PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

(AN AUTONOMOUS COLLEGE WITH NAAC "A" GRADE)

Board of Studies for UG Programmes

PHYSICS

2024 – 2025

DEPARTMENT

OF

PHYSICS & ELECTRONICS

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA

DEPARTMENT OF PHYSICS & ELECTRONICS

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PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

DEPARTMENT OF COLLEGIATE EDUCATION
GOVERNMENT OF ANDHRA PRADESH

PROCEEDINGS OF THE PRINCIPAL, PITHAPUR RAJAH's GOVT. COLLEGE [A] :: KAKINADA Present: Dr. B.V. TIRUPANYAM, Ph.D.

Rc.No.2/A.C/BOS/2024-25 Dt.23 Apr 2024

Sub: P.R.G.C[A] – Academic Cell - **Conduct of BOS Meetings for the Academic Year 2024-25** – 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), Programme Outcomes (POs) and Programme 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 2024-25 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 prepare curricula and 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 2024-25, 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 2023-24 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 2024-25 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 of teaching experience. He should have experience in designing industry related, market and job oriented curriculum.**
- Facilitate much room for intense deliberation on the design of the curricula, evaluation system, research component, enhancing learning experiences, resource utilization by 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 2023-24 and proposal for new courses for the Academic year 2024-25 keeping in view of the future job opportunities .

S.No	Title of the Paper	Feedback or suggestions on the curriculum designed during 2023-24 BoS(Whether industry oriented/ relevant for equipping skills for 21st century students)	Proposal of New Courses for 2024-25	Justification

Following contents shall be presented in the BOS document in order

1. Proceedings of the Principal pertaining to BOS
2. Composition of BOS
3. Vision and Mission of the college
4. Agenda: It shall include ATR on the previous BOS meeting first, resolutions, etc., later.
5. Table showing the Allocation of Credits in the following table for both theory and Lab incase 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/ entrepreneurship)
1	III	Botany	Plant Physiology	Plant Cell	Knowledge	Shall be shown Microscope	
2	III	History	Tourism	Tourism management	Applicatio n	Apprenticeship	Employabilit y

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 (2024-25 AB) has to complete one MOOCS course from SWAYAM in any subject per year which is mandatory.

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- 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** answer questions with five marks each out of four questions and five 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 anyunit 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**

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	1	1
4	IV	0	1	1
5	V	0	1+ one question from any unit(III or IV or V) with more syllabus weightage	1

- 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

CIA structure for 3 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** answer questions with five marks each out of four questions and five objective questions with one mark each.
- 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

CIA structure for 3 Major system for Honors programmes(2020-21AB)

- Out of 40 marks for CIA, 20 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 **Two essay** questions for ten marks each out of three questions, **four short** answer questions with five marks each out of six questions.
- The remaining 20 marks for CIA are allocated as per the following structure.

Assignment-10M	Seminar- 5M	Quiz -5M

13. Percentage of syllabus changes in each paper
14. Measure outcome attainment learning levels of students through direct and indirect methodology and mapping COs and POs 15. Text & Reference Books
16. e-content links.

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	23.04.2024
2	Pre BOS (Offline/Online)	25.04.2024
3	Departmental level curricula design	27.04.2024
4	Finalization of draft BOS	27-04-2024
5	Scrutiny by academic cell	29-04-2024
6	Correspondence with Subject experts, University nominees, Industrialists	28-04-2024
7	BOS for UG & PG	30-04-2024

Enclosures: Annexures- I, II & III Copy to:

Lecturers-in-Charge (BOS Chairmen) of all the departments
Academic Coordinator
IQAC coordinator
Controller of Examinations
Office

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

PRINCIPAL

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

OFFICE OF THE DEAN, ACADEMIC AFFAIRS

ADIKAVI NANNAYA UNIVERSITY

RAJAMAHENDRAVARAM

No. ANUR/DAA/PR Govt. College (A)/Sub. Experts/2021 Date: 22-10-2021

PROCEEDINGS OF THE VICE-CHANCELLOR

Sub:- ANUR- DAA - Nominated University Subject Experts for BOS - PR Govt. College (A), Kakinada - Orders - Issued.

Ref:- 1. Lr. dated 15.09.2021, from the Principal, PR Govt. College (A), Kakinada
2.Proc. No: ANUR/PRG College (A), KKD/UG BoS/2019/09, dated 19.03.2019

Read:-Note for Orders of the Vice-Chancellor dated 21.10.2021

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ORDERS

Having consider the request cited in the ref. 1, the Vice-Chancellor is pleased to order that the following members be nominated as University Subject Experts for UG Board of Studies of PR Govt College (A), Kakinada for a period of three years from the date of the proceedings issued.

S.N0.	UG Courses	Name of the Subject Expert
1	English	Dr. Prasanthi Sree, AKNU MNS Campus, Kkd, Ph No: 9848297555, sathu athi.sri a 'mail.com
2	Hindi	Dr. N Venkata Ramana, SKBR College, Amala uram, Ph. No: 9849373773
3	Telugu	Dr. P. Nagaraju, GDC, Palakollu, Ph.No: 9052038569, 7 a ,mail.com
4	Sanskrit	Dr. TGY Acharyulu, SKR Womens College, Ra•ahmundry, Ph. No: 9848628812
5	Mathematics	Dr. V. Anantha Lakshmi, Principal, GDC Pithapuram, Ph. No : 9963786386, ananlhamaths(ålrediffmail.com
6	Statistics & Actuarial Sciences	Dr. D V Ramana Murthy, HOD of Statistics, SKVT College, Rajamahendravaram, Ph.No: 9949135864, drdvrmurth 60 mail.eom
7	Chemistry & Analytical Chemistry	Dr. K. Jhansi Lakshmi, Principal, Ideal College of Arts & Sciences, KKD, Ph.No: 9441236409, • hansikalisindi(å) mail.com
8	Physics & Electronics	Dr . Paul Diwakar, Sri CRR College (A), Eluru, 9985050696
9	Petro Chemicals	Dr. M Trinadh, Lecturer in Chemistry, Govt. College A), Ra•ahmund , Ph. No: 8639551783
10	Bio-Chemistry	Dr. M Suvarchala, Lecturer in home science, ASD women's Degree College, KKD, Ph. No: 9346512694, suvarchakamallela a omail.com
11	Food Science	
12	Botany	Dr. J. Sujatha, Leturer in Botany, GDC Rjy, Ph.No: 9441050910, dr•suneethafi jcr• .ac.in

13	Microbiology	Dr. D Aruna, Lecturer in Micro-biology, ASD Women's Colle e, Kakinada, Ph. No: 9182525872
14	Zoology	Dr. B. Tejo Murthy, Lecturer in Zoology, GDC Yeleswaram, Ph. No: 9703799970, drmtm2()l l a mail.com
15	Bio Technology	Dr. B. Nageswari, Lecturer in Biotechnology, GDC Rjy, Ph. No: 986621955
16	Commercial Aquaculture	Dr. P Ramamohana Rao, Aquaculture Consultant, KKK), Ph. No: 9885144557, asreenivasulu(ii "mail.com
17	Computer Science & Computer Applications	Mr. N. Naga Subrahmanyesweri, Lecturer in Computer Science, ASD Women's College, KKD, Ph. No: 9948438376, esweri.velugu@asddgcw.a c.in
18	Commerce	Dr. K. Ratna Manikyam, CicM. College (A), RJY, Ph. No: 8919230362, drkrma c • .ac.in
19	Economics	Dr. D. V. Nageshwara Rao, Lecturer, GDC, RJY, Ph. No: 9490919676
20	History	Dr. B. Anjani Kumari, Lecturer in charge, GDC (W), Ph. No: 891989337
21	Philosophy	Dr. V. Venkatarao, Lecturer in Philosophy, MR Colle e, Vijayanagaram, Ph. No: 9440096609
22	Political Science	Dr. Seetha Mahalaxmi, Lecturer in Political Science, GDC, RJY Ph. No: 9491011844
23	Journalism & Mass Communication	Prof. DVR Murthy, Dept. of Journalism & Mass Communication, Andhra University, Vishakapatnam, Ph. No: 9985051793, 9440974092
24	Horticulture	Dr. J. Sujatha, Lecturer in Botany, GDC, Rjy, Ph. No: 9441050910, lrjsuneetha@ycr• .ac.in
25	Pharmaceutical Chemistry	Dr. K. Deepthi, Asst. Professor, Dept. of Chemistry, AKNU, Rjy, Ph. No: 9985469607, dee thikorabandi a ymail.com

Dean 22/10

(BY ORDERS)

ACADEMIC AFFAIRS

To
The Principal, PR Govt. College (A), Kkd
PA to R
PS to VC,
OOF

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

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

Present: Dr. B.V Tirupanyam , M.Sc, Ph.D

Rc. No: 12A/A.C/BOS 2024-25,Dated:23-04-2024

Sub:- Pithapur raja's Government College [A], Kakinada – UG Boards of Studies (BoS) – Program Course- B.Sc/Physics 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 PHYSICS** for framing the syllabi in Physics 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.P.Paul Diwakar	University nominee, Y.V.N.R Government college,Kaikaluru
3.	Dr.K.Jyothi	Subject Expert, Principal SVRKGDC(M) ,Nidadavolu
4.	Dr. MVK Meher,	Subject Expert,Principal GDC Permallapuram
5.	Sri.A.V.V Prasad	Representative from Industry, Solar Systems,Kakinada
6.	Dr.K.Nanda Gopal	Sr.Scientific Asst.IMD,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.	Mr.P.Veerendra	Member
15.	L.Subhash	Student Member, I B.Sc.Physics
16.	D. Sri Durga Bhavani	Student Member, II MPC EM-2

The above members are requested attend the BOS meeting on 31-08-2023 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
(b) Suggest methodologies for innovate teaching and evaluation techniques
(c) Suggest panel of names to the Academic council for appointment of examiners
(d) Coordinate research, teaching, extension and other activities in the department 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.

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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

Vision

To provide the right academic environment paving way for intellectual excellence, humane feelings and social commitment. The college believes in providing quality education for the socially disadvantaged, economically weaker sections of the society and thereby help them move up the ladder of success and social order.

- **Mission**

- To impart holistic education with special emphasis on character, culture, updated knowledge and skill-oriented learning.
- To make the students enjoy the fruits of globalization without prejudice to their local and cultural environment.
- To impart necessary life skills so as to make them face any challenge in the bigger world – Social, ethical, psychological or professional

Department of Physics and Electronics

BOARD OF STUDIES - PHYSICS

Meeting held on: Dt.28th April 2024 Time:2 P.M. at Department of Physics.

Agenda of the Meeting

To discuss and approve:

1. Action taken report (ATR) of the A.Y.2024 -25
2. Adoption of Single major system for the Ist year as per the guidelines of APSCHE
3. Adoption of Single minor system for the Ist year as per the guidelines of APSCHE
4. Revised-common program structure and semester wise curriculum.
5. Adoption of regulations on scheme of examination and marks/grading system.
6. Engaging of 7th hour of time table
7. Streamlining of regularity in attendance.
8. Value added courses viz. add on courses and skill development courses to be conducted by the department during the academic year 2024-2025
9. Collaboration with industry and third-party sector organization in view of industrial internship.
10. Make students access to ICT infrastructure for enhanced quality in higher education.
11. Remedial coaching for slow learners and project/ research work for advanced learners
12. Allocation of extra credits for extracurricular activities.

13. Conduct of parent teacher meeting.
14. Panel of Question paper setters and Examiners
15. Action plan for the academic year 2024-25.
16. Departmental budget proposal for the academic year 2024-25
17. Any other with the permission of the chair.

Action Taken Report 2023 - 24

The Department of Physics conducted the BOS meeting for the academic year 2022-23 on 31.10.2022 in the Department of Physics. All the activities according tothe plan of action were successfully completed in the proposed timeline. By taking the valuable recommendations of the members for enhancement of knowledge and to enrichthe skills of the students, the department took initiatives and implemented various innovative steps viz.

1. Post admission test was conducted on 11.11.2022.
2. Distribution of money under the Upkar Scheme was held on 14-07-2022.
3. A field visit was conducted to the India Meteorological Department on 12-09-2022.
4. International day for preservation of the ozone layer was conducted on 16-09-2022.
5. Started an add on certificate course "Applications of Solar Cells in Home Energy Systems" in Sem IV @30 hrs. for 2 credits having 5units@ 2 theory hrs. per week and one Study Project at the end of the course.
6. Started a skill enhancement certificate course "Soldering and Desoldering of Components" in Sem IV @30 hrs. for 2 credits having 5units@ 2 theory hrs. per week and one Study Project at the end of the course.
7. Energy Audit in The Campus was conducted during the period 15-11-2022 TO 18- 11-2022.
8. Microwave Oven Day was conducted on 16-12-2022.
9. Distribution Of Kasarabada Scholarships was conducted on 06-02-2023.
10. **National Science Day** was conducted on **28-02-2023.**
11. **Zero Shadow Day** was conducted on **07-05-2023.**
12. **Chandrayaan 3 Live LaunchingProgram was conducted on 14-07-2023.**
13. Guest Lecture on Electronics andElectronic Devices was conducted on **17-06-2023.**
14. National Seminar On "Novel Materials, Nanotechnology and Biomedical Applications" was conducted on 15-07-2023.

15. Seminar On Rocket-Satellite Technology was conducted on 24-07-2023.
16. Chandrayaan 3 Live Landing Programme was conducted on 23-08-2023.
17. Started "Centre for Innovation and Incubation Centre" for innovative projects on the platform of 'Atal Tinkering Labs'
18. Installation of "Solar Tree" in before the Physics Block is in process

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

DETAIL OF COURSE TITLES&CREDITS (A.Y.2024-25)

Sem	Course no.	Course Name	Course type (T/L/P)	Hrs./Wk .(Science)	Credits (Science: 4+1)	Max. Marks Cont/Internal/ MidAssessment	Max.Marks Semend Exam
I	1	Essentials and applications of Mathematical, Physical and Chemical Sciences	T	3+2	4	50M	50M
	2	Advances in Mathematical, Physical and Chemical Scineces	T	3+2	4		50M
II	3	Mechanics and Properties of Matter	T	3	3	50M	50M
		Mechanics and Properties of matter Practical Course	L	2	1		50M
	4	Waves and Oscillations	T	3	3	50M	50M
		Waves and Oscillations Practical course	L	2	1		50M
III	5	Optics	T	3	3	50M	50M
		Optics Practicals	L	2	1	0	50M
	6	Heat &Thermodynamics	T	3	3	50M	50M
		Practical Course	L	2	1	0	50M
	7	Electronic devices and circuits	T	3	3	50M	50M
		Electronic devices and circuits practicals	L	2	1	0	50M
	8	Analog and digital electronics	T	3	3	50M	50M
		Analog and digital electronics practicals	L	2	1	0	50M
IV	9	Electricity, Magnetism &Electronics	T	3	3	50M	50M
		PracticalCourse	L	2	1	0	50M
	10	Modern Physics	T	3	3	50M	50M
		PracticalCourse	L	2	1	0	50M
	11	**Introduction to nuclear and particle physics**	T	3	3	50M	50M
		Introduction to nuclear and particle physics practicals	L	2	1	0	50M
	6B	Low Temperature Physics & Refrigeration	T	4	4	50M	50M
		Low Temperature Physics & Refrigeration Lab	L	2	1	0	50M

V	7B	Solar Energy and Applications	T	4	4	50M	50M
		Solar Energy and Applications Lab	L	2	1	0	50M

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

Pithapur Rajah's Government College (Autonomous), Kakinada

Board of Studies–Department of Physics & Electronics

Resolutions of the Meeting - PHYSICS

The Board of Studies meeting was convened by the Physics & Electronics Department on 23-04-2024 at10 a.m. under the chairmanship of Smt. M. Surekha, In-charge of the Department., Dr. P. Paul Diwakar, University Nominee, Dr K Jyothi, Subject expert, Dr. M.V.K.Meher and Dr. D. Gangadhar, remaining external members, all the faculty members of Physics & Electronics and student representatives attended the meeting. The following agenda items are discussed and resolutions are made

Agenda1: 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 2.

Discussion: Discussed the entire program structure

Resolution Adopted: Resolved to adopt the revised common program structure and verified course wise syllabi as per guidelines issued by APSCHE and ANUR. Also discussed and approved the revised course wise structure, Syllabi, Blue print and model papers of **Semesters I – V** for the academic year 2024-25.

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.

Agenda5: Engaging of 7th hour of time table

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

Discussion: Discussed the engagement of 7thhr introduced by APCCE

Resolution Adopted: It is resolved to dedicate the7th hour classes for extra-curricular activities and student counseling by class mentors.

Agenda 6: 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 **1stand 2ndmid 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 7: Certificate courses viz. add on courses and skill development courses to be conducted by the department during the academic year 2024-25.

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

Proposal: It is placed before the BoS members to discuss on the above agenda 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	ISRE 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 3month apprenticeship program during the entire tenure of Semester VI.

Agenda 9: 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 10: 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 11: 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.

Agenda12: Conduct of parent teacher meeting.

Proposal: It is presented before the BOS members for the discussion on this agenda point 12

Discussion: Discussed the conduct of parent teacher meeting

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

Agenda 13: Panel of examiners to be approved in BOS.

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

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

Resolution Adopted: Approved and resolved.

Agenda 14: Action plan for the academic year 2024-25.

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

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

Resolution Adopted: It is resolved to approve Department Action Plan for the Academic Year 2024-25.

Agenda 15: Departmental budget proposal for the academic year 2024-25.

Proposal: It is presented before the BOS members to discuss on the above agenda 15.

Discussion: Discussed the budget proposal

Resolution Adopted: Approved the budget proposal for the academic year 2024-25.

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. P. Paul Diwakar	University nominee, Lec.In Phy,Y.V.N.R. Government College, Kaikaluru.	
3	Dr. K. Jyothi	Subject Expert; Principal; SVRKGDC(M), Nidadavolu	
4	Dr. M.V.K. Meher	Subject Expert, Lec.in charge/ Phy/A.S.D. Degree College (W), Kakinada.	
5	Sri A.V.V.V. Prasad	Representative from Industry, Solar Systems, Kakinada.	
6	Dr. K. Nanda Gopal	Sr. Scientific Asst., Indian Meteorology Dept, 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	Mr. P. Veerendra	Member	
15	L.Subhash IBSC PHYSICS	Student Member	
16	D. Sri Durga Bhavani II MPC EM 2	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

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

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			No. of Questions Given			No. of Questions to be answered		
		Unit	No. of Questions	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 = $\frac{45-25}{45} \times 100 = 44.44\ \%$

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 Questions	No. of Questions Given: Total Quetion	Marks allotted To	Total	No. of Questions to be answered: No. of Questio	Marks allotted To	Total marks
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 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

	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.

	Pithapur Rajah's Government College(Autonomous) Kakinada	
Department of Physics		
Specific Program Outcomes		
B. Sc	M.P.C	Domain knowledge and understand the theoretical concepts of physical and chemical properties of materials and the role of mathematics in dealing with them in a qualitative way through experiential learning.
		Analyze the concepts of mathematics, physics and chemistry and understand the relation among them like physical chemistry, mathematical modeling of physics and chemistry problems.
		Skills needed to handle instruments and adopt lab procedures to study physical chemical properties of materials.
		Ability to interlink and adopt the skills and knowledge in related areas of mathematics, physics and chemistry.
B. Sc	M.P.Cs	Domain knowledge and understand the concepts of vector spaces, group theory, quantum mechanics, optical, thermal, electrical, mechanical properties of a materials, probability, algorithm design, data base.
		Analyze the concepts of mathematics, physics and computers science able to relate them in numerical programming.
		Acquire the skills to study the properties of materials, implementation of numerical algorithms by using various experiential techniques.

		Ability to interlink the skills developed and acquires an aptitude to address the problems in simulations of material properties, web and mobile app development.
B.Sc.	M.P.E	Domain knowledge and understand the mechanism behind various electronic and physical systems and qualitative way through experiential learning with firm mathematical tools.
		Analyze the physical properties materials, electronic components to develop essential tools for better livelihood.
		Skills to study the optical, thermal, electrical and electronic properties of materials and also to explore the properties of various electronic components, communication systems, microprocessor and micro-controller.
		Ability to interlink the skills developed to select proper materials for suitable electronic applications, and acquires an aptitude to address the problems in simulation of electronic circuits, developing web and mobile applications.

New Courses introduced during the year 2024 - 25

S.No.	SEM	Course	Title of the Paper
	III	5	OPTICS(MAJOR&MINOR)
			OPTICS(MAJOR&MINOR) PRACTICALS
		6	HEAT AND THERMODYNAMICS
			HEAT AND THERMODYNAMICS PRACTICALS
		7	ELECTRONIC DEVICES AND CIRCUITS
			ELECTRONIC DEVICES AND CIRCUITS PRACTICALS
		8	ANALOG AND DIGITAL ELECTRONICS
			ANALOG AND DIGITAL ELECTRONICS PRACTICALS
	IV	9	ELECTRICITY,MAGNITISIM AND ELECTRONICS(MAJOR&MINOR)
			ELECTRICITY,MAGNITISIM AND ELECTRONICS(MAJOR&MINOR) PRACTICALS
		10	MODREN PHYSICS(MAJOR&MINOR)
			MODREN PHYSICS(MAJOR&MINOR) PRACTICALS
			INTRODUCTION NUCLEAR AND PARTICLE PHYSICS
			INTRODUCTION NUCLEAR AND PARTICLE PHYSICS PRACTICALS

PITHAPUR RAJAHS GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
DEPARTMENT OF PHYSICS

Percentage of Syllabi included/Excluded-2024-25

Sl No	Title of Paper	% of Change
1	Mechanics, Properties of matter	5%
2	Waves and Oscillations	0
3	Heat & Thermodynamics	0
4	Electricity, Magnetism & Electronics	0
5	Modern Physics	0

Semesterwise Additions & Deletions

Sl No	Semester	Title of Paper	Deletions	Justification
1	II	Mechanics, Properties of matter	Derivation of Divergence & Curl of a Vector field	As the derivation is laborious and complex and it is not being utilized in any of our concepts

	Pithapur Rajahs Government College (Autonomous) Kakinada	**Program & Semester** I B.Sc. (I Sem) COURSE-1 W.e.f. 2024 - 25 ADMITTED BATCH			
Course Code PH	**ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICALANDCHEMICAL SCIENCES**				
Teaching	Hours Allocated: 60(**Theory**)	L	T	P	C
Pre-requisites:	Different types of Physical quantities, Basic mathematical equations & formulae, Forces and its properties, knowledge about celestial bodies	5	0	-	4

Course Objective:

The objective of this course is to provide students with a comprehensive understanding of the essential concepts and applications of mathematical, physical, and chemical sciences. The course aims to develop students' critical thinking, problem-solving, and analytical skills in these areas, enabling them to apply scientific principles to real-world situations.

Learning outcomes:

1. Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.

2. To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations

3. To Explain the basic principles and concepts underlying a broad range of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life.

4. Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.

5 To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.

UNIT II: ESSENTIALS OF PHYSICS:

Definition and Scope of Physics- Measurements and Units - Motion of objects: Newtonian Mechanics and relativistic mechanics perspective - Laws of Thermodynamics and Significance- Acoustic waves and electromagnetic waves- Electric and Magnetic fields and their interactions- Behavior of atomic and nuclear particles- Wave-particle duality, the uncertainty principle- Theories and understanding of universe

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY:

Application of Physics in Industry and Technology: Electronics and Semiconductor Industry, Robotics and Automation, Automotive and Aerospace Industries, Quality Control and Instrumentation, Environmental Monitoring and Sustainable Technologies.

Reference Books:

1. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
2. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
3. Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway and John W. Jewett Jr.
4. Physics for Technology and Engineering" by John Bird

STUDENT ACTIVITIES:

UNIT II: ESSENTIALS OF PHYSICS:

1. Concept Mapping

Divide students into groups and assign each group one of the topics.

Students will create a concept map illustrating the key concepts, relationships, and applications related to their assigned topic.

Encourage students to use visual elements, arrows, and labels to represent connections and interdependencies between concepts.

2. Laboratory Experiment

Select a laboratory experiment related to one of the topics, such as motion of objects or electric and magnetic fields.

Provide the necessary materials, instructions, and safety guidelines for conducting the experiment.

Students will work in small groups to carry out the experiment, collect data, and analyze the results.

After the experiment, students will write a lab report summarizing their findings, observations, and conclusions.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

1: Interdisciplinary Case Studies

Divide students into small groups and provide them with interdisciplinary case studies that involve the interdisciplinary application of mathematics, physics, and chemistry.

Each case study should present a real-world problem or scenario that requires the integration of concepts from all three disciplines.

2: Design and Innovation Project

Challenge students to design and develop a practical solution or innovation that integrates mathematics, physics, and chemistry principles.

Students can choose a specific problem or area of interest, such as renewable energy, environmental conservation, or materials science.

3: Laboratory Experiments

Assign students laboratory experiments that demonstrate the practical applications of mathematics, physics, and chemistry.

Examples include investigating the relationship between concentration and reaction rate,analyzing the behavior of electrical circuits, or measuring the properties of materials.

GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–I

W.e.f. 2024- 25 ADMITTED BATCH

COURSE 1 BLUE PRINT

Hours/Week: 5 **Total hours: 60hrs**

Course Code: **No. of Credits: 04**

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

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

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	2	-	20
II	1	1	-	15
III	1	2	-	20
IV	2(M, P)	1(C)	-	25
V	1	1	-	15
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

W.e.f. 2023 - 24 ADMITTED BATCH

COURSE 1

Course Code: **No. of credits:4** Hours/Week :05 Total hours: 60hrs

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

	Pithapur Rajahs Government College (Autonomous) Kakinada	**Program & Semester** I B.Sc. (I Sem) COURSE-2 W.e.f. 2024 - 25 ADMITTED BATCH			
Course Code PH	**ADVANCES IN MATHEMATICAL, PHYSICALAND CHEMICALSCIENCES**				
Teaching	**Hours Allocated: 60 (Theory)**	L	T	P	C
Pre-requisites:	Different types of Physical quantities, Basic mathematical equations & formulae, Forces and its properties, knowledge about celestial bodies	5	0	-	4

Course Objective:

The objective of this course is to provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences. The course aims to broaden students' knowledge beyond the foundational concepts and expose themto the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements

Learning outcomes:

1. Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems.

2. To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations.

3. Understand the different sources of renewable energy and their generation processes and advances in nanomaterials and their properties, with a focus on quantum dots. To study the emerging field of quantum communication and its potential applications. To gain an understanding of the principles of biophysics in studying biological systems. Explore the properties and applications of shape memory materials.

3. Understand the principles and techniques used in computer-aided drug design and drug delivery systems, to understand the fabrication techniques and working principles of nano sensors. Explore the effects of chemical pollutants on ecosystems and human health.

4. Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.

5 Understand and convert between different number systems, such as binary, octal, decimal, and hexadecimal. Differentiate between analog and digital signals and understand their characteristics. Gain knowledge of different types of transmission media, such as wired (e.g., copper cables, fiber optics) and wireless (e.g., radio waves, microwave, satellite).

UNIT II: ADVANCES IN PHYSICS:

Renewable energy: Generation, energy storage, and energy-efficient materials and devices.

Recent advances in the field of nanotechnology: Quantum dots, Quantum Communication- recent advances in biophysics- recent advances in medical physics- Shape Memory Materials.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

Application of Renewable energy: Grid Integration and Smart Grids,

Application of nanotechnology: Nano medicine,

Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics,

Application of medical physics: Radiation Therapy, Nuclear medicine

Recommended books:

1. **Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle**
2. **"Energy Storage: A Nontechnical Guide" by Richard Baxter**
3. **"Nanotechnology: Principles and Applications" by Sulabha K. Kulkarni and Raghvendra A. Bohara**
4. **"Biophysics: An Introduction" by Rodney Cotterill**
5. **"Medical Physics: Imaging" by James G. Webster**

STUDENT ACTIVITIES

1: Case Studies

Provide students with real-world case studies related to renewable energy, nano technology, biophysics, medical physics, or shape memory materials.
Students will analyze the case studies, identify the challenges or problems presented, and propose innovative solutions based on the recent advances in the respective field. They will consider factors such as energy generation, energy storage, efficiency, sustainability, materials design, biomedical applications, or technological advancements.

2: Experimental Design

Assign students to design and conduct experiments related to one of the topics: renewable energy, nanotechnology, biophysics, medical physics, or shape memory materials.
They will identify a specific research question or problem to investigate and design an experiment accordingly.

Students will collect and analyze data, interpret the results, and draw conclusions based on their findings. They will discuss the implications of their experimental results in the context of recent advances in the field.

3: Group Discussion and Debate

Organize a group discussion or debate session where students will discuss the ethical, social, and environmental implications of the recent advances in renewable energy, nanotechnology, biophysics, medical physics, and shape memory materials.

Assign students specific roles, such as proponent, opponent, or moderator, and provide them with key points and arguments to support their positions.

GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–I

W.e.f. 2024 - 25 ADMITTED BATCH

COURSE 2 BLUE PRINT

No. of credits: 04 **Hours/Week:5** **Total hours: 60hrs**

Course Code:

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

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

Blue Print

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

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

PITHAPUR RAJAHS GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–I

W.e.f. 2024 - 25 ADMITTED BATCH

COURSE 2 MODEL PAPER

Course Code: **No. of credits: 04** **Hours/Week:5** **Total hours: 60hrs**

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

3. Essay question from UNIT- I
4. 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. Short answer question from UNIT - V
12. Problem from UNIT - I
13. Problem from UNIT - III

	Pithapur Rajah's Government College (Autonomous) Kakinada	**Program & Semester** I B.Sc. (II Sem) W.e.f. 2024 - 25 ADMITTED BATCH			
Course 3	**MECHANICS, PROPERTIES OF MATTER (For Physics Major and Minor)**				
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-II
COURSE 3: MECHANICS AND PROPERTIES OF MATTER

Theory Credits: 3 hrs/week

COURSE OBJECTIVE:

The course on Mechanics and Properties of Matter aims to provide

- a platform to understand the fundamental concepts about the Matter and its properties.
- students with a fundamental understanding of the behavior of physical systems
- the understanding the basic concepts related to properties of matter and its applications

COURSE OUTCOMES

	On Completion of the course, the students will be able to-	Cognitive Domain
CO 1	Students will be able to understand and apply the concepts of scalar and vector fields, calculate the gradient of a scalar field, determine the divergence and curl of a vector field.	Remembering &Understanding
CO 2	Students will be able to apply the laws of motion, solve equations of motion for variable mass systems	Application
CO 3	Students will be able to define a rigid body and comprehend rotational kinematic relations, derive equations of motion for rotating bodies, analyze the precession of a top and gyroscope, understand the precession of the equinoxes	Analyzing& Understanding
CO 4	Students will be able to define central forces and provide examples, understand the characteristics and conservative nature of central forces, derive equations of motion under central forces.	Application
CO 5	Students will be able to differentiate between Galilean relativity and the concept of absolute frames, comprehend the postulates of the special theory of relativity, apply Lorentz transformations, understand and solve problems	Knowledge & Understanding

UNIT-I: VECTOR ANALYSIS (9 hrs)

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: MECHANICS OF PARTICLES (9 hrs)

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-III: MECHANICS OF RIGID BODIES AND CONTINUOUS MEDIA (10 hrs)

Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, Precession of a top, Gyroscope, Precession of the equinoxes. Elastic constants of isotropic solids and their relations, Poisson's ratio and expression for Poisson's ratio. Classification of beams, types of bending, point load, distributed load.

UNIT-IV: 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 centralforce. Derivation of Kepler's laws. Motion of satellites

UNIT-V: SPECIAL THEORY OF RELATIVITY (8 hrs)

Galilean relativity, Absolute frames. Michelson-Morley experiment, The 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 & Subramanyam, S. Chand &Co. 1982
7. Dynamics of Particles and Rigid bodies– Anil Rao, Cambridge Univ Press, 2006
8. Mechanics-EM Purcell, Mc Graw Hill
9. University Physics-FW Sears, MW Zemansky& HD Young, Narosa Publications, Delhi
10. College Physics-I. T. Bhima sankaram and G. Prasad. Himalaya Publishing House.
11. Mechanics, S. G. Venkata chalapathy, Margham Publication, 2003.

WEB LINKS

- https://ocw.mit.edu/courses/physics/8-01sc-classical-mechanics-fall-2016/syllabus/
- https://ocw.aprende.org/courses/physics/8-01sc-physics-i-classical-mechanics-fall-2010/
- https://onlinecourses.nptel.ac.in/noc21_ph32/preview
- https://nptel.ac.in/courses/115/105/115105098/

GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–II PAPER 3

W.e.f. 2024 - 25 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	-	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 RAJAHS GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–II PAPER C3

W.e.f. 2024 – 25 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
3. Essay question from UNIT- II

SECTION-B

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

PART-II

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

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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

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.

Course Outcomes:

On the completion of this course, the students will be able to		Cognitive domain
CO 1	Mastery of experimental techniques: Students should become proficient in using laboratory equipment and experimental techniques to measure properties of matter and analyze mechanical systems.	Knowledge & Understanding
CO 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.	Application
CO 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	Analysis & Application
CO 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.	Critical Thinking & Problem solving
CO 5	Understanding of physical principles: Students should develop an understanding of the physical principles governing mechanical systems and the properties of matter, including elasticity, viscosity, and thermal expansion	Understanding & Application

LIST OF EXPERIMENTS

Minimum of 6 experiments to be done and recorded

1. Viscosity of liquid by the flow method (Poiseuille's method)
2. Young's modulus of the material of a bar (scale) by uniform bending
3. Young's modulus of the material a bar (scale) by non- uniform bending
4. *Surface tension of a liquid by capillary rise method*
5. *Determination of radius of capillary tube by Hg thread* method
6. Viscosity of liquid by Searle's viscometer method
7. Bifilar suspension –moment of inertia of a regular rectangular body.
8. Determination of moment of inertia using Fly-wheel
9. Determination of the height of a building using a sextant.
10. Rigidity modulus of material of a wire-dynamic method (torsional pendulum)

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: Vector Analysis

Activity: Field Mapping

Students can choose a physical field (e.g., temperature, magnetic field) and create a field map by taking measurements at different points. They can then calculate the gradient of the field and analyze the variations. This activity helps them understand the concept of gradient in a scalar field.

Unit II: 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 III: Mechanics of Rigid Bodies and Continuous Media

Activity: Balancing Act

Students can experiment with balancing various objects (e.g., rulers, books) on different points to understand the concept of center of mass and stability. They can analyse the equilibrium conditions and explore how the position of the center of mass affects the stability.

Unit IV: 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 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 dilation

	Pithapur Rajahs Government College (Autonomous) Kakinada	**Program & Semester-II** W.e.f. 2024- 25 ADMITTED BATCH			
Course 4	**WAVES AND OSCILLATIONS**				
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

No of Credits:03 hrs/week:03

COURSE OBJECTIVE:

This course provides students with

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

Course Outcomes

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	To describe the basic characteristics of waves such as frequency, wavelength, amplitude, period, and speed.	Remembering &Understanding
CO2	To utilize mathematical relationships related to wave characteristics.	Application
CO3	To compare particle motion and wave motion in different types of waves.	Analyzing
CO4	To distinguish between Longitudinal and Transverse waves.	Application
CO5	To get the knowledge about how to construct and analysis the square waves, saw tooth waves, etc. from Fourier analysis	Application

UNIT-I Simple Harmonic oscillations (9 hrs)

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

UNIT-II Damped and forced oscillations (9 hrs)

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

UNIT-III Complex vibrations (7 hrs)

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

UNIT-IV Vibrating Strings and Bars (12 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-V Ultrasonics: (8 hrs)

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

REFERENCE BOOKS:

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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA.

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

Waves and Oscillations (Blue Print)

w.e.f. 2024-25 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	1	20
III	1	2	-	20
IV	2	-	1	25
V	1	1		15
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–II PAPER 4

W.e.f. 2024 - 25 ADMITTED BATCH

WAVES AND OSCILLATIONS

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. Short answer question from UNIT - V
12. Problem from UNIT - I
13. Problem from UNIT - III

SEMESTER-II
COURSE 4: WAVES AND OSCILLATIONS

Hours/week:2

Practical Credits: 01

COURSE OBJECTIVE:

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

LEARNING OUTCOMES:

1. Students are made to determine the unknown frequency of tuning fork by volume resonator experiment
2. Students are made to determine 'g' by compound/bar pendulum
3. Students are made to determine the force constant of a spring by static and dynamic method.
4. Students are made to determine the elastic constants of the material of a flat spiral spring.
5. Students are made to verify the laws of vibrations of stretched string –sonometer
6. Students are made to determine the frequency of a bar –Melde's experiment.
7. Students are made to study the damped oscillation using the torsional pendulum immersed in liquid-decay constant and damping correction of the amplitude.
8. Students are made to form Lissajous figures using CRO.

Minimum of 6 experiments to be done and recorded

Experiments

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

Scheme of Evaluation for Practicals

Time: 2hrs Max.Marks:50

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

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 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-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.

	P.R. Government College (Autonomous) Kakinada	**Program & Semester** II B.Sc. (IV Sem) **(A.Y. 2024 – 2025)**			
Course Code	**Troubleshooting and Fixing of Laboratory Instrument's** (Value Added Certificate Course)				
Teaching	Hours Allocated: 30 (**Theory**)	L	T	P	C
Pre-requisites:	Knowledge about Voltmeter, Ammeter to be connected in circuits. Usage of wire cutter.	2	0	-	2

Course Outcomes: After successful completion of the course the student will be able to

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

- Acquire necessary skills/hand on experience/ working knowledge on multi-meters, galvanometers, ammeters, voltmeters, ac/dc generators, motors, transformers, single phase and three phase connections, basics of electrical wiring with electrical protection devices.
- Understand the working principles of different lab equipment.
- Check the electrical connections also learn the skill to repair lab equipment for the general troubleshoots.

Module – 1(5 hrs.)

Introduction to Laboratory equipment Trouble shooting:

Overview of Laboratory equipment, Importance of Troubleshooting & Maintenance

Module – 2(5 hrs.)

Fundamentals of electricity: Concept of basic Electricity - Electric conductor, insulator and resistance.

Measurement of Electrical quantities: Voltage, Current, Resistance, Impedance, power factor and energy.

Module – 3(5 hrs.)

Trouble shooting technique and Tools:

Systematic Troubleshooting approach using Multimeters, oscilloscopes and other tools

Module – 4(10 hrs.)

Soldering and De-soldering: Soldering techniques, Flux and its role in soldering, Soldering safety and hygiene, Desoldering techniques, De soldering tools (wicks , pumps and vacuums)

Module – 5 (5 hrs.)

Testing procedure of voltage current /Importance of Earthling: Definition and testing procedure of voltage, current, power, MCB and bus bars - Earthling Connection – Different earthling systems.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)Kakinada.

Department of Physics & Electronics

I B. Sc – Semester – I (A.Y. 2024 – 2025)

Course Code: **No. of Credits: 02**

Household Electrical Wiring

(Value Added Certificate Course)

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

Time: 1 Hr **Max. Marks: 50**

Blue Print

Module		No. of Qs.	Marks allotted
1	**Introduction to Laboratory equipment Trouble shooting**	10	10
2	**Fundamentals of electricity**	20	20
3	**Trouble shooting technique and Tools**	10	10
4	**Soldering and De-soldering**	5	5
5	**Testing procedure of voltage current /Importance of Earthling**	5	5
	TOTAL	**50**	**50**

- **Question paper will be set in the Multiple Choice Based**

	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 properties 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. Achromatism 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 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 and Michelson Interferometer.

UNIT-III Diffraction

Introduction, distinction between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction – Diffraction due to 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 period 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 specific 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.

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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**

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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

II B.Sc., SEMESTER–III 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 and 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 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 analyse 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 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 of 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**.

	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**

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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

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 $\frac{1}{2}$ 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

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

SECTION-B

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

PART-II

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

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

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 electronic devices and their applications in various circuits.

LEARNING OUTCOMES:

1. Understand the behavior of P-N junction diodes in forward and reverse bias conditions and analyze the impact of junction capacitance on diode characteristics.
2. Analyze and compare the characteristics and operation of different BJT configurations (CB, CE, and CC) and demonstrate proficiency in biasing techniques.
3. Comprehend the operation and characteristics of FETs, including JFETs and MOSFETs, and explain the working principles and characteristics of UJTs.
4. Describe the operation and applications of various photoelectric devices such as LEDs, photo diodes, phototransistors, and LDRs.
5. Understand the operation of rectifiers (half-wave, full-wave, and bridge), analyze the ripple factor and efficiency, and demonstrate knowledge of different filter types and three-terminal voltage regulators

UNIT I: PN JUNCTION DIODES

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

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

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

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

Difference between JFET and BJT, Construction and working of JFET, Drain and Transfer Characteristics, MOSFET - Depletion-type, and Enhancement-Type MOSFETs. FET Biasing: Voltage Divider Biasing. UJT- Construction, working, V-I characteristics. SCR – Construction, Working and Characteristics

UNIT IV: PHOTO ELECTRIC DEVICES:

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

UNIT-V: POWER SUPPLIES:

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

REFERENCE BOOKS:

1. Electronic Devices and Circuit Theory --- Robert L. Boylestad & Louis Nashelsky.
2. Electronic Devices and Circuits I – T.L.Floyd- PHI Fifth Edition
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 $\frac{1}{2}$ 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 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 with the fundamental principles of electronic devices and circuits.

LEARNING OUTCOMES:

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

Minimum of 6 experiments to be done and recorded

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

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 measure 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 or a 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-source voltages (VGS). They can plot the transfer characteristic curve and observe the variations in ID with VGS. They can 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 emission 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 different 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 state machines

UNIT-I: OPERATIONAL AMPLIFIERS

a) Concept of feedback in CE amplifier, negative and positive feedback, advantages and disadvantages of negative feedback, Basic concepts of differential amplifier, Block diagram of op amp and its equivalent circuit, IC Diagram (IC 741), Ideal voltage transfer curve, Open loop Op-Amp configurations- differential, inverting and non-inverting Op-Amps.

b) Voltage Series Feedback Amplifier (Non-Inverting Op amp): Gain and Bandwidth derivations: Voltage Shunt Feedback Amplifier (Inverting Op amp): Gain and Bandwidth derivations

UNIT-II: PRACTICAL OPERATIONAL AMPLIFIER AND APPLICATIONS

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

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

UNIT-III: NUMBER SYSTEMS, CODES AND LOGIC GATES

a) Number Systems and Codes: Decimal, Binary, Octal and Hexadecimal number systems, conversions, Binary addition, Binary subtraction using 1's and 2's complement methods, BCD code and Gray code – Conversions

b) Logic Gates: Construction and truth tables of OR, AND, NOT gates, Universal gates – Basic construction and truth tables of NOR & NAND, Realization of logic gates using NAND and NOR, XOR and XNOR Logic gates symbol and their truth tables. De Morgan's Laws, Boolean Laws, Simplification of Boolean Expressions using Boolean Laws

UNIT-IV: ARITHMETIC CIRCUITS & DATA PROCESSING CIRCUITS

a) Half Adder and Full Adder: Explanation of truth tables and Circuits. Half Subtractor and Full Subtractor: Explanation of truth tables and Circuits, 4 - bit binary Adder/Subtractor.

b) Multiplexers - 2 to 1 Multiplexer, 4 to 1 multiplexer, De-multiplexers: 1 to 2 Demultiplexer, 1 to 4 Demultiplexer, Applications of Multiplexers and Demultiplexers Decoders: 1 of 2 decoders, 2 of 4 decoders, Encoders: 4 to 2 Encoder, 8 to 3 Encoder, Applications of decoders and encoders

UNIT-V: SEQUENTIAL LOGIC CIRCUITS & CODE CONVERTERS

a) Combinational Logic vs Sequential Logic Circuits, Sequential Logic circuits: Flip-flops, Basic NAND, NOR Latches, Clocked SR Flip-flop, JK Flip-flop, D Flip-flop, Master-Slave Flip- flop, Conversion of Flip flops.

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

Reference Books:

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

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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

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-on 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 scenarios.
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, filters, and oscillators. They can be asked to select the appropriate op-amp and other components such as resistors, capacitors, 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 an 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 theoretical 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 on 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 such as XOR, AND, and OR gates. They can then test the circuit by adding two binary numbers and comparing the result with 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 such 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 using flip-flops. They can use different types of counters, such as ripple, synchronous, or Johnson, and test their operation by 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 decoders 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 formulate the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and 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

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 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 &Understanding

- 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 sphere, Electrical potential–Equipotential surfaces, Potential due to a uniformly charged sphere. Dielectrics-Polar and Non-polar dielectrics- Effect of electric field on dielectrics, Dielectric strength, Electric displacement D, electric polarization Relation between D, E and P, Dielectric constant and electric susceptibility.

UNIT-II Current electricity

Electrical conduction-drift velocity-current density, equation of continuity, ohms law and limitations, Kirchhoff's Law's, Wheatstone bridge-balancing condition - sensitivity. Branch current method, Nodal Analysis, star to delta & delta to star conversions. Superposition Theorem, Thevenin's Theorem, Norton's Theorem, 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 its application 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, Self-inductance of a long solenoid, Magnetic Energy density. Mutual inductance of a pair of coils. Coefficient of Coupling

UNIT-IV Electromagnetic waves-Maxwell's equations:

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

UNIT-V Varying and alternating currents:

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

REFERENCE BOOKS

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

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

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

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

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

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

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

8. 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**

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 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	**ELECTRICITY AND MAGNETISM**				
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:

1. Figure of merit of a moving coil galvanometer.
2. LCR circuit series/parallel resonance, Q factor.
3. Determination of ac-frequency –Sonometer.
4. Verification of Kirchhoff's laws and Maximum Power Transfer theorem.
5. Verification of Thevenin's and Norton's theorem
6. Field along the axis of a circular coil carrying current-Stewart & Gee's apparatus.
7. Charging and discharging of CR circuit-Determination of time constant
8. A.C Impedance and Power factor
9. 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 spectrum, Vector atom model – Stern and Gerlach experiment, Quantum numbers associated with it, Coupling 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 effect, Characteristics of Raman effect, Experimental arrangement to study Raman effect, Quantum theory of Raman effect, Applications of Raman effect. Spectroscopic techniques: IR, UV-Visible, and Raman spectroscopy

UNIT-III: Matter waves & Uncertainty Principle:

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

UNIT-IV: Quantum Mechanics:

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

UNIT-V: Superconductivity:

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

theory, 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**

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., 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. Short answer question from UNIT - V
12. Problems from UNIT - II
13. Problems from UNIT - IV

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

Minimumof6experimentstobedoneandrecorded

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-IV

COURSE 11:

INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS

Theory Credits: 3 3 hrs/week

COURSE OBJECTIVE:

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

LEARNING OUTCOMES

By 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 forces: Characteristics of nuclear forces- Yukawa's meson theory; Nuclear Models- Liquid drop model- Semi 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 of interactions- strong, electromagnetic and weak interactions; Conservation laws – Isospin, parity, charge conjugation

UNIT-III: Nuclear Reactions and Nuclear Detectors

Nuclear Reactions: Types of reactions, Conservation Laws in nuclear reactions, Reaction energetic, Threshold energy, nuclear cross-section; Nuclear detectors: Geiger- Muller counter, Scintillation counter, 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 Beta-decay, selection rules. Nuclear Accelerators: Types- Electrostatic and electrodynamics accelerators; Cyclotron-construction, working and applications; Synchrocyclotron-construction, working and applications.

UNIT-V: Applications of Nuclear and Particle Physics

Medical Applications: Radiation therapy and imaging techniques, nuclear energy: nuclear reactors and 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 $= \frac{(95-50)}{95}$ X 100 = $\frac{45}{95}$ x 100 = 47%

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 nuclearand 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 andtechniques.
6. Learn to design and perform experiments, including calibration, measurement, and control ofvariables.

NSINRPTNEEX EPXE

1. GM counter – Determination of dead time
2. eiacl oc rilclripciiir 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 III Year B. Sc. Semester – V w.e.f. 2022-23 ADMITTED BATCH			
Course Code	TITLE OF THE COURSE Low Temperature Physics &Refrigeration (Skill Enhancement Course (Elective) -6B				
Teaching	Hours Allocated: 60, Max.marks 50 (**Theory**)	L	T	P	C
Pre-requisites	Thermo Dynamic Laws, fluid mechanics, Condensation, States of matter, Phase diagram of material,	4	-	-	4

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

1. Identify various methods and techniques used to produce low temperatures in the Laboratory.
2. Acquire a critical knowledge on refrigeration and air conditioning.
3. Demonstrate skills of Refrigerators through hands on experience and learns about refrigeration components and their accessories.
4. Understand the classification, properties of refrigerants and their effects on environment.
5. ComprehendtheapplicationsofLowTemperaturePhysicsandrefrigeration.

COURSE OBJECTIVES

1. Different methods of liquefaction
2. Learning various types of thermometers
3. knowledge on refrigeration and air-conditioning
4. Learning various applications of low temperature &refrigeration

Course Outcomes

On Completion of the course, the students will be able to		cognitive domain
CO1	Identify various methods and techniques used to produce low temperatures in the Laboratory.	Remembering
CO2	Demonstrate skills of Refrigerators through hands on experience and learns about refrigeration components and their accessories	Applying
CO3	Understand the classification, properties of refrigerants and them effects on environment	Understanding
CO4	Comprehend the applications of Low Temperature Physics and refrigeration	Analyzing

Course with focus on Employability / Entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

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

UNITI: PRODUCTION OF LOW TEMPERATURE (10hrs)

Production of low temperatures-Introduction, Freezing mixtures, Joule-Thomson effect**, Joule-Thomson effect of an ideal gas- Joule-Thomson effect of real gases**-Regenerative cooling, Different methods of liquefaction of gases, liquefaction of air Production of liquid hydrogen and nitrogen, Adiabatic demagnetization – **mathematical treatment**, Properties of materials at low temperatures, Curie's Law-Superconductivity

UNITII: MEASUREMENT OF LOW TEMPERATURE (10hrs)

Gas thermometer and its correction and calibration, Secondary thermometers, resistance thermometers, thermocouples, Vapour pressure thermometers, Magnetic thermometers, Advantages and drawbacks of each type of thermometer.

UNITIII: PRINCIPLES OF REFRIGERATION (10hrs)

Introduction to Refrigeration- Natural and artificial refrigeration, Stages of refrigeration, Types of refrigeration - Vapor compression and vapor absorption refrigeration systems, Refrigeration cycle and explanation with a block diagram, Introductory ideas on air-conditioning.

Refrigerants-Introduction, Ideal refrigerant, Properties of refrigerant, Classification of refrigerants, commonly used refrigerants, Eco-friendly refrigerants

UNITIV: COMPONENTS OF REFIGERATOR (10hrs)

Refrigerator and its working, Block diagram, Coefficient of Performance (COP), Tons of refrigeration (TR) and Energy Efficiency Ratio (EER), Refrigerator components: Types of compressors, evaporators and condensers and their functional aspects, defrosting in a refrigerator, Refrigerant leakage and detection

UNITV: APPLICATIONS OF LOWTEMPERATURE & REFRIGERATION (10hrs.)

Applications of Low temperatures: Preservation of biological material, Food freezing, liquid nitrogen and liquid hydrogen in medical field, Superconducting magnets in MRI- Tissue ablation (cryosurgery) - Cryogenic rocket propulsion system.

Applications of refrigeration: Domestic refrigerators, Water coolers, Cold storages, Ice plants, Food preservation methods, Chemical and Process industries, Desalination of water,

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. Heat and Thermodynamics by BrijLal & N.Subramanyam, S.Chand Publishers.
2. Thermal Physics by S C Garg, R M Bansal & C K Ghosh, Mc Graw Hill Education,India
3. Heat and Thermodynamics by M M Zemansky, McGraw Hill Education(India).
4. Low-Temperature Physics by Christian E.& Siegfried H Springer.
5. Thermal Engineering by S. Singh, S Pati, Ch:18IntroductiontoRefrigeration.
6. The Physics Hyper Text Book Refrigerators .https://physics.info/refrigerators/
7. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi
8. A course in Refrigeration and Air Conditioning by S. C. Arora and S. Domkundwar , Dhanpatrai and sons, Delhi.

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

III B.Sc Physics Paper – 6B – Semester – V (Model Paper)

Low Temperature Physics & Refrigeration

(Skill Enhancement Course (Elective)

2022-23ADMITTED BATCH

Course Code: **No. of credits: 04**

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

Time: 2 Hrs. Max. Marks: 50

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

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

Blue Print

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

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

III B. Sc Physics Paper – 6B – Semester – V (Model Paper)

Low Temperature Physics &Refrigeration

(Skill Enhancement Course (Elective)

2022-23ADMITTED 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- I

SECTION-B

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

PART-II

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

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

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code PH	**TITLE OF THE PRACTICAL – 6B** **Low Temperature Physics & Refrigeration Lab**	III Year B. Sc Semester – V			
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. Record the Principles and applications of Refrigerators and Freezers.
2. Measure the temperatures below Melting point of Ice using a thermometer available in the Lab.
3. Make a freezing mixture by adding different salts viz., Sodium chloride, Potassium Hydrate (KOH), Calcium chloride to ice in different proportions and observe the temperature changes.
4. Studytheoperationofarefrigeratorandunderstandtheworkingofdifferentparts.
5. Study the properties of refrigerants like chlorofluorocarbons-hydro chloro fluoro- carbons and record the lowest temperatures obtained.
6. Considerasimplefaultyrefrigeratorandtrytotroubleshootthesimpleproblemsby understanding its working.
7. UnderstandthepracticalproblemoffillingtheFreonGasintotheRefrigerator.
8. Get the Liquid Nitrogen or Liquid Helium from nearby Veterinary Hospital and measure their temperatures using chromel-alumel thermocouple or mercury thermometer and observe their physical properties like colour, smell etc. and precautions to be taken for their safe handling.

9. Preparation of freeze-drying food with Dry ice and liquid nitrogen
10. Preparation of freeze-drying food with liquid nitrogen

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	- 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	- 05Marks
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 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.

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code	**TITLE OF THE COURSE** Solar Energy and Applications -7B **(Skill Enhancement Course (Elective)**	III Year B. Sc Semester – V			
Teaching	Hours Allocated: 60, Max.marks 50 (**Theory**)	L	T	P	C
Pre-requisites	Basic idea about Latitudes and Longitudes, Introduction to semiconductors, PN junction diode and its characteristics	4	-	-	4

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

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

COURSE OBJECTIVES

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

COURSE OUTCOME

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

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 secondary, Solid-state battery, Molten solvent battery, lead acid battery and dry batteries, Mechanical storage – Flywheel, Electrical storage –Super capacitor

CO – PO Mapping

1: Slight [Low]; 2: Moderate [Medium]; 3:Substantial [High]; '-': (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 – 7B – Semester – V (Model Paper)

Solar Energy and Applications -7B

(Skill Enhancement Course (Elective)

2022-23ADMITTED BATCH

Course Code: **No. of credits: 04**

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

Time: 2 Hrs. Max. Marks: 50

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

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

Blue Print

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

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

III B.Sc Physics Paper – 7B – Semester – V (Model Paper)

Solar Energy and Applications

(Skill Enhancement Course (Elective)

2022-23ADMITTED 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 – 7B** **Solar Energy and Applications Lab**	III Year B. Sc Semester – V			
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.	Dr. A. Nirmala Jyotsna 9490171202	Physics	St. Theresa College (W), Eluru
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
6	P.P.Divakar	Physics	Y.V.N.R. GDC, Kaikaluru.
7	R.SuryanarayanaRaju	Physics	K.G.R.L.College , Bhimavaram
8	Smt.V.Vidyamallika	Physics	K.G.R.L.College , Bhimavaram
9	P.Rajyalakshmi	Physics	C.R.R. College (W), Eluru
10	K.Sireesha	Physics	C.R.R. College (W), Eluru
11	M.Jayalakshmi Devi	Physics	C.R.R. College (W), Eluru
12	N.S.Satyanarayana Murthy	Physics	S.K.B.R.College, Amalapuram
13	V.V.SubbaRao	Physics	S.K.B.R.College, Amalapuram
14	J.PrabhakaraRao	Physics	S.K.B.R.College, Amalapuram
15	S.V.KumaraSastry	Physics	S.K.B.R.College, Amalapuram
16	V.Radha Krishna	Physics	S.K.B.R.College, Amalapuram

17	K.SrinivasaRao	Physics	Govt. Deg.College,Razole
18	ValluriSrinivasaRao	Physics	Govt. College (W) Nidadavolu
19	E.NageswaraRao	Physics	Govt. College, Eleswaram
20	EsubBasha Sheik	Physics	Govt. College (A), RJY
21	P.S. Brahamachari	Physics	Govt. College , Tadepalligudem
22	K.Ganesh Kumar	Physics	Govt. College , Tadepalligudem
23	M.Sudhadhar	Physics	Govt. College (A), RJY
24	B.DurgaLakshmi	Physics	Govt. College (A), RJY
25	T.Y.H.A.G.Gandhi	Physics	Govt. College , Ravulupalem
26	P. Rama Krishna Rao	Physics	Y.N. College (A), Narasapur
27	D. Gangadharudu	Physics	M.R. College, Peddapuram
28	A.Satyanarayana Murthy	Physics	M.R. College, Peddapuram
29	N. Veer Kumar	Physics	M.R. College, Peddapuram
30	S. Rama Rao	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	K.Srinivasa Rao	Physics	GDC, Mandapeta

PITHAPUR RAJAH'S GOVERNMENT COLLEGE [A]:: KAKINADA
PLAN OF ACTION FOR AY 2024-25

The department of Physics and Electronics is planning to conduct the following programs for the academic year 2024-25

S.No	Activity planned	Dates/ Period
1	Distribution of Kasarabada Scholarship both for UG& PG Students	2.7.2024
2	Expenses for repair of damaged equipment in lab	01.08.2024 to 30.04.2025
3	National /International online webinar	01-08-2024 to 30-10-2024
4	Certificate course-1/Diploma Course	August 2024 onwards
5	Guest Lectures - 4	1.20.08.2024 2.12.10.2024 3.28.12.2024 4.11.03.2025
6	MoUs - 3 (Target)	01.08.2024 to 30.04.25

7	Developing Innovation Incubation Center	01.08.2024 to 30.04.2025
8	Research publications - 5 (target)	01.07.2024 to 30.04.2025
9	Parent-Teacher Meeting	01.08.2024 to 30.04.2025
10	Best Practice: 1. Collaboraton with Industries. 2. UPKARscheme – Disbursement of scholarships to Poor & merit tudents	01.07.2024 to 30.04.2025
11	Field trip	4th week 2024
12	Observation of important days 1.Observing World Chess Day 2.Observing Hiroshima/NagasakiDay3.Observing World OzoneDay 4. Celebration of Birthday of Sir C.V.Raman 5. National Science Day 6. Zero shadow day	1.20-07-2024 2.06-08-2024 3.16-09-2024 3.07-11-2024 4.28-02-2025

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

Budget Proposal for the Academic Year 2024-25

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:

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)

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**

PHYSICS BOS 2024 - 25

Certificate

The syllabus and model question papers including **Blue – Print** in Physics subject for 3 years B.Sc. course for the semester I,II,III,IV,V and VI for the academic year **2024-25**, list of examiners and paper setters, departmental activities which contains pages is approved in the Board of Studies meeting held offline and on line through the Google Meet app on **30 –04- 2024**

Members of Board of Studies			Signatures of members
1	Dr. M.Surekha Head of the Department	Chairman	
2	Dr.P.Paul Diwakar	University nominee, Y.V.N.R Government college,Kaikaluru	
3	Dr.K.Jyothi	Subject Expert, Principal SVRKGDC(M),Nidadavolu	
4	Dr. D.Sanjeev Kumar	Subject Expert, Assistant professor of Physics, Government College(A),Rajamahendravaram	
5	Sri.A.V.V Prasad	Representative from Industry, Solar Systems,Kakinada	
6	Dr.K.Nanda Gopal	~~Sr.Scientific Asst~~.IMD,Alumni METEOROLOGIST	
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	Mr.P.Veerendra	Member	
15	L.Subhash	Student Member I B.Sc PHY(HON)	
16	B. Sri Durga Bhavani	Student Member, II MPC EM-2	