Hours Allocated: 30 (**PRACTICALS**)	L	T	P	C
Pre-requisites:	Multimeter, Bread board, Active, passive components, Power supply, Function generator, Electrical appliances safety operation.	-	0	2	1

Minimumof6experimentstobedoneandrecorded:

. Figure of merit of a moving coil galvanometer.

. LCR circuit series/parallel resonance, Q factor.

. Determination of ac-frequency –Sonometer.

. Verification of Kirchhoff's laws and Maximum Power Transfer theorem.

. Verification of Thevenin's and Norton's theorem

. Field along the axis of a circular coil carrying current-Stewart & Gee's apparatus.

. Charging and discharging of CR circuit-Determination of time constant

. A.C Impedance and Power factor

. Determination of specific resistance of wire by using Carey Foster's bridge

Virtual LabLinks:

- https://vlab.amrita.edu/
- http://web.mit.edu/8.02t/www/802TEAL3D/visualizations/guidedtour/GuidedTour.htm
- http://web.mit.edu/8.02t/www/802TEAL3D/visualizations/guidedtour/GuidedTour.htm
- http://physics.bu.edu/~duffy/classroom.html

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA

II B. Sc Physics Paper – C9 – Semester – IV

Electricity and Magnetism

Scheme of Valuation for Practical's

Time: 3hrs 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	-5 Marks
6. Record	- 5 Marks

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

Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

Measurable:

- **Assignments on**: Gauss's law- Statement and its proof, Electricfield intensity due to uniformly charged solid sphere and Potential due to a uniformly charged sphere.
- **Student seminars (Individual presentation of Courses) on topics relating to**:
- Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, Ampere's Circuital Law and its application to Solenoid, Hall effect, determination of Hall coefficient and applications
- **Quiz Programmes on**: PN junction diode, Zener diode and Light Emitting Diode (LED) and their I-V characteristics, Zener diode as a regulator- Transistors and its operation, CB, CE and CC configurations
- **Individual Field Studies/projects**: Maxwell's equations -Derivation, Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves, Poynting theorem (Statement and proof)
- **Group discussion on:** Number systems, Conversion of binary to decimal system and vice versa, Binary addition & Binary subtraction (1's and 2's complement methods), Laws of Boolean algebra
- **Group/Team Projects on**: Alternating current - Relation between current and voltage in L, C, R, LR and CR circuits, Phasor and Vector diagrams, LCR series and parallel resonant circuit, Q –factor, Power factor.

General

1. Collectionofnewsreportsandmaintainingarecordof Course-cuttingsrelatingto topics covered in syllabus
2. Group Discussions on:
3. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
4. Any similar activities with imaginative thinking.

Recommended Continuous Assessment methods:

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (IV Sem) C10 **w.e.f.2023-24** **ADMITTED BATCH**			
Course Code	**MODERN PHYSICS** **Paper – C10 MAJOR/MINOR**				
Teaching	Hours Allocated: 45(**Theory**)	L	T	P	C
Pre-requisites:	Atomic models, Types of spectra, Matrices, Types of forces in nature, Electrical conductivity.	4	0	-	4

Aim and objectives of the course:

- To Create awareness on the topics of Atomic & Molecular Physics, Quantum mechanics, Nuclear Physics, and Solid-state physics.
- To be explain all the topics of experiments, concepts and derivations to the student.
- Explain the basic principles of quantum mechanics and apply to atomic, Molecular structure of energy levels etc.
- Motivate all the students to pursue PG courses in reputed institutes and to endow the students with creative and analytical skills; this will equip them to become entrepreneurs.

Learning outcomes of the Subject:

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

1. Understand the principles of atomic structure and spectroscopy.
2. Understand the principles of molecular structure and spectroscopy
3. Develop critical understanding of concept of Matter waves and Uncertainty principle.
4. Get familiarized with the principles of quantum mechanics and the formulation of Schrodinger wave equation and its applications.
5. Increase the awareness and appreciation of superconductors and their practical applications

Course Outcomes

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Students would able to learn about the concepts of atomic models and their drawbacks. Students would also learn about Stern & Gerlach experiment Vector atom model; this model gives the existence of spin of an electron. Study of fine spectra and Zeeman effect on various elements.	Remembering &Understanding
CO2	Students would able to learn about the importance of Quantum mechanics, study the basic concepts involved in the origin of quantum mechanics like uncertainty principle, De-Broglie matter waves, and experiments that confirm wave nature of matter and particle nature of radiation.	Application
CO3	Students would able to learn about the importance of Heisenberg's uncertainty principle for position and momentum. Students would able to learn Schrodinger time independent and time dependent wave equations. Wave function properties Significance. Basic postulates of quantum mechanics. from these we can predict the position of a particle at future specific time	Analyzing
CO4	Students would learn about basic properties of nucleus, dipole & quadrupole moments, binding energy, nuclear forces and nuclear models. Elementary particles and counters Students would learn about basics of nanomaterials, classification, properties.	Application &Understanding

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)Kakinada.

II B.Sc., Physics-Semester – IV, Paper – C10

Modern Physics

w.e.f. 2024-25 ADMITTED BATCH

Course Code: **No. of Credits: 03**

No. of Hrs./Wk:03 **Total Hrs:60**

UNIT-I: Introduction to Atomic Structure and Spectroscopy:

Bohr's model of the hydrogen atom -Derivation for radius, energy and wave number - Hydrogen spectrur Vector atom model – Stern and Gerlach experiment, Quantum numbers associated with it, Couplir Schemes, Spectral terms and spectral notations, Selection rules. Zeeman effect, Experimental arrangement to study Zeeman effect.

UNIT-II: Molecular Structure and Spectroscopy

Molecular rotational and vibrational spectra, electronic energy levels and electronic transitions, Raman effec Characteristics of Raman effect, Experimental arrangement to study Raman effect, Quantum theory Raman effect, Applications of Raman effect. Spectroscopic techniques: IR, UV-Visible, and Rama Spectroscopy

UNIT-III: Matter waves & Uncertainty Principle:

Matter waves, de Broglie's hypothesis, Properties of matter waves, Davisson and Germer's experimer Heisenberg's uncertainty principle for position and momentum & energy and time, Illustration of uncertain Principle using diffraction of beam of electrons (Diffraction by a single slit) and photons (Gamma ra Microscope).

UNIT-IV: Quantum Mechanics:

Basic postulates of quantum mechanics, Schrodinger time independent and time dependent wave equation Derivations, Physical interpretation of wave function, Eigen functions, Eigen values, Application Schrodinger wave equation to (one-dimensional potential box of infinite height (Infinite Potential Well)

UNIT-V: Superconductivity:

Introduction to Superconductivity, Experimental results-critical temperature, critical magnetic field, Meissn Effect, London's Equation and Penetration Depth, Isotope effect, Type I and Type II superconductors, BC

ıeory, high Tc super conductors, Applications of superconductors

REFERENCE BOOKS

1. BSc Physics, Vol.4, Telugu Akademy, Hyderabad
2. Atomic Physics by J.B. Rajam; S.Chand& Co.,
3. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.
4. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
5. Nuclear Physics, D.C.Tayal, Himalaya Publishing House.
6. S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publ.Co.)
7. K.K.Chattopadhyay&A.N.Banerjee, Introd.to Nanoscience and Technology(PHI Learning Priv. Limited).
8. Nano materials, A K Bandopadhyay. New Age International Pvt Ltd (2007)
9. Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj,BB Rath and J Murday-Universities Press-IIM

	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_{10}	PSO_1	PSO_2	PSO_3	PSO_4
CO_1	3	3	2	3	3	3	1	2	2	3	2	3	2	3
CO_2	3	2	3	3	2	3	3	1	3	3	3	2	1	2
CO_3	2	3	2	3	2	3	2	2	2	3	2	2	3	3
CO_4	3	2	3	2	2	2	3	3	1	1	3	1	2	2

Weblinks:

- https://ocw.mit.edu/resources/res-6-005-understanding-lasers-and-fiberoptics-spring-2008
- https://nptel.ac.in/courses/115/105/115105083/
- https://ocw.mit.edu/courses/physics/8-02t-electricity-and-magnetism-spring-2005
- https://nptel.ac.in/courses/115/103/115103108
- https://nptel.ac.in/courses/118/102/11810200
- https://nptel.ac.in/courses/115/104/115104096/

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) Kakinada.

II B.Sc., Physics-Semester – IV, Paper – C10

Modern Physics – Blue Print

w.e.f. 2023-24 ADMITTED BATCH

Course Code: **No. of Credits: 03**

MODEL QUESTION PAPER

Note: - Set the question paper as per the blue print given.

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	1	20
III	1	1	-	15
IV	1	1	1	20
V	1	1	-	15
Total Marks				**95**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)Kakinada.

II B.Sc., Physics-Semester – IV, Paper – C10

Modern Physics

w.e.f. 2023-24 ADMITTED BATCH

Course Code: **No. of Credits: 03**

Time: 2 Hrs. **Max. Marks: 50**

PART-1

Answer **any Three** questions by attempting at least one question form 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
4. Essay question from UNIT-III
5. Essay question from UNIT-IV
6. Essay question from UNIT- V

PART-2
SECTION-B

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. Problems from UNIT - I
12. Problems from UNIT - II
13. Problems from UNIT - IV

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code	**MODERN PHYSICS LAB**	II B.Sc. (IV Sem) C10			
Teaching	Hours Allocated: 30 (**Practicals**)	L	T	P	C
Pre-requisites:	Radiation safety, Handling electrical equipment and magnets, Safety measures.	-	0	2	1

Minimum no of 6 experiments to be done and recorded

1. e/m of an electron by Thomson method.
2. Determination of Planck's Constant (photocell).
3. Verification of inverse square law of light using photovoltaic cell.
4. Determination of the Planck's constant using LEDs of at least 4 different colours.
5. Determination of work function of material of filament of directly heated vacuum diode.
6. Determination of M & H.
7. Energy gap of a semiconductor using junction diode.

Energy gap of a semiconductor using thermistor

Virtual Lab Links:

- https://vlab.amrita.edu/
- http://web.mit.edu/8.02t/www/802TEAL3D/visualizations/guidedtour/GuidedTour.htm
- http://physics.bu.edu/~duffy/classroom.html

Scheme of Valuation for Practicals

Time: 3hrs 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

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

Recommended Reference books:

Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

I. Measurable:

Assignments on: Stern-Gerlach experiment, Quantum numbers associated with it, Angular momentum of the atom, Coupling schemes, Experimental arrangement to study Zeeman effect; Raman effect, Characteristics of Raman effect. Experimental arrangement to study Raman effect, Applications of Raman effect, Wave length of matter waves, *Nuclear Radiation detectors*: G.M. Counter, Cloud chamber, Solid State detector, Classification of nano materials– (0D, 1D, 2D); Quantum dots, Nano wires, Fullerene, CNT, Graphene (Mention of structures and properties),

Student seminars (Individual presentation of Courses) on topics relating to: Stern-Gerlach experiment, Zeeman effect, Raman effect. Davisson and Germer's experiment, Heisenberg's uncertainty principal Schrodinger time independent and time dependent wave equations-Derivations, The Shell model, Magic numbers;

1. **Quiz Programmes on**: Zeeman effect, Matter waves, de Broglie's hypothesis, Heisenberg's uncertainty principle for position and momentum& energy and time, Schrodinger time independent and time dependent wave equations-Derivations.
2. **Individual Field Studies/projects**: Nuclear Radiation detectors: G.M. Counter, Cloud chamber, Solid State detector, Liquid drop model, Distinct properties of nano materials
3. **. Group discussion on:** Properties of matter waves, Davisson and Germer's experiment, Eigen functions, Eigen values, Application of Schrodinger wave equation to (i) one dimensional potential box of infinite height (Infinite Potential Well), Liquid drop model, TheShell model, Magic numbers
4. **Group/Team Projects on**: Basic postulates of quantum mechanics, Schrodinger time independent and time dependent wave equations-Derivations, Physical interpretation of wave function

II. General

5. Collectionofnewsreportsandmaintainingarecordof Course-cuttingsrelatingtotopics covered in syllabus
6. Group Discussions on:
7. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
8. Any similar activities with imaginative thinking. Recommended Continuous Assessment methods:

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester II B.Sc. (IV Sem) COURSE-11 W.e.f. 2023 - 24		
Course Code	**INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS**			
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P
Pre-requisites:	Properties of Nucleus, classification of elementary particles	3	0	-

SEMESTER-V

COURSE 11:

INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS

Theory Credits: 3 3 hrs/week

COURSE OBJECTIVE:

'he course aims to provide students with an understanding of the principles of Nuclear and Particle physics nd their applications in various fields.

LEARNING OUTCOMES

3y successful completion of the course, students will be able to

1. know about high energy particles and their applications which prepares them for further study and research in elciirapphysics
2. Students can explain important concepts on nucleon-nucleon interaction, such as its short-range, spin dependence, isospin, and tensors.
3. Students can show the potential shapes from nucleon nucleon interactions.
4. Students can explain the single particle model, its strengths, and weaknesses
5. Students can explain magic numbers based on this model

UNIT-I: Introduction to Nuclear Physics

Nuclear Structure: General Properties of Nuclei, Mass defect, Binding energy; Nuclear force Characteristics of nuclear forces- Yukawa's meson theory; Nuclear Models- Liquid drop model- Se empirical mass formula, nuclear shell model.

UNIT-II: Elementary Particles And Interactions

Discovery and classification of elementary particles, properties of leptons, mesons and baryons; Types interactions- strong, electromagnetic and weak interactions; Conservation laws – Isospin, parity, char conjugation

UNIT-III: Nuclear Reactions and Nuclear Detectors

Nuclear Reactions: Types of reactions, Conservation Laws in nuclear reactions, Reaction energet Threshold energy, nuclear cross-section; Nuclear detectors: Geiger- Muller counter, Scintillation count Cloud chamber

UNIT-IV: Nuclear Decays and Nuclear Accelerators

Nuclear Decays: Gamow's theory of alpha decay, Fermi's theory of Beta- decay, Energy release in Be decay, selection rules. Nuclear Accelerators: Types- Electrostatic and electrodynamics accelerato Cyclotron-construction, working and applications; Synchrocyclotron-construction, working a applications.

UNIT-V: Applications of Nuclear and Particle Physics

Medical Applications: Radiation therapy and imaging techniques, nuclear energy: nuclear reactors a power generation, Particle physics in high-energy Astro Physics

Reference Books:

1. Nuclear Physics, Irving Kaplan, Narosa Pub. (1998).
2. Nuclear Physics, Theory and experiment – P.R. Roy and B.P. Nigam, New Age Int.1997.
3. Atomic and Nuclear Physics (Vol.2), S.N. Ghoshal, S. Chand & Co. (1994).
4. Nuclear Physics, D.C. Tayal, Himalaya Pub. (1997).
5. Atomic and Nuclear Physics, R.C. Sharma, K. Nath& Co., Meerut.
6. Nuclei and Particles, E. Segre.
7. Introduction to Nuclear Physics, H.A. Enge, Addison Wesley (1975).

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) Kakinada.

II B.Sc., Physics-Semester – IV, Paper – C11
INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS

Blue Print

w.e.f. 2023-24 ADMITTED BATCH

Course Code: **No. of Credits: 03**

MODEL QUESTION PAPER

Note: - Set the question paper as per the blue print given.

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	1	20
III	1	1	-	15
IV	1	1	1	20
V	1	1	-	15
Total Marks				**95**

Percentage of Choice = $\frac{(95-50)}{}$ **X 100 =**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)Kakinada.

II B.Sc., Physics-Semester – IV, Paper – C11
INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS

w.e.f. 2023-24 ADMITTED BATCH

Course Code: **No. of Credits: 03**

Time: 2 Hrs. **Max. Marks: 50**

PART-1

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

SECTION-A

14. Essay question from UNIT- I
15. Essay question from UNIT- I
16. Essay question from UNIT- II
17. Essay question from UNIT-III
18. Essay question from UNIT-IV
19. Essay question from UNIT- V

PART-2
SECTION-B

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

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

SEMESTER-IV

COURSE 11: INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS

Practical Credits: 1 2 hrs/week

COURSE OBJECTIVE:

To familiarize students with experimental techniques and methodologies used in nuclear and particlephysics.

To provide hands-on experience in conducting experiments related to nuclear and particle physics.

LEARNING OUTCOMES:

1. Gain a solid understanding of fundamental concepts in nuclear and particle physics.
2. Acquire knowledge of experimental techniques and methodologies used in the field.
3. Understand the principles and operation of laboratory equipment and instruments specific to nuclear and particle physics experiments.
4. Develop proficiency in conducting experiments related to nuclear and particle physics.
5. Acquire skills in data acquisition, analysis, and interpretation using appropriate software and techniques.
6. Learn to design and perform experiments, including calibration, measurement, and control of variables.

NSINRPTNEEX EPXE

1. GM counter – Determination of dead time
2. eiacl oc rilclripciiiir racop oc se roacipc lcc piiioliioc oc iii oepcliict ooailtp
3. riiioliioc oc pcciripcrl coc l tlool ioacrp oc iip se roacipc
4. ro opcicl icopcip ilalcp alw aiict se roacipc
5. fcocariioc lcc liipcaliioc ocbremsstrahlung
6. riiioliioc oc pcciripcrl coc l bpil ioacrp oc iip se roacipc
7. eiacl oc blre irliipcict oc bpil elciirapi

STUDENT ACTIVITIES

UNIT-I: INTRODUCTION TO NUCLEAR PHYSICS

Provide students with a computer simulation or interactive app that allows them to explore radioactive decayprocesses.
Ask students to observe and analyze the decay patterns of different isotopes, including the concept of half-life.
Guide students to make connections between the simulation results and the fundamental principles ofnuclear physics

UNIT-II: ELEMENTARY PARTICLES AND INTERACTIONS

Divide students into small groups and assign each group a specific elementary particle (e.g., proton, electron,neutrino, quark).
Instruct students to create a poster showcasing their assigned particle, including its properties, classification,and interactions.
Encourage creativity in the presentation of information, such as diagrams, illustrations, and concise explanations.
Have each group present their posters to the class, promoting discussion and comparisons between different particles.

UNIT-III: NUCLEAR REACTIONS AND NUCLEAR DETECTORS

Divide students into small groups and assign each group a specific scenario that requires radiation shielding, such as a nuclear power plant, a medical facility, or a space mission.
Instruct students to research and design an effective radiation shielding system for their assigned scenario, considering factors such as the type of radiation, the intensity of radiation, and the materials available for shielding.
Encourage students to calculate and compare the attenuation properties of different materials and discuss the trade-offs between effectiveness, cost, and practicality in their designs.
Have each group present their shielding design to the class, explaining their rationale and addressing potential challenges or limitations

UNIT-IV: NUCLEAR DECAYS AND NUCLEAR ACCELERATORS

Provide students with a radioactive decay chain involving multiple decays, such as alpha decay, beta decay,and gamma decay.
Instruct students to analyze the decay chain and determine the sequence of decays, including the types ofparticles emitted and the resulting daughter nuclei.
Ask students to calculate the half-lives of the parent and daughter nuclei based on the decay data and explorethe concept of radioactive equilibrium.
Encourage students to discuss the practical applications and significance of decay chains in fields such asradiometric dating or medical imaging

UNIT-V: APPLICATIONS OF NUCLEAR AND PARTICLE PHYSICS

Assign students specific medical imaging techniques based on nuclear and particle physics, such as positron emission tomography (PET), single-photon emission computed tomography (SPECT), or computed tomography (CT).
Instruct students to research and present on the principles behind their assigned imaging technique, includingthe interaction of particles or radiation with matter, detector technology, and image reconstruction methods. Ask students to discuss the advantages, limitations, and specific medical applications of their assignedimaging technique.
Encourage students to critically analyze the role of nuclear and particle physics in advancing medicaldiagnostics and treatment planning

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code	**TITLE OF THE COURSE APPLICATIONS OF ELECTRICITY AND MAGNETISM**	III Year PHYSICS MAJOR/MINOR C12/C5 Semester – V **w.e.f. 2023-24 ADMITTED BATCH**			
Teaching	Hours Allocated: 60, Max.marks 50 (**Theory**)	L	T	P	C
Pre-requisites	Circuit elements: R,L &C, Ohm's law, kirchhoff 's laws, ac& dc sources, mesh analysis, phasor analysis etc	4	-	-	4

Learning Outcomes: Students after successful completion of the course will be able to:

1. Identify various components present in Electricity& Electronics Laboratory.
2. Acquire a critical knowledge of each component and its utility (like resistors, capacitors, inductors, power sources etc.).
3. Demonstrate skills of constructing simple electronic circuits consisting of basic circuitelements.
4. Understand the need & Functionality of various DC & AC Power sources.
5. Comprehend the design, applications and practices of various electrical & Electronic devices and also their trouble shooting..

COURSE OBJECTIVES

The objective of the course on Applications of Electricity and Magnetism is to provide students with a comprehensive understanding of the practical applications of electricity and magnetism in various fields. The course aims to develop students' knowledge and skills in applying electrical and magnetic principles to real-world problems and technologies.

Course Outcomes

On Completion of the course, the students will be able to		**cognitive domain**
CO1	Identify various components present in Electricity& Electronics Laboratory.	Remembering
CO2	Acquire a critical knowledge of each component and its utility (like resistors, capacitors, inductors, power sources etc.).	Applying
CO3	Demonstrate skills of constructing simple electronic circuits consisting of basic circuitelements.	Understanding
CO4	Understand the need & Functionality of various DC & AC Power sources.	Analyzing

Course with focus on Employability / Entrepreneurship / Skill Development modules

Skill Development		**Employability**		**Entrepreneurship**	

Syllabus: *TotalHours:50instruction hours (Lab, Field Training, Unittestsetc. -40)*

Unit-I: Introduction to Passive Elements

a) Passive elements

Resistor - Types of Resistors, Color coding, Combination of Resistors – Series combination (Vol division), Parallel combination (Current division), Ohms Law and its limitation. Inductor - Principle, I induced in an Inductor, Energy stored in Inductor, Phase relation between V and I, Combinations Inductors, Types of Inductors. Capacitor - Principle, Charging and discharging of a Capacitor, Type Capacitors, Color coding

b) Applications of Passive elements:

Applications of a Resistor as a heating element in heaters and as a fuse element. Open circuit, S circuit, Applications of Inductors, Application of choke in a fan and in a radio tuning circuit, Se resonance circuit as a Radio tuning circuit. Applications of Capacitor in power supplies, motors (Fans)

Unit-II Power Sources (Batteries)

a) Power sources:

Types of power sources-DC & AC sources, Different types of batteries, Rechargeable batteries –Lea acid batteries, Li-ion batteries **Series, Parallel & Series-Parallel configuration of batteries**,

b)Network Theorems for DC circuits

Thevenin's theorem, Norton's theorem, Maximum Power transfer theorem, Constant Voltage sourc Constant Current Source-Applications of Current sources & Voltage sources, SMPS used in computer

Unit-III Alternating & Direct Currents

a) A.C Generator, Construction and its working principle, Types of AC Generators, DC Genera Construction and its working principle, advantages and disadvantages, Applications, Types of Generators, Losses associated with DC generators, Differences between DC and AC generators

b) Transformers- Construction and its working principle, EMF equation, , Types of Transformers - S down and Step-up Transformers, Relation between primary turns and secondary turns of the transfor with emf, Use of a Transformer in a regulated Power supplies, Single phase motor – working princ Applications of motors (like water pump, fan etc).

Unit-IV Modulation Circuits

a) Need for modulation, Types of modulation, Amplitude modulation, modulation index, Waveforms, Pc relations, Demodulation, Diode detector, AM transmitter, AM Receiver, Frequency modulat modulation index, Waveforms, FM Transmitter, FM Receiver

b) Transmitters and Receivers:

AM transmitter, AM Receiver, Frequency modulation, modulation index, Waveforms, FM Transmi

Unit-V Applications of EM Induction & Power Supplies

a) DC motor – Construction and operating principle, Calculation of power, voltage and current in a motor, Design of a simple Motor (for example Fan) with suitable turns of coil

b) Working of a DC regulated power supply, Construction of a 5 volts regulated power supply, Design step-down (ex:220-12V) and step-up (ex:120-240V) transformers- Design of a simple 5 volts DC cha

References:

1. Grob's Basic Electronics by Mitchel Schultz , TMH or McGraw Hill

2. Electronic and Electrical Servicing by Ian Robertson Sinclair, John Dunton, Elsevier Publications

3. Troubleshooting Electronic Equipment by R.S.Khandapur ,TMH

Web sources suggested by the teacher concerne

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	1
CO4	3	2	3	2	2	2	3	3	1	1	3	1	2	1

REFERENCE BOOKS:

1. Grob's Basic Electronics by Mitchel Schultz , TMH or McGraw Hill
2. Electronic and Electrical Servicing by Ian Robertson Sinclair, John Dunton, Elsevier Publications
3. Troubleshooting Electronic Equipment by R.S.Khandapur ,TMH

Web sources suggested by the teacher concerne

Web links

- https://nptel.ac.in/content/storage2/courses/112105129/f/RAC%20Lecture%203.pdf
- Other Web sources suggested by the teacher concerned and the reading material.https://nptel.ac.in
- The Physics Hyper Text Book. Refrigerators.https://physics.info/refrigerators/
- https://trc.nist.gov/cryogenics/Papers/Review/2017-Low_Temperature_Applications_and_Challenges.pdf
- https://nptel.ac.in/content/storage2/courses/112105129/pdf/RAC%20Lecture%203.pdf
- Other Web sources suggested by the teacher concerned and the reading material.https://nptel.ac.in

APPLICATIONS OF ELECTRICITY AND MAGNETISM

2023-24ADMITTED 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 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	1	1	1	20
II	2	1	-	25
III	1	1	1	20
IV	1	1		15
V	1	1	-	15
Total Marks				**95**

I **TITLE OF THE COURSE**

APPLICATIONS OF ELECTRICITY AND MAGNETISM

2023-24ADMITTED 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 form 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 - I
9. Short answer question from UNIT - II
10. Short answer question from UNIT - III
11. Problem from UNIT - III
12. Short answer question from UNIT - IV
13. Short answer question from UNIT – V

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code PH	**TITLE OF THE PRACTICAL – C12** APPLICATIONS OF ELECTRICITY AND MAGNETISM Lab	III Year B. Sc Semester – V MAJOR/MINOR			
Practical	Hours Allocated: 30 hrs., Max Marks: 50 (**Lab**)	L	T	P	C
Pre-requisites	Thermometers, Multimeter, Various refrigerants	-	-	2	1

Learning Outcomes: On completion of practical course, student shall be able to

1. List out, identify and handle equipment used in refrigeration and low temperature lab.
2. Learn the procedures of preparation of Freezing Mixtures.
3. Demonstrate skills on developing various Freezing mixtures and materials and their applications in agriculture, medicine and day to day life.
4. Acquire skills in observing and measuring various methodologies of very low Temperatures
5. PerformsometechniquesrelatedtoRefrigerationandFreezingindailylife.

Practical (Laboratory)Syllabus:*(30hrs.Maxmarks:50)*)

1. Acquainting with the soldering techniques
2. Design and Construction of a 5 Volts DC unregulated power supply
3. Construction of a Step down Transformer and measurement of its output voltage. Andto compare it with the calculated value.
4. Connect two or three resistors or capacitors or inductors and measure the Series, Parallel Combination values using a Multimeter and compare the values with the Calculated values.
5. Use the Digital Multimeter and Analog Multimeter to measure the output voltage of an AC &DC power supply and also the voltage and frequency of a AC signal using CRO.
6. Use the Multimeter to check the functionality of a Diode and Transistor. Also test whether the given transistor is PNP or NPN.
7. Construct a series electric circuit with R, L and C having an AC source and study the frequency response of this circuit. Find the Resonance Frequency.
8. Construct a Parallel electric circuit with R, L & C having an AC source and study the frequency response of this circuit .Find the resonant frequency.

9. Test whether a circuit is a Open circuit or Short Circuit by measuring continuity witha Multimeter and record your readings.

Lab References:

1. Experimental techniques in low temperature physics by Guy White, Philip Meeson.
2. Experimental low-temperature physics by A.Kent,Macmillan physical science series
3. Physics and Chemistry at Low Temperatures by Leonid Khriachtchev. https://www.routledge.com/Physics-and-Chemistry-at-Low-Temperatures /Khriachtchev/p/book/9789814267519
4. PracticalCryogenics.http://research.physicsillinois.edu/bezryadin/links/practical%20Cryogenics.pdf
5. Freeze-Drying,3rdEditionbyPeterHaseley,Georg-WilhelmOetjen,Wiley(e-Book)
6. Web sources suggested by the teacher concerned.

Scheme of Valuation for Practicals

Time: 3hrs Max.Marks:50

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

Co-Curricular Activities:

(a) Mandatory:(*Trainingofstudentsbyteacherinfieldrelatedskills:(lab:10+field:05*)

1. **For Teacher**: Training of students by the teacher in the in the laboratory/field for a total of not less than 15 hours on the techniques/skills of Low Temperature Production, methods used and applications of Low temperatures and refrigeration in day-to-day life and other applications in medicine and industry.
2. **For Student**: Student shall (individually) visit (i) a small ice plant or a cold storage plant (ii) Air Conditioner (AC) repair shop or (iii) Refrigerator repair shop to understand the construction, working principle and the trouble shooting of these devices after interacting with the technicians. **Or** Student shall observe the various thermodynamic processes taking place while working with the refrigerator and observe the leak detection in refrigeration system by different methods, air

removal and charging of a refrigeration unit and testing of a refrigeration system to find out the Refrigerating capacity/Ton of refrigeration (TR) and the Power input. **Or** Student shall identify the refrigerant cylinder by color coding and standing pressure. **Or** Student shall visit the freezer isle of a supermarket and observes the bags of different frozen fruits. Student shall write the observations and submit a hand-written Fieldwork/ Project work not exceeding 10 pages in the given format to the teacher.

3. Max marks for Field work/Projectwork:05.
4. Suggested Format for Fieldwork /Project work: Titlepage, student details, index page, details of place visited, observations, findings and acknowledgements.
5. Unit tests (IE).

(b) <u>Suggested Co-Curricular Activities</u>

1. Training of students by related Factory, industrial experts.
2. Assignments (including technical assignments like identifying tools in Refrigerators, Freezers and their handling, operational techniques with safety and securit)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in Low Temperatures and applications.
5. Collection of material/figures/photos related to substances used in Freezing Mixtures, their Properties and availability etc., writing and organizing them in a systematic way in a file.
6. Visits to Ice plants and labs in universities, research organizations, private firms, etc.
7. Making your own mini refrigerator at home
8. Build your own water cooler with the materials available at home.
9. Making hand launched liquid nitrogen rockets
10. Experiments with Liquid nitrogen and strawberry/ banana/ lemon/ onion/ mushroom/egg etc. (*To be tried under professional supervision only*).
11. Invitedlecturesandpresentationsonrelatedtopicsbyfield/industrialexperts
12. Identification of different Ozone -depleting substances (ODS) that damage the ozone layer in the upper atmosphere.
13. Demonstrationtoillustratethegreenhouseeffectandtheroleofcarbondioxideasa greenhouse gas using plastic water bottles, flood light lamp, beakers and temperature sensors and observe the temperature changes.

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A), KAKINADA	**Program & Semester** III B.Sc. (V Sem) MAJOR/MINOR-COURSE-12 W.e.f. 2023 - 24		
Course Code	**SEMESTER-V** **COURSE 13: ELECTRONIC INSTRUMENTATION**			
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P
Pre-requisites:	Volte Meter, Ammeter, Multimeter, transducers	3	0	-

COURSE OBJECTIVE:

The objective of the course on Electronic Instrumentation is to provide students with a comprehensiv understanding of various electronic instruments used for measurement, data acquisition, and contrc applications. The course aims to develop students' knowledge and skills in the design, operatior calibration, and application of electronic instruments.

LEARNING OUTCOMES:

Students after successful completion of the course will be able to:

1. Identify various facilities required to set up a basic Instrumentation Laboratory.
2. Acquire a critical knowledge of various Electrical Instruments used in the Laboratory.
3. Demonstrate skills of using instruments like CRO, Function Generator, Multimeter etc. through hands on experience.
4. Understand the Principle and operation of different display devices used in the display systems and different transducers
5. Comprehend the applications of various biomedical instruments in daily life like B.P. meter, ECG, Pulse oximeter etc. and know the handling procedures with safety and security.

JNIT-I Introduction to Instruments (

) Basic of measurements:

Instruments accuracy, precision, sensitivity, resolution, range, errors in measurement, Classification o Instruments, Analog instruments & Digital Instruments, Construction and working of an Analo Multimeter and Digital Multimeter (Block diagram approach), DC Voltmeter and AC Voltmete Sources of errors in the Measurement of resistance, voltage and current, Specifications of Multimete and their significance.

) Balancing and damping Moving iron instruments & PMMC instruments.

UNIT-II Oscilloscope (

) Cathode ray oscilloscope – Principle and block diagram of CRO - Cathode Ray Tube – functioning –

) Applications CRO: Measurement of voltage (dc and ac), frequency & time period, Different types o oscilloscopes and their uses, Digital storage Oscilloscope

UNIT-III Transducers and Bridges (

) Linear Variable Differential Transformer (LVDT), Resistive, Capacitive & Inductive transducers, Piezo electric transducer.

) DC Bridge -Wheatstone's bridge, AC Bridges - Measurement of Inductance and Capacitance Maxwell's bridge, Schering Bridge, Measurement of frequency – Wien's bridge.

UNIT-IV ADC and DAC & Display Instruments **A/D & D/A converters - Bina adder, A/D converters –successive approximation type.**

) Introduction to Display devices, LED Displays, Seven Segment Displays, Construction and operatio (Display of numbers), Types of SSDs (Common Anode & Common Cathode type), Limitations of SSDs Liquid Crystal Displays, Principle and working, Applications of LCD modules.

UNIT-V Amplifiers, Oscillators & Biomedical Instruments Amplifiers Classification of amplifiers, Coupling amplifiers – RC Coupled amplifier – frequency response characterist no derivation), Feedback in Electronic circuits – Positive and Negative feedback, expressions for gai advantages of negative feedback, Barkhausen criteria, RC phase shift oscillator.

) Basic operating principles and uses of (i) ECG machine (ii) Radiography

EFERENCE BOOKS:

1. Electronic Instrumentation by H.S.Kalsi ,TMH Publishers
2. Electronic Instrument Hand Book by Clyde F. Coombs ,McGraw Hill
3. Introduction to Biomedical Instrumentation byMandeep Singh, PHI Learning.
4. Electronic Instrumentation – WD Cooper
5. Electrical and Electronic Instrumentation – AK Sawhany
6. A text book in electrical technology by B.L.Thereja (S.Chand&Co)
7. *Biomedical Instrumentation* and Measurements by Leslie *Cromwell ,Prentice Hall India.*
8. Electronic Measurements and Instrumentation by Kishor, K Lal, Pearson, New Delhi
9. Electrical and Electronic Measurements by Sahan, A.K., Dhanpat Rai, New Delhi
10. Electronic Instruments and Measurement Techniques by Cooper, W.D. Halfrick, A.B., PHI Learning New Delhi
11. Web sources suggested by the teacher concerned and the college librarian including reading material.

SEMESTER-V

COURSE 13: ELECTRONIC INSTRUMENTATION

Practical Credits: 1 2 hrs/week

COURSE OBJECTIVE:

The objective of the practical course on Electronic Instrumentation is to provide students with hands-on experience in using electronic instruments for measurement, data acquisition, and control applications. The course aims to develop students' practical skills in operating, calibrating, and troubleshooting electronic instruments commonly used in scientific, engineering, and industrial settings.

LEARNING OUTCOMES:

1. Familiarize students with a range of electronic instruments, including multimeters oscilloscopes, signal generators, and data acquisition systems.
2. Learn the basic operation, functions, and features of each instrument.
3. Gain hands-on experience in connecting, configuring, and using different instruments for various measurement tasks.
4. Develop proficiency in performing common electrical measurements, such as voltage current, resistance, frequency, and temperature measurements.
5. Learn specialized measurement techniques, including impedance measurements, time and frequency measurements, and power measurements.
6. Gain practical experience in selecting appropriate measurement techniques and instruments for specific applications.

PRACTICAL SYLLABUS

1. Familiarization of digital multimeter and its usage in the measurements of (i) resistance (ii) current (iii) AC & DC voltages
2. Measure the AC and DC voltages, frequency using a CRO and compare the values measured with other instruments like Digital multimeter.
3. Formation of Sine, Square wave signals on the CRO using Function Generator and measure their frequencies. Compare the measured values with actual values.
4. Display the numbers from 0 to 9 on a single Seven Segment Display module by applying voltages.
5. Displacement transducer-LVDT
6. A.C - Impedance and Power Factor.
7. Maxwell's Bridge – Determination of Inductance.
8. Measurement of body temperature using a digital thermometer and list out the error and corrections.
9. Measurement of Blood Pressure of a person using a B.P. meter and record your values and analyze them.
10. Display the letters **a** to **h** on a single Seven Segment Display module by applying voltages.

11. Get acquainted with an available ECG machine and study the ECG pattern to understand the meaning of various peaks
12. Observe and understand the operation of a Digital Pulseoxymeter and measure the pulse rate of different people and understand the working of the meter.

Lab References:

1. Electronic Measurement and Instrumentation by J.P. Navani. ,S Chand & Co Ltd
2. Principles of Electronic Instrumentation by A De Sa, Elsevier Science Publ.
3. Electronic Measurements and Instrumentation by S.P.Bihari, YogitaKumari, Dr. Vinay Kakka, Vayu Education of India .
4. Laboratory Manual For Introductory Electronics Experiments by Maheshwari, New Age International (P) Ltd., Publishers.
5. Electricity-Electronics Fundamentals: A Text-lab Manual by Paul B. Zbar ,Joseph Sloop, & Joseph G. Sloop , McGraw-Hill Education.
6. Web sources suggested by the teacher concerned.

TUDENT ACTIVITIES

Co-Curricular Activities

(a) Mandatory:(*Training of students by teacher in field related skills: (lab:10 + field:05*)

1. **For Teacher**: Training of students by the teacher in the in the laboratory/field for notless than 15 hours on the field techniques/skills of understanding the operation, Maintenance and utility of various electrical and electronic instruments both in the Laboratory as well as in daily life.

   For Student: Students shall (individually)visit a local electrical and electronics shop or small firm to familiarize with the various electrical and electronic instruments available in the market and also to understand their functionality, principle of operation and applications as well as the troubleshooting of these instruments.(Or) Student shall visit a diagnostic centre and observe the ECG machine and the ECG pattern(Or) Student shall visit a diagnostic centre and observe the CT scan and MRI scan.(Or) Student shall visit a mobile smart phone repair shop and observe the different components on the PCB(Motherboard), different ICs (chips) used in the motherboard and trouble shooting of touch screen in smart phones.

   Observations shall be recorded in a hand-written Fieldwork/Project work not exceeding 10 pages in the given format to be submitted to the teacher.
2. Max marks for Fieldwork/Project work: 05.
3. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements*.
4. Unit tests (IE)

(b) Suggested Co-Curricular Activities

1. Training of students by related industrial / technical experts.
2. Assignments (including technical assignments like identifying different measuring

instruments and tools and their handling, operational techniques with safety and security.

3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Making your own stethoscope at home.
5. Making seven segment display at home.
6. Preparation of videos on tools and techniques in various branches of instrumentation.
7. Collection of material/figures/photos related to products of Measuring Instruments, Display Modules and Biomedical Instruments and arrange them in a systematic way ina file.
8. Visits to Instrumentation Laboratories of local Universities or Industries like Cement, Chemical or Sugar Plants etc. or any nearby research organizations, private firms, etc.
9. Invited lectures and presentations on related topics by Technical /industrial experts

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA.

III B.Sc., Physics-Semester – V

Major Paper – C13; & Minor/Minor Physics

ELECTRONIC INSTRUMENTATION

(BluePrint)

w.e.f. 2023- 24 **ADMITTED BATCH**

Course Code: PH3202 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	2	1	-	25
II	1	-	1	15
III	1	1	1	20
IV	1	1	-	15
V	1	1	1	20
Total Marks				**95**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

III B.Sc., Physics-Semester –V
Major Paper – C13 & Minor Physics
ELECTRONIC INSTRUMENTATION - Model Paper

w.e.f. 2023- 24 Admitted Batch

Note: - Set the question paper as per the blue print given at the end of the syllabus

Time: 2 Hours Max Marks: 50

PART-I

Answer **any Three** questions by attempting **at least one question form 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

1. Essay question from UNIT-III
2. Essay question from UNIT-IV
3. Essay question from UNIT- V

PART-II

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

4. Short answer question from UNIT – I
5. Short answer question from UNIT – III
6. Short answer question from UNIT – IV
7. Short answer question from UNIT – V
8. Problems from UNIT - II
9. Problems from UNIT - III
10. Problems from UNIT - V

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code	**TITLE OF THE COURSE** **SEMESTER-V** **COURSE 14A: OPTICAL INSTRUMENTS AND OPTOMETRY**	III Year B. Sc Semester – V MAJOR			
Teaching	Hours Allocated: 45, Max.marks 50 (**Theory**)	L	T	P	C
Pre-requisites	Lenses,Microscope,Telescope	3	-	-	3

Theory Credits: 3 3 hrs/week

COURSE OBJECTIVE:

The objective of the course on Optical Instruments and Optometry is to provide students with a comprehensive understanding of the principles, design, and application of optical instruments used in various fields, with a specific focus on optometry

LEARNING OUTCOMES:

Students at the successful completion of the course will be able to:

1. Understand the construction and working principles of various optical instruments usedin daily life.
2. Acquire a critical knowledge on the various defects of eye and their correcting methodswith suitable lenses.
3. Demonstrate skills of using biological microscope through hands on experience.
4. Understand the various techniques used in optometry and computer based eye testing.
5. Comprehend the various applications of microscopes and telescopes.

UNIT-I Optical Microscopes

Simple Microscope-Construction, Magnifying power, normal adjustment; Compound Microscope-Construction, Magnifying power, normal adjustment, Phase contrast microscope-Operating principle, travelling microscope-Construction, workingand uses

UNIT-II Telescopes

Refracting Telescopes and Reflecting telescopes, Construction, working and magnifying power of Astronomical Telescope and Terrestrial Telescopes, Binoculars – working principle and applications.

UNIT-III Applications Of Optical Instruments

Introductory ideas and applications of various microscopes *viz*., (i) Optical microscopes (Compound microscope, Stereo microscope, Confocal microscope) (ii) Electron microscopes

(TEM, SEM), (iii) Scanning Probe microscope (iv) Scanning Acoustic microscope and (v) X-ray microscope. Introductory ideas and applications of various telescopes *viz.*, (i) Optical telescopes (ii) Radio telescopes (iii) Solar telescopes (iv) Infrared telescope (v) Ultraviolet telescope

UNIT-IV Optical Vision

Introduction to optical Vision, Eye as an optical instrument, Formation of image in the eye and the camera, Ophthalmic lenses, Myopia and Hypermetropia defects, Removal of defects in vision using ophthalmic lenses, Contact lenses-Working principle, Different types of Contact lenses.

UNIT-V Ophthalmic Techniques and Optometry

Ophthalmoscope and keratometer and their working principles, Evaluation of eye disorders, Guidelines for standardized eye chart preparation, Simple phoropter and its working principle and its uses, Principles of Computer based eye testing

Reference Books

1. Optics and Optical Instruments: An Introduction by B. K. Johnson, Dover Publications.
2. Modern Optical Instruments and their construction by or ford Henry-Publisher: Biblio Life, LLC.
3. A Text Book of Optics by Brj Lal and N.Subramanyam, S.Chand & Co.
4. Practical Optics by Menn Naftly, Elsevier Science Publishing.
5. Applications of Optics in daily life | CK-12 Foundation. https://flexbooks.ck12.org ›
6. Web sources suggested by the teacher concerned and the college librarian including Reading material.

SEMESTER-V

COURSE 14 A: OPTICAL INSTRUMENTS AND OPTOMETRY

Practical Credits: 1 2 hrs/week

COURSE OBJECTIVE:

The objective of the practical course on Optical Instruments and Optometry is to provide students with hands-on experience and practical skills in the operation, calibration, and application of optical instruments used in optometry

Learning Outcomes:

On successful completion of this practical course, student shall beable to:

1. List out, identify and handle various equipment like binoculars, telescopes and microscopes.
2. Learn the procedures of operation of various optical instruments.
3. Demonstrate skills on testing the power of lenses, improving the resolution of telescopes and microscopes.
4. Acquire skills in observing and measuring the power, focal length and different refractive errors of eye.
5. Perform some techniques related to testing the blood and other biological samples.
6. Understand the technique of operation of Computer eye testing and evaluation.

Practical (Laboratory) Syllabus:

1. Evaluation of magnifying power of simple microscope.
2. Measurement of reflection and transmission coefficient of certain materials using a microscope.
3. Resolving power of telescope
4. Determination of radii of different capillary tubes using travelling microscope.
5. Refractive index of a liquid (water) using (i) concave mirror and (ii) convex lens and a plane mirror.
6. Removal of refractive errors of eye using combination of lenses.
7. Determination of power of a convex lens by finding its focal length.

Lab References:

1. A Practical Guide to Experimental Geometrical Optics byYuriy A. Garbovskiy-Cambridge Univ. Press
2. https://physics.columbia.edu/sites/default/files/content/Lab%20Resources/1292%20Lab%20Manual.pdf
3. https://www.lnmiit.ac.in/Department/Physics/uploaded_files/lab-manual.pdf
4. Basic Optics Experiments -http://www.phys.unm.edu › Optics Lab › Basics
5. A Practical Guide to Experimental Geometrical Optics by Yuriy A. Garbovskiy, Anatoliy V. Glushchenko, Cambridge Univ. Press
6. Web sources suggested by the teacher concerned.

STUDENT ACTIVITIES

Co-Curricular Activities

(a) Mandatory: (*Training of students by teacher in field related skills: (lab:10 + field:05*)

1. **For Teacher**: Training of students by the teacher (if necessary, by a local expert) in laboratory/field for a total of not less than 15 hours on the field techniques/skills on the familiarization of various optical instruments available in the laboratory; construction of different types of telescopes and their comparison in construction, operation and their utility and limitations; the details of construction of eye and various defects in the eye sight, emerging techniques in the design of eye lenses including contact lenses and making the student to understand on the testing of a biological sample using a clinical microscope

For Student: Students shall (individually) visit and observe the functioning of optical instruments at any one of the following places /centres like (a) pathological laboratory **or** (b) a local ophthalmologist **or** (c) a local optician to understand the various typesof eye lenses **or** (d) a local computer based eye testing centre **or** (e) an optician, who fixes contact lenses **or** (f) a local cinema theatre **or** (g) a planetarium. Student shall write the observations and submit a hand-written Fieldwork/Project work not exceeding 10 pages in the given format to the teacher.

2. Max marks for Fieldwork/Project work: 05.
3. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements*.
4. Unit tests (IE).

(b) <u>Suggested Co-Curricular Activities</u>

1. Training of students by related industrial experts.
2. Assignments (including technical assignments like identifying tools in the lens grinding, frame fitting, lens cleaning culture and other operational techniques with safety and security, IPR)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in optical instruments and optical lenses, contact lenses.
5. Making a model microscope and measuring its magnification.
6. Making a simple astronomical telescope using two convex lenses.
7. Checking the power of your spectacles or lenses at home.
8. Students shall take up making their own (i) Telescope and (ii) Binoculars with the accessories available at home.

https://paksc.org/pk/science-experiments/physics-experiments/how-to-make-astronomical-telescope

https://kids.nationalgeographic.com/nature/article/make-a-telescope

<u>https://learning-center.homesciencetools.com/article/how-to-make-a-telescope-optical-science-project/</u>

http://scipop.iucaa.in/Amateurs/telemaking.html

9. Collection of material/figures/photos related to various types of lenses and their power.
10. Visit to any eye research laboratories, if available

ıvited lectures and presentations on related topics by field/industrial experts

Pithapur Rajah's Government College (Autonomous), Kakinada

III B.Sc., SEMESTER-V

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 14 OPTICAL INSTRUMENTS AND OPTOMETRY BLUE PRINT

Course Code: **No. of hours: 03 Hours/Week Total hours: 45hrs**
No. of Credits: 03

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

Blue Print

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

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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

III B.Sc., SEMESTER–VPAPER C14

(Model Paper)

OPTICAL INSTRUMENTS AND OPTOMETRY

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 form 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-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 – IV
9. Short answer question from UNIT – IV
10. Short answer question from UNIT – V
11. Problems from UNIT - II
12. Problems from UNIT - III
13. Problems from UNIT - V

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code	**TITLE OF THE COURSE** Solar Energy and Applications –C15 **MAJOR /MINOR**	III Year B. Sc Semester – V MAJOR/MINOR			
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	3	-	-	3

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

Course with focus on Employability / Entrepreneurship / Skill Developmentmodules

Skill Development		Employability		Entrepreneurship	

Syllabus:
TotalHours:90 Instruction hours 60,(Lab,FieldTraining,Unittestsetc.30Hours)

UNITI: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 desalinator.

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**11s9**ec|o nd a r y, 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]; '-': (NoCorrelation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO 4
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

REFERENCESBOOKS:

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.,

Weblinks

- https://courses.edx.org/c4x/DelftX/ET.3034TU/asset/solar_energy_v1.1.pdfhttps://www.sku.ac.ir/Datafiles/BookLibrary/45/John%20A.%20Duffie,%20Willia
- m%2 0A.%20Beckman(auth.)-Solar%20Engineering%20of%20Thermal%20Processes,%20Fourth%20Edition%20(2013).pdf

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

III B.Sc Physics Paper – C15 – Semester – V (Model Paper)

Solar Energy and Applications –C15

2023-24ADMITTED 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 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**

Percentage of Choice = $\frac{(95-50)}{95}$ **X 100 =** $\frac{45}{95}$ **x 100 = 47%**

III B.Sc Physics Paper – C15 – Semester – V (Model Paper)

Solar Energy and Applications

2023-24ADMITTED 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 form 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 - 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			
Course Code PH	**TITLE OF THE PRACTICAL –C15** **Solar Energy and Applications Lab**	III Year B. Sc Semester – V MAJOR			
Practical	Hours Allocated: 30 hrs, Max Marks: 50 (**Lab**)	L	T	P	C
Pre-requisites	Plotting graphs, Voltage, current, solar radiation	-	-	2	1

Practical(lab)work *(30hrs,Max Marks:50)*
Learning Outcomes: On successful completion of this practical course, student

Shall be able to:

1. List out and identify various components of solar thermal collectors and systems, solar photovoltaic modules and systems.
2. Learn the procedures for measurement of direct, global and diffuse solar radiation, I -V characteristics and efficiency analysis of solar cells and modules.
3. Demonstrate skills acquired in evaluating the performance of solar cell/module in connecting them appropriately to get required power output.
4. Acquire skills in identification and elimination of the damaged panels without affecting the output power in a module / array.
5. Perform procedures and techniques related to general maintenance of solar thermal and photovoltaic modules.

Practical(Laboratory)Syllabus:(**30hrs**)(Max.50Marks)

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. Performance of a solar cooker
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 in tensity 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.

LAB REFERENCES:

1. Solar Photovoltaic -Alabtraining manual, C.S.Solankietal.,Foundation Books Publishers,2012.
2. Laboratory Manual on Solar thermal experiments H P Garg,T C Kandpal, Narosa Publishing House 2000.

Web links

- https://renewablelab.niu.edu/experiments/solarPanelDevelopmentofsimplesolarhot water collector: https://www.youtube.com/watch?v=WP8H5IOTwYU
- https://www.instructables.com/Solar-Water-Heater-From-Scratch/

Scheme of Valuation for Practicals

Time:3hrs 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	- 05 Marks
6. Records	- 05 Marks

Co-curricular Activities:

(a) Mandatory:(*Trainingofstudentsbyteacherinfieldrelatedskills:(lab:10+field:05*)

1. **For Teacher**: Training of students by the teacher in the in the laboratory/field for not less than 15 hours on the field techniques/skills related to measurement of direct, diffused and global solar radiation; demonstration of procedures used in the performance evaluation of solar flat plate collectors, solar photovoltaic cells and modules measurement of different parameters in the calculation of efficiency.
2. **For Student**: Students shall visit to solar thermal and photovoltaic laboratories in universities/research organizations/ nearby industries to observe and understand the techniques and procedures used for evaluation of solar collector, solar cell and module efficiencies. They shall write their observations and submit to the teacher hand-written Fieldwork/Project work not exceeding 10 pages in the given format.
3. Max marks for Field work/Projectwork:05.
4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements.*
5. Unit tests (IE).

(b) Suggested Co-Curricular Activities

1. Training of students by related industrial/ technical experts using guest lectures/ invited talks.
2. Assignments (including technical assignments like identifying components of a solar hot water and solar photovoltaic systems and their handling, operational techniques and maintenance procedures with safety and security)
3. Seminars, Group discussions, Quiz, Debates etc. On related topics.
4. Preparationofvideosonthermalandphotovoltaicsystemsandtechnicalprocedures.
5. Collectionofbrochures/figures/photosrelatedtoproductsandapplicationsofsolar energy and organizing them in a systematic way in a file.
6. Makinga(i)solarpanel(ii)solarlight(iii)solarcooker(iv)solaroven(v)solar inverter at Home.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS),

KAKINADA LIST OF EXAMINERS/ PAPER SETTERS IN PHYSICS
2024-2025

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

18	ValluriSrinivasaRao	Physics	Govt. College (W) Nidadavolu
19	K.Venkateswa Rao	Physics	Govt. College, Eleswaram
20	EsubBasha Sheik	Physics	Govt. College (A), RJY
21	Ch.Ch.Srenivasu	Physics	Govt. College (A), RJY
22	K.Ganesh Kumar	Physics	Govt. College , Ganapavaram
23	M.Sudhadhar	Physics	Govt. College (A), Tuni
24	B.Durga Lakshmi	Physics	Govt. College (A), RJY
26	P. Rama Krishna Rao	Physics	Y.N. College (A), Narasapur
27	D. Gangadharudu	Physics	M.R. College, Peddapuram
31	Smt. M. Satyavani	Physics	D.N.R. College (A), Bhimavaram
32	M.V.S. Prasad	Physics	D.N.R. College (A), Bhimavaram
33	Smt. N. Udaya Sri	Physics	D.N.R. College (A), Bhimavaram
34	A. Veeraiah	Physics	D.N.R. College (A), Bhimavaram
35	N. Srinivasarao	Physics	Govt. College , Tadepalligudem
36	Dr.K.Srinivasa Rao	Physics	GDC, Mandapeta
37	B.Sreekanth	Physics	GDC, Mandapeta
37	Dr.Y.N.Ch.Ravi Babu	Physics	GDC, Avanigadda
38	Dr.P.B.sandhya Sri	Physics	GDC, Avanigadda
39	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 Bithday Celebrations	07-11-2025
13	Workshop/webinar	17-11-2025 to 31-01-2026
14	Guest Lecture-2	09-12-2025
15	Parent-TeacherMeeting	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

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

Budget Proposal for the Academic Year 2025-26

S.No.	PURPOSE	EXPENDITURE ESTIMATED	REMARKS
1.	Upgradation of 1st year Lab	Rs. 1,00,000=00	
2.	Upgradation of 2nd 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 OFHIGHER 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 t0 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 andcontinuous 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 involvementin 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 theiroutcomes.
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 theCollege. 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.

For Example:

II MPC-EM

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 HIGHEREDUCATION

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 t0 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 intoconsideration 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 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:

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.

For Example:

[I PHYSICS-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 HIGHEREDUCATION

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 thecompletion 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.

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**