P.R. GOVERNMENT COLLEGE (A), KAKINADA

(AN AUTONOMOUS COLLEGE WITH NAAC "A" GRADE)

Board of Studies for UG Programmes

PHYSICS

2022 – 2023

DEPARTMENT OF

PHYSICS & ELECTRONICS

P. R. GOVT. COLLEGE (A), KAKINADA

DEPARTMENT OF PHYSICS & ELECTRONICS

TABLE OF CONTENTS

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.12A/A.C/BOS/2022-23 **Dt.24Sept'2022**

Sub: P.R.G.C [A]–Academic Cell-**Conduct of BOS Meetings for the Academic Year 2022-23** – Guidelines issued -Regarding.

Ref: 1. Minutes of IQAC meeting dated 18 September 2022
2. Resolutions adopted in 22nd Staff Council Meeting held on 23 Sept 2022

PREAMBLE

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 of 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 equip students with such skills that translate them into leaders and potential entrepreneurs too besides credit transfer mechanism through ABC (Academic Bank of Credits).

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 by facilitating the students experience a wide range of participative and experiential learning strategies including field trips, conferences, integration of technology, community service programs, career guidance, certificate and value added courses, research and inquisition based teaching, exchange programs, gender equity programs, etc.

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.

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 institutions vision and mission, SDG-4, NEP – 2020, NAAC, NIRF to the autonomous HEIs, need to customize, design and re-orient their academic and research administration in tune with the policies of above bodies, our institution is no exception.

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 separately between **11 October 2022 and 15 October 2022**. 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 and a 21st century student capable of facing challenges, adaptive to changes, creative and innovative.

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 60% forI mid-term examination, 75% for II mid-term examination 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 2022-23, if any, number of certificate courses, their frequency, Bloom's- Taxonomy based evaluation system for effective learning outcomes as per the Annexure -I

The Chairmen are, therefore, requested to

- Design curricula of Odd and even semesters for the A.Y 2022-23 both for U.G and P.G courses in tune with the stated vision, mission of the institution, RAF of NAAC, NEP-2020 and NIRF.
- 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.
- 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 member's 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 coordinator shall conduct a meeting with the Chairmen, BOS between 28-29 September 2022 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 per Board to the respective Chairman (If BOS meetings for multiple Boards are to be held under one Chairmanship, he/ she shall be given advance amount equivalent to the number of Boards 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).

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 in case of science subjects

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

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

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

8. Each BOS Chairman shall, immediately after syllabus, tabulate the changes made in the syllabus/ paper along with justification, in the Proforma given in Annexure –I.
9. Attendance of Members present with signatures in the tabularform.
10. List of Examiners & Paper setters
11. Syllabus for each course (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical) and allocation of CIA(50 marks) for each course with structure.
12. CO-PO mapping /PO attainment data
13. Text & Reference Books
14. e-content links

PRINCIPAL
P.R.Govt. College (A)
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.No.	UG Courses	Name of the Subject Expert
1	English	Dr. Prasanthi Sree, AKNU MNS Campus, Kkd, Ph No: 9848297555, sathupathi.sri@gmail.com
2	Hindi	Dr. N Venkata Ramana, SKBR College, Amalapuram, Ph. No: 9849373773
3	Telugu	Dr. P. Nagaraju, GDC, Palakollu, Ph.No: 9052038569, raju00517@gmail.com
4	Sanskrit	Dr. TGY Acharyulu, SKR Womens College, Rajahmundry, Ph. No: 9848628812
5	Mathematics	Dr. V. Anantha Lakshmi, Principal, GDC Pithapuram, Ph. No : 9963786386, ananthamaths@rediffmail.com
6	Statistics & Actuarial Sciences	Dr. D V Ramana Murthy, HoD of Statistics, SKVT College, Rajamahendravaram, Ph.No: 9949135864, drdvrmurthy@gmail.com
7	Chemistry & Analytical Chemistry	Dr. K. Jhansi Lakshmi, Principal, Ideal College of Arts & Sciences, KKD, Ph.No: 9441236409, jhansikalisindi@gmail.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), Rajahmundry, Ph. No: 8639551783
10	Bio-Chemistry	Dr. M Suvarchala, Lecturer in home science, ASD women's Degree College, KKD, Ph. No: 9346512694, suvarchakamallela@gmail.com
11	Food Science	
12	Botany	Dr. J. Sujatha, Leturer in Botany, GDC Rjy, Ph.No: 9441050910, drjsuneetha@gcrjy.ac.in
13	Microbiology	Dr. D Aruna, Lecturer in Micro-biology, ASD Women's College, Kakinada, Ph. No: 9182525872
14	Zoology	Dr. B. Tejo Murthy, Lecturer in Zoology, GDC Yeleswaram, Ph. No: 9703799970, drmtm2011@gmail.com
15	Bio Technology	Dr. B. Nageswari, Lecturer in Biotechnology, GDC Rjy, Ph. No: 986621955

16	Commercial Aquaculture	Dr. P Ramamohana Rao, Aquaculture Consultant, KKD, Ph. No: 9885144557, asreenivasulu@gmail.com
17	Computer Science & Computer Applications	Mr. N. Naga Subrahmanyesweri, Lecturer in Computer Science, ASD Women's College, KKD, Ph. No: 9948438376, yesweri.velugu@asddgcw.ac.in
18	Commerce	Dr. K. Ratna Manikyam, Govt. College (A), RJY, Ph. No: 8919230362, drkrm@gcrjy.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 College, 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, drjsuneetha@gcrjy.ac.in
25	Pharmaceutical Chemistry	Dr. K. Deepthi, Asst. Professor, Dept. of Chemistry, AKNU, Rjy, Ph. No: 9985469607, deepthikorabandi@gmail.com

(BY ORDERS)

Dean 22/10/21
ACADEMIC AFFAIRS

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

PROCEEDINGS OF THE PRINCIPAL, P.R. GOVERNMENT COLLEGE(A), KAKINADA–A.P.

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

R.C. No.12A/A.C./BOS/2022-23, Dated: 24.09.2022

SUB: P.R.Government College (A), Kakinada - UG Boards of Studies (BoS)- Program/ Course - **B.Sc:,/ Physics,**Nomination of Members – Orders issued

REF: 1. UGC Guidelines of for Autonomous Colleges-2018.

ORDER:

The Principal, P.R.Government College (A), Kakinada is pleased to constitute UG Boards 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	Sri U.V.B.B. Krishna Prasad; 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	Sri K. VenkateswaraRao	Subject Expert, Local Nominee, 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 Department., Alumni
7	Smt. M. Surekha	Member
8	Dr. K.Jayadev	Member
9	Ms. G. Sridevi	Member
10	Sri R. Tejeswara Rao	Member
11	Dr.SVGVA Prasad	Member
12	Sri P. Himakar	Member
13	Sri B.Srikanth	Member
14	K. Durga Rao	Member
15	Mr.G.John,	Student Member II MPCTM
16	Kum. A Rani,	Student Member IIMPCS
17	Kum.UV Mahalakshmi	Student Member I B.Sc MPC(EM)
18	P.Satwika	Student Member IMPCS

The above members are requested to attend the BOS meeting on **-10-2022** and share their valuable views, and suggestions on the following functionaries.

- Prepare syllabi for the subject keeping in view the objectives of the college, interest of the stake holders and National requirement for consideration and approval of the IQAC and Academic Council
- Suggest methodologies for innovative teaching and evaluation techniques
- Suggest the panel of names to the Academic Council for appointment of Examiners
- Coordinate research, teaching, extension and other activities in the Department of the College.

B.V.T.
PRINCIPAL

P.R.Government College (A), Kakinada

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

P.R. Government College (Autonomous), Kakinada

Department of Physics and Electronics

BOARD OF STUDIES - PHYSICS

Meeting held on: Dt. 31.10.2022(Monday) 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.2021-22
2. Revised-common program structure and semester wise curriculum.
3. Adoption of regulations on scheme of examination and marks/grading system.
4. Engaging of 7th hour of time table
5. Streamlining of regularity in attendance.
6. Value added courses viz. add on courses and skill development courses to be conducted by the department during the academic year 2022-23.
7. Collaboration with industry and third party sector organisation in view of industrial internship.
8. Make students access to ICT infrastructure for enhanced quality in higher education.
9. Remedial coaching for slow learners and project/ research work for advanced learners
10. Allocation of extra credits for extracurricular activities.
11. List of equipment/software requirement for each lab/practical of **Semester-V**.
12. Conduct of parent teacher meeting.
13. Panel of Question papersetters and Examiners
14. Action plan for the academic year 2022-23.
15. Departmental budget proposal for the academic year 2022-23
16. Any other with the permission of the chair.

P.R.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 31-10-20222 at 2 p.m. under the chairmanship of Sri U.V.B.B. Krishna Prasad, In-charge of the Department., Dr. P. Paul Diwakar, University Nominee, Dr K Jyothi, Subject expert, 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

Agenda 1: Action taken report (ATR) of the A.Y.2021-22

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

Discussion: Discussed the action taken report (ATR) of the A.Y.2021-22

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

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

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

Discussion: Discussed the entire program structure

Resolution Adopted: Resolved to adopt the revised common program structure and verified course wise syllabi as per guidelines issued by APSCHE and ANUR. Also discussed and approved the revised course wise structure, Syllabi, Blue print and model papers of **Semesters I – V** for the academic year 2022-23.

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

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

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

Resolution Adopted: Approved the Mode of internal assessment, pattern of examination of internal assessment and scheme of evaluation of practical exams .

of Semesters I-IV as external 50Marks and internal assessment 50Marks. For all LSCs and SDCs has no internal assessment. All the practical classes of Semesters I-V will be conducted for 2 Hrs .

It is resolved to approve the split up of Continuous Comprehensive Evaluation CCE – 50 Marks for **Semesters I-IV** as follows:

Examination	Mode of Assessment	Marks allotted
(CIA) Continuous Internal Assessment SEM I-IV	Student study Project	10
	Viva Voce	10
	Seminar and Group Discussion	5
	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-IV** and the student should attend at least one internal exam.

- Resolved to continue the scheme of examination, pattern of examination of **SemV** as external 60Marks and internal assessment 40Marks.

- It is resolved to continue the split up of Continuous Comprehensive Evaluation CCE – 40 Marks for **SemV** as

Examination	Mode of Assessment	Marks allotted
(CIA) Continuous Internal Assessment Sem-V	ICT based Seminar	10
	Assignment	5
	Quiz	5
	Average of 2 Mid examinations conducted @40marks	20
	TOTAL MARKS	**40**

- It is resolved to conduct one pre-final examination for I, II & III year students.
- Discussed and approved the scheme of evaluation of practical examinations for all the I –V semesters.
- It is resolved to approve the conduct of semester end practical exams only with internal examiners for odd semester and with both internal and external examiners for even semesters at the end of each semester.
- Resolved and approved the blue print, model papers of semester end examinations for all the I –V semesters.

Agenda 4: Engaging of 7^{th} hour of time table

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

Discussion: Discussed the engagement of 7^{th} hr introduced by the authorities

Resolution Adopted: It is resolved to dedicate the 7^{th} hour classes for extra-curricular activities and student counseling by class mentors.

Agenda 5: Streamlining of regularity in attendance.

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

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

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

Agenda 6: Certificate courses viz. add on courses and skill development courses to be conducted by the department during the academic year 2022-23.

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 **"Household Electrical Wiring"** for **Sem I** along with the APSCHE and Affiliated University, ANUR prescribed SDC, "Electrical Appliances**",** @30 hrs. for 2 credits having 5units@ 2 theory hrs. per week and one Study Project at the end of the course, designed by the Department.

- Resolved to adopt Community Service Project for all the students at the end of **Sem –II**.

- Resolved to organize the add on certificate course "**Applications of Solar Cells in Home Energy Systems"** in **Sem III** with aduration of 30 hrs. for 2 credits having 4units@ 2 theory hrs. per week and one Study Project at the end of the course.

Agenda 7: Collaboration with industry and third party sector organisation 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 organisation 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 V/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	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

Agenda 8: Make students access to ICT infrastructure for enhanced quality in higher education.

Proposal: It is placed before the BoS members to discuss on the above agenda 8.

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

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

Agenda 9: Remedial coaching for slow learners and project/ research work for advanced learners

Proposal: It is placed before the BoS members to discuss on the above agenda 9.

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

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

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

Agenda 10: Allocation of extra credits for extracurricular activities.

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

Discussion: Discussed the allocation of extra credits for extracurricular activities

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

Sl. No.	Activity	Details of achievement	Credits
1	**MOOC Course**	SWAYAM /NPTEL /CEC etc., (Course Completion certificate with credits should be produced for the claim of extra credits)	Total credits achieved will be considered
2	**NCC**	B CERTIFICATE	2
		Participation in National Camp after 'B' certificate	3
		C certificate	4
		Adventure camp/RD parade along with 'B'	5
		Failed in B certificate Examination	1
3	**Sports**	Intercollegiate selection	2
		South zone selection	3
		All India participation	4
		Winning medals in all India competitions	5
4	**NSS**	40% attendance in regular NSS activities	1
		50% attendance with Community Service	2
		Conduct of survey/Youth exchange/RD	3
5	**JKC**	Enrollment and training	1
		Campus recruitment local level	2
		MNCs/reputed companies	3
6	**Community service**	Participation in community service by departments (outreach programmes)	2
7	**Cultural activity**	Winning medals at state level-2, District level-1	2 1
8	**COP/Add on Course**	Pass in Certificate Exam-1, Diploma-2	1 2
9	**Support services**	Lead India, Health club, RRC and Eco Club etc., participation in various programmes	1

Agenda 11: List of equipment/software requirement for each lab/practical of **Semester-V**.

Proposal: Placed before the BOS members to discuss on this agenda point 11.

Discussion: Discussed the requirement for each lab/practical of **Semester-V**.

Resolution Adopted: Approved and resolved to purchase the needy equipment, which are suggested after discussion.

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 2022-23.

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 2022-23.

Agenda 15: Departmental budget proposal for the academic year 2022-23

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 2022-23.

P.R.Government College (Autonomous), Kakinada

DEPARTMENT OF PHYSICS

Board of Studies Meeting 2022-23

Action Taken Report

The Department of Physics conducted the BOS meeting for the academic year 2021-22 on 12.11.2021 in the Department of Physics. All the activities according to the plan of action were successfully completed in the proposed time line. By taking the valuable recommendations of the members for enhancement of knowledge and to enrich the skills of the students, the department took initiatives and implemented various innovative steps viz.

- International conference was organized on 7.1.2022 on "New Forays Of Luminescent Advanced Materials & Phosphors in Multi Disciplinary Technologies" (Lamp – 2022)
- A guest lecture was conducted by scientists of BARC on "Nuclear Energy and its Applications, Career opportunities in BARC" on 17.302022
- A field visit was conducted to Command & Communication Centre, Smart City, Kakinada on 13th July 2022.
- Many electronic kits which were not in working condition were replaced by bread boards and electronic components.
- 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.
- 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
- Started "Centre for Innovation and Incubation Centre" for innovative projects on the platform of 'Atal Tinkering Labs'
- Installation of "Solar Tree" in before the Physics Block is in process

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

This is to certify that the proposed agenda of board of studies meeting held in Department of Physics& Electronics on 31 -10-2022, for the Academic Year 2022-23 have been discussed and approved by the board members unanimously. The valuable suggestions have been adopted for effective implementation of Curricular/Co-curricular and Research activities for the academic year 2022-23.

- Syllabi regarding all semesters of B.Sc program.
- Following the scheme of evaluation for CIA&SEE for all the semesters I-V of I,II &III B.Sc. Programs.
- Following the allocation of Credits for all the semesters of B.Sc. Programme
- Offering one "Community Service Project" as a credit course to I year students, one skill enhancement course as a credit course for II year and internship for III year before completion of the course during summer vacation in either V or VI semester.
- Certificate courses offered by the Department of Physics& Electronics
- List of Examiners
- Departmental action plan for the academic year 2022-23.
- Budget proposal for the academic year 2022-23.

S.No.	Members of Board of Studies		Signature
1	Sri U.V.B.B. Krishna Prasad; HoD	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	Sri K.VenkateswaraRao	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	Ms. M. Surekha	Member	
8	Dr. K.Jayadev	Member	
9	Ms. G. Sridevi	Member	
10	Ms.. A. Padmavathi	Member	
11	Dr.SVGVA Prasad	Member	
12	Sri P.Himakar	Member	
13	Sri B.Srikanth	Member	
14	Sri K. Durga Rao	Member	
15	Mr.G.John,II MPCTM	Student Member	
16	Kum. A.Rani, II MPCs	Student Member	
17	Kum.UV Mahalakshmi I B.Sc MPC(EM)	Student Member	
18	Kum.P.Satwika, IMPCs	Student Member	

P.R. Government College (Autonomous), Kakinada
Department of Physics and Electronics

UG Program (4years Honors) Structure (CBCS)

2020-21A.Y. onwards

BACHELOR OF SCIENCE

(3^{rd} and 4^{th} year detailed design will be followed as per APSCHE GUIDELINES)

Subjects/ Semesters		I		II		III		IV		V		VI			
		H/W	C	H/W	C	H/W	C	H/W	C	H/W	C	H/ W	C		
Languages												THIRDPHASE of APPRENTICESHIP Entire 5th / 6th Semester		FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between2ndand3rdyear(twosummervacations).	
English		4	3	4	3	4	3								
Language(H/T/S)		4	3	4	3	4	3								
Life Skill Courses		2	2	2	2	2+2	2+2								
Skill Development Courses		2	2	2+2	2+2	2	2								
Core Papers															
M-1	C1toC5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-2	C1toC5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-3	C1toC5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-1	SEC (C6,C7)									4+2 4+2	4+1 4+1				
M-2	SEC (C6,C7)									4+2 4+2	4+1 4+1				
M-3	SEC (C6,C7)									4+2 4+2	4+1 4+1				
Hrs/ W (Academic Credits)		30	25	32	27	32	27	36	30	36	30	0	12	4	4
ProjectWork															
Extension Activities (Non Academic Credits)															
NCC/NSS/Sports/Extra Curricular									**2**						
Yoga							**1**		**1**						
ExtraCredits															
Hrs/W(Total Credits)		30	25	32	27	32	28	36	33	36	30	0	12	4	4

M=Major; C=Core; SEC: Skill Enhancement Courses

P.R. Government College (Autonomous), Kakinada

Marks & Credits distribution: UG-Sciences

Sl. No	Course type	No. of courses	Each course teaching Hrs/wk	Credit for each course	Total credits	Each course evaluation			Total marks
						Conti-Assess	Univ-exam	Total	
1	English	3	4	3	9	50	50	100	300
2	S. Lang	3	4	3	9	50	50	100	300
3	LS	4	2	2	8	0	50	50	200
4	SD	4	2	2	8	0	50	50	200
5	Core/SE-I	5+2	4+2	4+1	35	50	50+50	150	1050
	Core/SE-II	5+2	4+2	4+1	35	50	50+50	150	1050
	Core/SE-III	5+2	4+2	4+1	35	50	50+50	150	1050
6	Summer-Intern	2		4	8		100	200	200
7	Internship/ Apprentice/ On the job training	1		12	12		200	200	200
		38			**159**				**4550**
8	**Extension Activities(Non Academic Credits)**								
	NCC/NSS/Sports/ExtraCurricular			**2**	**2**				
	Yoga	**2**		**1**	**2**				
	Extra Credits								
	Total	**40**			**163**				

DETAILS OF COURSE TITLES & CREDITS (A.Y. 2022-23)

Sem	Course no.	CourseName	Course type (T/L/P)	Hrs./Wk (Science : 4+2)	Credits (Science: 4+1)	Max. Marks Cont/Internal/ Mid Assessment	Max.Marks Sem end Exam
I	1	Mechanics, Waves & Oscillations	T	4	4	50M	50M
	2	Practical course-1	L	2	1	0	50M
II	3	Wave Optics	T	4	4	50M	50M
	4	Practical Course- 2	L	2	1	0	50M
III	5	Heat &Thermodynamics	T	4	4	50M	50M
	6	Practical Course- 3	L	2	1	0	50M
IV	7	Electricity, Magnetism &Electronics	T	4	4	50M	50M
	8	Practical Course-4	L	2	1	0	50M
	9	Modern Physics	T	4	4	50M	50M
	10	PracticalCourse-5	L	2	1	0	50M
V	6A	Optical Instruments and Optometry	T	4	4	40M	60M
		Optical Instruments and Optometry Lab	L	2	1	0	50M
	7A	Optical Imaging and Photography	T	4	4	40M	60M
		Optical Imaging and Photography Lab	L	2	1	0	50M
	OR						
	6B	Low Temperature Physics & Refrigeration	T	4	4	40M	60M
		Low Temperature Physics & Refrigeration Lab	L	2	1	0	50M
	7B	Solar Energy and Applications	T	4	4	40M	60M
		Solar Energy and Applications Lab	L	2	1	0	50M
	OR						
	6C	Applications of Electricity & Electronics	T	4	4	40M	60M
		Applications of Electricity & Electronics Lab	L	2	1	0	50M
	7C	Electronic Instrumentation	T	4	4	40M	60M
		Electronic Instrumentation Lab	L	2	1	0	50M

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

Note 1: For Semester–V, for the domain subject **PHYSICS**, any one of the three pairs of Skill Enhancement Courses shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).

Note 2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations.

Note 3: To insert assessment methodology for Internship/ on the Job Training/Apprenticeship under the revised CBCS as per APSCHE Guidelines.

- **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 (the detailed guidelines are enclosed).
  - **Credit For Course:04 for 100 marks**

Examples of community service project offered by the department

- Consumption of solar energy in industrial sector
- Survey of electricity consumption on primary needs
- Effect of social media on society
- Impact of online payments in daily life
- Usage of Internet for education purpose
- Utilization of solar energy in public sector
- Effect of social media on society
- Recommendations for energy saving houses
- Utilization of solar energy in Kakinada Smart city
- Energy saving techniques in houses
- Usage of Internet for carrier development
- Usage of Internet for digital payments
- Household survey in electricity consumption
- Survey of quality on internet service provider

- **Second Internship (After 2nd Year Examinations):** Apprenticeship / Internship / on the job training / In-house Project / Off-site Project. To make the students employable, this shall be undertaken by the students in the intervening summer vacation between the 2nd and 3rd years (the detailed guidelines are enclosed).
  - **Credit For Course:04 for 100 marks**
- **Third internship /Project work (6th Semester Period):**
  During the entire 6thSemester, 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 (the detailed guidelines are enclosed).
  - **Credit For Course:12 for 200 marks**

P.R. Government College (Autonomous), Kakinada

Department of Physics& Electronics

Proposed Skill Enhancement Courses

For **Sem I,** along with the APSCHE and Affiliated University, ANUR prescribed Skill Development Course, **"**Electrical Appliances**",** one Add on certificate course **"Household Electrical Wiring"** @ 30 hrs. for 2 credits having 5 units @ 2 theory hrs. per week and one Study Project at the end of the course was designed by the Department.

For **Sem II,** the APSCHE and Affiliated University, ANUR prescribed Skill Development Course, " Solar Energy" was adopted by the Department.

For **Sem III**, one Add on certificate course "**Applications of Solar Cells in Home Energy Systems"** with 30 hrs. Duration for 2 credits 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

- **List of Suitable levels of positions eligible in the Govt./Pvt. organizations**

Suitable levels of positions for these graduates either in industry/govt organization like., technicalassistants/scientists/schoolteachers.,clearlydefinethem,with reliable justification

S.No	Position	Company/Govt. organization	Remarks	Additional skills required, if any
1	Clerk	IBPS		Skill in functional English, and aptitude.
2	SSC	Central Govt.		Skill in functional English, and aptitude with GK.
3	Asst. Programmer	MNC(Software Companies)		Skill in functional English, and aptitude and expected domain skills
4	Technical Assistant	Pharma Companies	Chemistry background student	Along with aptitude and English, domain skills.

P.R. Government College (A), Kakinada
Blue print for the model paper – Physics
Semester End External Examination
For I & II year core courses
2022 – 2023

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

Percentage of Choice given $= \frac{95-50}{95} \; x \; 100$

$= \frac{45}{95} \; x \; 100 \qquad = 47.4 \; \%$

Semester End External examination
For III year core courses 2022 – 2023

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**	12	5	60	6	5	30
TOTAL		18		120	9		60

Percentage of Choice given $= \frac{120-60}{120} \; x \; 100$

$= \frac{60}{120} \; x \; 100 \qquad = 50 \; \%$

P.R. Government College (A), Kakinada

Blue Print for Internal Theory (Mid) Examination

For I & II Year (Semesters I - IV) Papers

S. No.	Type of question	No. of Questions Given			No. of Questions 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	2	10	20	1	10	10
2	**Section – B** Short answer questions	5	5	25	3	5	15
TOTAL				**45**			**25**

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

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

Study project = 10 marks
(Practical for odd Sem / Theoretical for even Sem)

Viva on subject/ Assignment = 10 marks

Seminar/ GD/ Quiz/ Field trip = 5 marks

Total **= 25 marks**

P.R. Government College (A), Kakinada

Blue Print for Internal Theory Examination

For III year (Sem V) Papers

S. No.	Type of question	No. of Questions Given			No. of Questions 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	2	10	20	2	10	20
2	**Section – B** Short answer questions	4	5	20	4	5	20
TOTAL				**40**			**40**

Percentage of Choice given $= \frac{40-40}{40} X\ 100 = 0\ \%$ **(No choice)**

The total of two internals is reduced to 20 marks and the other 20 marks allocated for CIA are further divided as follows

Seminar / Viva-voce	= 5 marks
Group discussion / Quiz	= 5 marks
Assignment	= 10 marks
Total	**= 20 marks**

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.

P.R. Government College (Autonomous), Kakinada

Department of Physics& Electronics

B.Sc.	Physics

1. Aim and objectives of UG program in Subject: To align with emerging and employment areas.

   - Students will be able to perform experiments and interpret the results of observation, including making an assessment of experimental uncertainties.
   - They develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Physics.
   - To apply the theories learnt and the skills acquired to solve real time problems
   - To understand the concepts and significance of the various physical phenomena

2. Learning outcomes of Subject

Semester-1: Mechanics, Waves &Oscillations:

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

- Understand Newton's laws of motion and motion of variable mass system and its application to rocket motion and the concepts of impact parameter, scattering cross section.
- Apply the rotational kinematic relations, the principle and working of gyroscope and its applications and the processional motion of a freely rotating symmetric top.
- Comprehend the general characteristics of central forces and the application of Kepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.
- Understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence.
- Examine phenomena of simple harmonic motion and the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator.
- Appreciate the formulation of the problem on Fourier Analysis of Waves
- Figure out the formation of harmonics and overtones in a stretched string and acquire the knowledge on Ultrasonic waves, their production and detection and their applications in different fields.

Semester-2: Wave Optics:

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

- Understand the phenomenon of interference of light and its formation of Newton's rings and Michelson interferometer due to division of amplitude.
- Distinguish between Fresnel's diffraction and Fraunhoffer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating.
- Describe the construction and working of zone plate and make the comparison of zone plate with convex lens.
- Explain the various methods of production of plane polarized light and their detection and the concept of optical activity..
- Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields.3
- Explain about the different aberrations in lenses and discuss the methods of minimizing them.
- Understand the basic principles of fibre optic communication and explore the field of Holography and Nonlinear optics and their applications.

Semester - 3: Heat and Thermodynamics:

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

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

Semester-4: Electricity, Magnetism and Electronics:

- 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.
- Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.
- Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.
- Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.

- Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor of series resonant circuits.
- Describe the operation of p-n junction diodes, zener diodes, and transistors
- Understand the operation of basic logic gates and universal gates and their truth tables.

Semester-4: Modern Physics:

- On successful completion of this course, the students will be able to:
- Develop an understanding on the concepts of Atomic and Modern Physics, basic elementary quantum mechanics and nuclear physics.
- Develop critical understanding of concept of Matter waves and Uncertainty principle.
- Familiarized with the principles of quantum mechanics and the formulation of Schrodinger wave equation and its applications.
- Examine the basic properties of nuclei, characteristics of Nuclear forces, salient features of Nuclear models and different nuclear radiation detectors.
- Classify Elementary particles based on their mass, charge, spin, half life and interaction.
- Get familiarized with the nano materials, their unique properties and applications.
- Increase the awareness and appreciation of super conductors and their practical applications.

Recommended SEC for Semester-5:

Semester- 5: VIB (Skill Enhancement Course-Elective) Low Temperature Physics & Refrigeration

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

- Identify various methods and techniques used to produce low temperatures in the Laboratory.
- Acquires critical knowledge on refrigeration and air conditioning.
- Demonstrate skills of Refrigerators through hands on experience and learns about refrigeration components and their accessories.
- Understand the classification, properties of refrigerants and their effects on environment.
- Comprehend the applications of Low Temperature Physics and refrigeration.

Semester- 5: VII B(Skill Enhancement Course-Elective) Solar Energy and Applications

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

- Understand Sun structure, forms of energy coming from the Sun and its measurement.
- Acquires critical knowledge on the working of thermal and photovoltaic collectors.
- Demonstrate skills related to callus culture through hands on experience
- Understand testing procedures and fault analysis of thermal collectors and PV modules.
- Comprehend applications of thermal collectors and PV modules.

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

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

	Sustainability	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.

	**P.R.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.

P .R . GOVT. COLLEGE (A), KAKINADA
DEPARTMENT OF PHYSICS

Percentage of Syllabi included/Excluded-2022-23

Sl No	Title of Paper	% of Change
1	Mechanics, Waves and Oscillations	20
2	Wave Optics	20
3	Heat & Thermodynamics	25
4	Electricity, Magnetism & Electronics	20
5	Modern Physics	20

P.R. GOVERNMENT COLLEGE (A), KAKINADA

DEPARTMENT OF PHYSICS

ADDITIONS AND DELETIONS

Semester – I PH 1202			
S. No.	No. of the Unit	**Topics added**	**Justification**
1	**Unit IV**	**Complex vibrations (6hrs)** Fourier theorem and evaluation of the Fourier coefficients (T), analysis of periodic wave functions-square wave(T), saw-tooth wave(P).	1. In continuation with the previous topic 2. It is appropriate to include this topic in view of further studies and competitive exams
		Topics deleted	**Justification**
2	**Unit IV** **Unit-V:**	**Coupled oscillations:** Coupled oscillators - introduction, Two coupled oscillators, Normal coordinates and Normal Modes. Melde's strings.	1. Not much application oriented 2. To decrease the content as the topic, Complex Vibrations is added

Semester - II PH 2202			
S. No.	No. of the Unit	**Topics added**	**Justification**
3	**Unit-I:**	Oblique incidence of a plane wave on a thin film- Cosine law- Interference due to reflected light Interference due to transmitted light	For furthermost understanding of following next topics of the unit
	Unit-II:	Determination of wavelength of light using diffraction grating- Normal incidence	For clarity added the term 'Normal Incidence'
4	No. of the Unit	**Topics Deleted**	**Justification**
	Unit-I: **Unit-II:**	Lloyd's single mirror, Interference in thin films: Plane parallel and wedge- shaped films, colors in thin films, Explanation of rectilinear propagation of light, Resolving power of grating	In view of average and slow learners reduced the content

Semester – III PH 3202			
S. No.	**Name of the Unit**	**Topics added**	**Justification**
1	UNIT II: Thermodynamics:	work done in isothermal and adiabatic processes,	To understand the derivations of next topics
2	UNIT IV: Low temperature Physics	Liquefaction of Helium gas by Kapitza's method	to make the students research oriented
3	UNIT V: Quantum theory of radiation:	Ferry's Black body	important example of an ideal black body
S.No.	**Name of the Unit**	**Topics Deleted**	**Justification**
1	UNIT II: Thermodynamics	Thermodynamic scale of temperature and its identity with perfect gas scale, Principle of refrigeration.	All these topics are Covered in the Sem V classes
2	UNIT IV: Low temperature Physics:	Liquification of air by Linde's method, Practical applications of substances at low temperatures	Covered in the Sem V classes
3	UNIT V: Quantum theory of radiation:	Kirchoff's law. Stefan-Boltzmann's law and Rayleigh-Jean's law (No derivations),	In view of syllabus coverage more over these topics were covered in the lower classes

Semester – IV Paper IV			
	Name of the Unit	Topics Added	Justification
6	**Unit - I** **Unit - III**	Differential form of Gauss law Potential due to i) a point charge, ii) *Dipole* B due to a long straight wire	These topics added for the continuation of the next topics

Semester – IV Paper IV

	Name of the Unit	Topics Deleted	Justification
7	**Unit - I**	an infinite conducting sheet of charge, Potential due to a uniformly charged sphere	All the topics are less in weightage and to

	Unit - II **Unit - III** **Unit - IV**	Dielectric strength Eddy currents LCR Parallel resonant circuit Light Emitting Diode (LED)	cover huge syllabus these topics are added as Additional inputs

Semester – IV Paper V			
	Name of the Unit	**Topics Added**	**Justification**
1	**Unit - IV**	Nutrino hypothesis of β-decay, energy spectrum of β-decay	These topics added for the continuation of higher studies
Semester – IV Paper V			
	Name of the Unit	**Topics Deleted**	**Justification**
1 2	**Unit - I** **Unit - II**	Fine structure of Sodium D-lines, Zeeman effect, Experimental arrangement to study Zeeman effect Illustration of uncertainty principle using diffraction of beam of electrons and photons (Gamma ray microscope), Bohr's principle of complementary. Application of Schrodinger wave equation to three dimensional box -tunneling effect.	All the topics are less in weightage and to cover huge syllabus these topics are added as Additional inputs

Semester – V PAPER – 6B			
S. No.	**Name of the Unit**	**Topics added**	**Justification**
1	UNIT I: Production of low temperature	Joule-Thomson effect of an ideal gas- Joule-Thomson effect of real gases Adiabatic demagnetization – **mathematical treatment** Curie's Law	To understand the topics in depth
S.No.	**Name of the Unit**	**Topics Deleted**	**Justification**
1	UNIT V: Applications of Low Temperature & Refrigeration:	Cold treatment of metals, Construction field, Data centers.	In view of syllabus coverage more over these topics were covered in the lower classes

NOTE : ALL THE DELETED TOPICS ARE ADDED AS ADDITIONAL INPUTS.

	P.R. Government College (Autonomous) Kakinada	Program & Semester I B.Sc. (I Sem) Paper –I W.e.f. 2020 - 21 ADMITTED BATCH			
Course Code PH 1202	**MECHANICS, WAVES AND OSCILLATIONS**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:	Linear Kinematics, Vector Algebra, Center of mass, Coordinate systems, Second order differential equation solutions, Properties of sound waves.	4	0	-	4

Aim and objectives of the course:

- To understand basic theories related with properties of matter and its applications to determine values of various physical quantities associated with matter.
- Be able to apply knowledge of the properties of matter to explain natural physical processes and related technological advances.
- To learn about fundamentals of verbal and mathematical concepts of waves and oscillations
- We should make the students to know their skills required to get the information from the syllabus and use them in a proper way

Learning outcomes of the Subject :

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

- Understand Newton's laws of motion and motion of variable mass system and its application to rocket motion and the concepts of impact parameter, scattering cross section.
- Apply the rotational kinematic relations, the principle and working of gyroscope and its applications and the processional motion of a freely rotating symmetric top.
- Comprehend the general characteristics of central forces and the application of Kepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.
- Understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence.
- Examine phenomena of simple harmonic motion and the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator.
- Appreciate the formulation of the problem on Fourier Analysis of Waves
- Figure out the formation of harmonics and overtones in a stretched string and acquire the knowledge on Ultrasonic waves, their production and detection and their applications in different fields.

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Students would learn about motion of variable mass system, Collisions in two and three dimensions, Rutherford scattering problem. Students would learn about rotational kinematics of rigid body, Moment of inertia tensor, Euler equations, Precision of top, equinoxes and Gyroscope	Remembering &Understanding
CO2	Students would learn about conservative forces, relation between conservative force and potential, equation of motion under central forces, Keppler's laws and Coriolis force.	Application
CO3	Students would learn about Gallian-Lorentz frames of references, Lorentz transformations, Michelson-Morley experiment, Postulates of special theory of relativity, length contraction, time dilation, addition of masses, mass energy relation.	Analyzing
CO4	Students would solve the wave equation for vibrating strings and study various parameters like modes, overtones, energy transport, transverse impedance etc. They would also learn about basics of ultrasonics, production detection of ultrasonics, measurement of frequency sand velocity of ultrasonics and the	Application

Skill Development		Employability		Entrepreneurship	

UNIT-I:

1. Mechanics of Particles (5 hrs)

Review of Newton's Laws of Motion, Motion of variable mass system,Motion of a rocket, Multistage rocket,Concept of impact parameter, scattering cross-section, Rutherford scattering-Derivation.

2. Mechanics of Rigid bodies (7 hrs)

Rigid body, rotational kinematic relations, Equation of motion for a rotating body, Angular momentum and Moment of inertia tensor, Euler equations, Precession of a spinning top, Gyroscope, Precession of the equinoxes

Unit-II:

3. Motion in a Central Force Field (12hrs)

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, Equation of motion under a central force, Kepler's laws of planetary motion- Proofs, Motion of satellites, Basic idea of Global Positioning System (GPS), weightlessness, Physiological effects of astronauts

UNIT-III:

4. Relativistic Mechanics (12hrs)

Introduction to relativity, Frames of reference, Galilean transformations, absolute frames, Michelson-Morley experiment, negative result, Postulates of Special theory of relativity, Lorentz transformation, time dilation, length contraction, variation of mass with velocity, Einstein's mass-energy relation.

Unit-IV:

5. Undamped, Damped and Forced oscillations: (07 hrs)

Simple harmonic oscillator and solution of the differential equation, Damped harmonic oscillator, Forced harmonic oscillator – Their differential equations and solutions, Resonance, Logarithmic decrement, Relaxation time and Quality factor.

~~**Coupled oscillations:** Coupled oscillators - introduction , Two coupled oscillators, Normal coordinates and Normal Modes~~.

6. Complex vibrations (6hrs)

Fourier theorem and evaluation of the Fourier coefficients(T), analysis of periodic wave functions-square wave(T), saw-tooth wave(P).

Unit-V:

7. Vibrating Strings: (06hrs)

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, ~~Melde's strings.~~

8. Ultrasonics: (05 hrs)

Ultrasonics, General Properties of ultrasonic waves, Production of ultrasonics by piezoelectric and magnetostriction methods, Detection of ultrasonics, Applications of ultrasonic waves, SONAR

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	3
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3	2
CO4	3	2	3	2	2	2	3	3	1	1	3	1	2	3

REFERENCEBOOKS:

1. B.Sc.Physics,Vol.1,TeluguAcademy,Hyderabad
2. Fundamentals of Physics Vol.I-Resnick,Halliday,Krane,WileyIndia2007
3. CollegePhysics-I.T.BhimasankaramandG.Prasad.HimalayaPublishingHouse.
4. UniversityPhysics-FWSears,MWZemansky&HDYoung,NarosaPublications,Delhi
5. Mechanics, S.G.Venkatachalapathy,MarghamPublication,2003.
6. Waves and Oscillations. N.SubramanyamandBrijlal, Vikas Pulications.
7. Unified Physics-Waves and Oscillations, JaiPrakashNath & Co.Ltd.
8. Waves & Oscillations. S.Badami, V.Balasubramanian and K.R.Reddy,OrientLongman.
9. The Physics of Waves and Oscillations, N.K.Bajaj, TataMcGraw Hill
10. ScienceandTechnologyofUltrasonics-Baldevraj,Narosa,NewDelhi,2004

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/

https://ocw.mit.edu/courses/physics/8-03sc-physics-iii

- vibrations-and-waves-fall-20166
- https://nptel.ac.in/courses/122/105/122105023/
- https://onlinecourses.nptel.ac.in/noc19_ph18/preview

P.R. Government College (A), Kakinada.

I B.Sc., Physics-Semester-I Paper – I

W.e.f. 2020 - 21 ADMITTED BATCH

MECHANICS, WAVES AND OSCILLATIONS

QUESTION BANK

UNIT-I (MECHANICS OF PARTICLES&MECHANICS OF RIGID BODIES)

Essay Questions-10M

1. State Newton's laws. Derive the equation of motion of variable mass system?
2. Explain the motion of a rocket under constant gravitational field.
3. Derive Rutherford's scattering cross section of an α-Particle.
4. Define rigid body? Derive Euler's equations for a rigid body?

Short Questions – 5 M

5. Explain the multistage Rocket?
6. Discuss about impact parameter?
7. Explain the principle and working of a Gyroscope.
8. Describe precession of Equinoxes.

UNIT-II (MOTION IN A CENTRALFORCE FIELD)

Essay questions-10M

9.Discuss briefly about central forces? Explain that the central forces are conservative in nature
10.State and prove Kepler's first law of planetary motion?
11.State and prove Kepler's second and third laws of planetary motion?

Short Questions – 5M

12.Derive equation of motion under central force?
13. Explain briefly about GPS.
14.Differentiate satellites and geo stationary satellites? Discuss the weightlessness.

UNIT – III (RELATIVISTIC MECHANICS)

Essay Questions-10M

15. Describe Michelson-Morley experiment with a neat diagram.
16. State the Postulates of Special theory of Relativity. Derive Einstein's Mass Energy equivalence relation.
17. Explain the concept of relativity? Derive Lorentz transformation equations?
18. Derive an expression for the variation of mass of a body with velocity.

Short Questions – 5M

19. Deduce Galilean transformations.
20. Explain Time Dilation in relativity.
21. Discuss about Length Contraction of relativistic motion

Problems-5M

22. Calculate the velocity of the rod, when its length will appear 90% of its proper length.
23. A particle of mass M_0 is moving with a velocity 0.9C. Calculate its relativistic mass.
24. Find the mass of Electron moving with a velocity 10^{10} cm/sec. The rest mass of the electron is $9.1x10^{-31}$Kg.
25. The total energy of a particle is exactly twice its rest energy. Calculate its speed.

UNIT – IV (UNDAMPED,DAMPEDAND FORCED OSCILLATIONS& COMPLEX VIBRATIONS)

Essay Questions - 10M

26. Derive the differential equation of a simple harmonic oscillator and its solution?
27. StateFouriertheorem? Derive Fourier coefficients
28. Analyse a squarewaveusingfouriertheorem?
29. Analyse a saw-toothwaveusingFouriertheorem?

Short Questions – 5 M

30. Explain Logarithmic decrement of an oscillator?
31. Define Relaxation time and Quality factor?
32. Identify the limitations of Fourier theorem?

Problems - 5M

33. A damped oscillator starting from rest reaches a first amplitude of 500mm. It reduces to 50mm after 100 oscillations. The periodic time is 2.3sec. Find the damping constant and relaxation time.
34. The amplitude of a second pendulum falls to half initial value in 150 sec. calculate the Q factor.
35. The amplitude of an oscillator of frequency 200Hz falls to 1/10 of its initial value after 2000 cycles. Calculate its relaxation time.

UNIT- V (Vibrating strings & Ultrasonics)

Essay Questions - 10M

36. Explain the general equation of transverse wave along a stretched string and it's solution
37. Explain modes of vibration of stretched string clamped at both the ends.
38. Define Ultrasonics? Explain how ultrasonic waves can be produced by Piezo-electric method?
39. Define Ultrasonics? Describe the magnetostriction method of producing ultrasonics?

Short Questions – 5 M

40. Illustrate the laws of transverse waves along a stretched string
41. Explain the properties of ultrasonics.
42. Illustrate the applications of ultrasonic waves?

P.R.GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–I PAPER I

W.e.f. 2021 - 22 ADMITTED BATCH

MECHANICS, WAVES AND OSCILLATIONS

CourseCode: PH1202 No. of credits: 04 4 Hours/Week Total hours: 60hrs

MODEL QUESTION PAPER

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

Time: $2\frac{1}{2}$Hrs. Max.Marks:50

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

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

P.R.GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–I; PAPER I
(Model Paper)

W.e.f. 2021 - 22 ADMITTED BATCH

MECHANICS, WAVES AND OSCILLATIONS

Course Code: PH1202 No. of credits: 04 4 Hours/Week Total hours: 60hrs

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

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

PART-I

Answer **any Three** questions by attempting at least one question 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 - IV

11. Short answer question from UNIT - V

12. Problem from UNIT - III

13. Problem from UNIT - IV

	P.R Government College (Autonomous) Kakinada	Program & Semester I B.Sc. (I Sem) W.e.f. 2020 - 21 ADMITTED BATCH			
Course Code PH1202P	**MECHANICS, WAVES ANDOSCILLATIONS**				
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites:	Screw gauge, Vernier Calipers, Stop watch, Graph plotting basics, MATLAB	-	-	2	1

Minimumof6experimentstobedoneandrecorded:

1. Bifilar suspension–Moment of inertia of a regular rectangular body.
2. Fly-wheel-Determination of moment of inertia
3. Rigidity modulus of material of a wire-Dynamic method(Torsional pendulum)
4. Volume resonator experiment
5. Determination of 'g' by compound/bar pendulum
6. Simple pendulum- normal distribution of errors-estimation of time period and the error of the mean by statistical analysis
7. Determination of the force constant of a spring by static and dynamic method.
8. Melde's Experiment - Determination of frequency.
9. Verification of laws of transverse waves- Sonometer

Virtual LabLinks:

1. https://vlab.amrita.edu/
2. https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html
3. https://www.myphysicslab.com/

P.R.GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc., SEMESTER–I; PAPER I

W.e.f. 2021 - 22 ADMITTED BATCH

MECHANICS, WAVES AND OSCILLATIONS

Scheme of Evaluation 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**.

Co-curricular and Assessment Methods:

A. Measurable:

1. Assignments
2. Student seminars (Individual presentation of Courses)
3. Quiz Programmes
4. Individual Field Studies/projects
5. Group discussion
6. Group/Team Projects

B. General

1. Collection of news reports and maintaining a record of Course-cuttings relating to topics covered in syllabus
2. Group Discussions
3. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturer
4. Any similar activities with imaginative thinking.

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)

A. Measurable:

1. Assignments on: Motion of a rocket, Multistage rocket, Rutherford scattering-Derivation. Precession of a spinning top, Gyroscope, Precession of the equinoxes, Kepler's laws of planetary motion-Proofs, Motion of satellites, Michelson-Morley experiment, negative result, Postulates of Special theory of relativity, Lorentz transformation, Simple harmonic oscillator and solution of the differential equation, Damped harmonic oscillator, Forced harmonic oscillator – Their differential equations and solutions, Fourier Analysis of Waves, Transverse wave propagation along a stretched string, Production of ultrasonics by piezoelectric and magnetostriction methods, Detection of ultrasonics, Coupled Oscillators
2. Student seminars (Individual presentation of Courses) on topics relating to: Motion of variable mass system, Motion of a rocket, Multistage rocket, Rutherford scattering-Derivation. Rigid body, rotational kinematic relations, Equation of motion for a rotatingbody.CentralForces-Kepler'slaws,Specialtheoryofrelativity,MichelsonMorley experiment, Lorentz transformation, Simple Harmonic Motion, Ultrasonics,
   Quiz Programmes on: Rutherford Scattering, Mechanics of rigid bodies, Keplers laws, Special theory of relativity, SHM, Ultrasonics
3. Individual Field Studies/projects:
4. Group discussion on: Newton's Laws of Motion, Motion of satellites, Basic idea of Global Positioning System (GPS),Special theory of relativity, SHM

5. Group/Team Projects on: Motion of a rocket, Multistage rocket, Concept of impact parameter, Central forces, Kepler's laws of planetary motion-Proofs, Motion of satellites, Basic idea of Global Positioning System (GPS), weightlessness. Ultrasonics, General Properties of ultrasonic waves, Production of ultrasonics by piezoelectric and magnetostriction methods, Detection of ultrasonics

B. General

1. Collection of news reports and maintaining a record of Course-cuttings relating to topics covered in syllabus
2. Group Discussions on: Kepler's laws of planetary motion
3. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
4. Any similar activities with imaginative thinking.
5. Recommended Continuous Assessment methods

	P.R. Government College (Autonomous) Kakinada	Program & Semester I B.Sc. (I Sem) W.e.f. 2020 - 21 ADMITTED BATCH			
Course Code SDCEA01	**Electrical Appliances Skill Development Course**				
Teaching	Hours Allocated: 30 (**Theory**)	L	T	P	C
Pre-requisites:	Electronic components viz. resistors, capacitors, Diodes, transistors transformer and their significance	2	0	-	2

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

- Acquire necessary skills/hand on experience/ working knowledge on multimeters, 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 household domestic appliances.
- Check the electrical connections at house-hold but will also learn the skill to repair the electrical appliances for the general troubleshoots and wiring faults.

UNIT-I (10 hrs):

Voltage, Current, Resistance, Capacitance. Inductance, Electrical conductors and Insulators. Ohm's law. Series and parallel combinations of resistors.Galvanometer.Ammeter.Voltmeter.Multimeter.Transformers, Electrical energy. Power. Kilowatt hour (KWH). Consumption of electrical power

UNIT-II (10 hrs):

Direct current and alternating current.RMS and peak values. Power factor. Single phase and three phase connections. Basics of House wiring. Star and delta connection Electric shock. First aid for electric shock. Over loading Earthing and its necessity. Short circuiting. Fuses. MCB, ELCB. Insulation. Inverter. UPS.

UNIT-III (10 hrs) :

Principles of working, parts and servicing of Electric fan. Electric Iron box, Water heater: Induction heater, Microwave oven: Refrigerator. Concept of illumination, Electric bulbs. CTL.LED lights, Energy efficiency in electrical appliances. IS codes & IE codes.

REFERENCE BOOKS:

1. A text book on Electrical Technology. B.L.Theraja. S.Chand&Co..
2. A text book on Electrical Technology. A.K. Theraja.
3. Performance and design of AC machines, M.G.Say, ELBS Edn.,
4. Handbook of Repair & Maintenance of domestic electronic appliances: BPB publications
5. Consumer Electronics. S.P.Bali. Pearson
6. Domestic appliances servicing. K.P. Anwer. Scholar institute publications

P.R. Government College (A), Kakinada.

Department of Physics & Electronics

Semester-1 Skill Development Course

w.e. f. 2020-21 Admitted Batch

Electrical Appliances - Question Bank

Essay Questions

UNIT - I

1. State ohm's Law? Deduce the resultant resistances of series and parallel combination of resistors.
2. What is a capacitor? Deduce the expression for resultant capacity when the capacitors are connected in series and parallel.
3. Distinguish between electrical conductors and insulators? Give 2 examples for each

UNIT-2

4. Differentiate single phase and three phase connections?
5. Explain earthling and it's necessary in electrical wiring?
6. Discuss the star and delta connections?

UNIT - 3

7. Describe the various parts of an electric fan? Explain its working.
8. Explain the working of refrigerator.
9. Interpret illumination? Write about various types of electric bulbs.

Short Questions

UNIT - 1

10. Write briefly on current, electrical power and kWh?
11. Mention the units of charge, electrical power, current, resistance, and capacitance
12. Distinguish Voltmeter,Galvanometer and Ammeter
13. Explain a transformer? Write the types of transformers.
14. Justify Multimeter.

UNIT - 2

13. Distinguish between AC and DC? Write a note on their conversions
14. Discuss about electric short circuiting?
15. Describe Earthing and write its necessity.

UNIT - 3

17. Explain the working of a water heater
18. Identify different parts of an electrical fan
19. Analyze energy efficiency in electrical appliances?
20. Distinguish between IS codes & IE codes

P.R. Government College (A), Kakinada.

Department of Physics & Electronics

Semester-1 Skill Development Course

w.e.f. 2020-21 Admitted Batch

Electrical Appliances

Course Code: SDCEA01 No. of credits: 2 Hours/ Week: 2 Total hours: 30hrs

Note: Set the Question paper as per the blue print given at the end of this model paper

Time : 2 Hrs. Max. marks: 50

Blue Print

Module	Essay Questions 10 Marks	Short Questions 5 Marks	Marks allotted
Unit – I	2	3	35
Unit – II	2	2	30
Unit – III	2	3	35
Total Marks			100

P.R. Government College (A), Kakinada.

Department of Physics & Electronics

Semester-1Skill Development Course

Electrical Appliances (Model Question Paper)

w.e. f. 2020-21 Admitted Batch

Time: 2 Hrs Max Marks: 50

Section – A

Answer any **FOUR** questions. each question carry 5 marks. 4 x 5 = 20Marks

1. Explain the terms (i) Voltage and (ii) Current.
2. Write a short note on short circuiting?
3. Write about Galvanometer
4. What is the difference between Inverter and rectifier
5. What is the variation of Electrical energy and Power
6. Define IS codes and IE codes
7. What is the principle of Microwave oven
8. Explain the parts and servicing of Electric fan

Section – B

Answer any **THREE** questions. Each question carry 10marks. 3x10M = 30Marks

9. Explain about the series and parallel combinations of resistors

(OR)

10. Distinguish between Electrical conductors and Insulators

11. Discuss about single phase and three phase connections

(OR)

12. What is electric shock and discuss necessary steps for first aid for electric shock

13. Write the concept of illumination and discuss about LED light

(OR)

14. Distinguish between Water heater and Induction heater.

	P.R. Government College (Autonomous) Kakinada	Program & Semester I B.Sc. (I Sem) (A.Y. 2022 – 2023)			
Course Code	**Household Electrical Wiring** (Value Added Certificate Course)				
Teaching	Hours Allocated: 30 (**Theory**)	L	T	P	C
Pre-requisites:	Electronic components viz. resistors, capacitors, Diodes, transistors transformer and their significance, MCB, Testers, Household wiring equipment	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 household domestic appliances.
- Check the electrical connections at house-hold but will also learn the skill to repair the electrical appliances for the general troubleshoots and wiring faults.

Module – 1(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.

Basic Electrical Circuits: Single phase & three phase circuits - Serial connection- Different types of Series and Direct Board connections.

Module – 2(10 hrs)

Different types of electrical wiring / installations:

Fans, Tube light, Heater, calling bell wiring - Two way switch wiring - Room wiring - 3 phase wiring.

Module – 3 (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.

Module – 4 (5 hrs)

Tools and equipment: Tools required for marking punching, cutting, drilling, filing, stripping, crimping, socketing and fixing glands & screws etc., – Measuring Tools.

Module – 5 (5 hrs)

Safety measures and precautions: General Safety of Tools & equipment - Fires in electrical Circuits - Precautions.

P.R. Government College (A), Kakinada.

Department of Physics & Electronics

I B.Sc – Semester – I (A.Y. 2022 – 2023)

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 Hrs. **Max. Marks: 50**

Blue Print

Module		No. of Qs.	Marks allotted
1	Fundamentals of electricity	10	10
2	Different types of electrical wiring / installations	20	20
3	Testing procedure of voltage current /Importance of Earthling	10	10
4	Tools and equipment	5	5
5	Safety measures and precautions	5	5
	TOTAL	**50**	**50**

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

	P.R. Government College (Autonomous) Kakinada	Program & Semester I B.Sc. (II Sem) w.e.f. 2021-22 ADMITTED BATCH			
Course Code **PH 2202**	**Wave Optics**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:	Wave equation solutions, Geometrical identities, Classification of theories of light, Image formation with mirrors and lenses, Properties of light.	4	0	-	4

1. **Aim and objectives**:

- Understand the nature of light and principles of Laser and holography.
- Analyzetheintensityvariationoflightduetointerference,diffraction and polarization.
- Solve problems in Optics by selecting the appropriate equations and performing numerical or analytical calculations.
- Studentcanabletooperationofopticaldevicesincludingpolarizers,interferometers,and Lasers.

2. Learning outcomes of Subject

After successful completion of the course the student will be able to

- Understand the phenomenon of interference of light and its formation of Newton's rings and Michelson interferometer due to division of amplitude.
- Distinguish between Fresnel's diffraction and Fraunhoffer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating.
- Describe the construction and working of zone plate and make the comparison of zone plate with convex lens.
- Explain the various methods of production of plane polarized light and their detection and the concept of optical activity..
- Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields.
- Explain about the different aberrations in lenses and discuss the methods of minimizing them.
- Understand the basic principles of fibre optic communication and explore the field of Holography and Nonlinear optics and their applications.

Course Outcomes:

	On Completion of the course, the students will be able to-	Cognitive Domain
CO1	Students would learn about principle of superposition, coherence, Interference by division of wavefront and amplitude, Fresnel's bi-prism, Lloyd's mirror, thin film interference, wedge shaped film interference, Newton's rings,Michelson's interferometer and their applications to sodium D lines and thickness of thin film.	Understanding & Application
CO2	Students would learn about Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction due to circular aperture, single slit, and double slit, N-slit, grating. They would also learn about Fresnel's half period zones, zone plate, phase reversal zone plates, comparison of zone plate & convex lens, interference & diffraction.	Application
CO3	Students would learn about methods of polarization, Brewster's law, Malus law, Nicol prism, Quarter wave plate, half wave plate, babinet's compensator and optical activity analysis by Laurent's half shade polarimeter.	Understanding , Application
CO4	Students would learn about principles of LASER, He-Ne laser, Ruby laser, applications of laser, Principles of optical fiber communication, classification of optical fibers, applications of optical fiers, principles of holography, limitations of Gabor's hologram and applications of holography	Application

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

Skill Development		Employability		Entrepreneurship	

UNITI:Interferenceoflight:(12hrs)

Introduction, Conditionsfor interference of light, Interference of light bydivision of wave front and amplitude,Phase change on reflection- Stokes' treatment, ~~Lloyd's single mirror, Interference in thin films: Plane parallel and wedge- shaped films, colours in thin films,~~**Oblique incidence of a plane wave on a thin film- Cosine law- Interference due to reflected light - Interference due to transmitted light** -Newton's rings in reflected light-Theory and experiment, Determination of wavelength of monochromatic light, Michelson interferometer anddetermination of wavelength.

UNITII:Diffractionoflight:(12hrs)

Introduction, Types of diffraction: Fresnel and Fraunhoffer diffractions, DistinctionbetweenFresnel and Fraunhoffer diffraction,Fraunhoffer diffraction at a single slit, Plane diffraction grating,Determination of wavelength of light using diffraction grating-Normal incidence,~~Resolving power of grating~~, Fresnel's half period zones, ~~Explanation of rectilinear propagation of light~~, Zone plate, comparison of zone plate with convex lens.

UNITIII:Polarisationoflight:(12hrs)

Polarized light: Methods of production of plane polarized light, Double refraction, Brewster's law, Malus law, Nicol prism,Nicol prism as polarizerandanalyzer,Quarterwaveplate, Halfwaveplate, Plane, Circularly and Elliptically polarized light-Production and detection, Optical activity, Laurent's half shade polarimeter: determination of specific rotation.

UNITIV:AberrationsandFibreOptics:(12hrs)

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.

Fibre optics: Introduction to Fibers, different types of fibers, rays and modes in an opticalfiber,Principles of fiber communication (qualitative treatmentonly), Advantages of fiber optic communication.

UNITV:LasersandHolography:(12hrs)

Lasers: Introduction, Spontaneous emission, stimulated emission, Population Inversion, Laser principle, Einstein coefficients, Types of lasers-He-Ne laser, Ruby laser, Applications of lasers; Holography: Basic principle of holography, Applications of holography

CO-PO Mapping:

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

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

REFERENCEBOOKS:

1. BScPhysics,Vol.2,TeluguAkademy,Hyderabad
2. ATextBookofOptics-NSubramanyam,LBrijlal,S.Chand&Co.
3. Optics-Murugeshan,S.Chand&Co.
4. UnifiedPhysicsVol.IIOptics,JaiPrakashNath&Co.Ltd.,Meerut
5. Optics,F.A.JenkinsandH.G.White,McGraw-Hill
6. Optics,AjoyGhatak,TataMcGraw-Hill.
7. IntroductionofLasers–Avadhanulu,S.Chand& Co.
8. PrinciplesofOptics-BKMathur,GopalaPrintingPress, 1995

WebLinks:

- https://nptel.ac.in/courses/122/107/122107035/
- https://nptel.ac.in/courses/115/105/115105083/
- https://ocw.mit.edu/courses/mechanical-engineering/2-71-optics-spring-2014
- https://ocw.mit.edu/courses/mechanical-engineering/2-71-optics-spring-2009
- https://ocw.mit.edu/resources/res-6-005-understanding-lasers-and-fiberoptics-spring-2008/

P.R. Government College (A), Kakinada.

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

Wave Optics – Question Bank

Course Code: PH2202 **No. of Credits : 04**

UNIT: 1 - INTERFERENCE OF LIGHT

Essay questions-10 M

1. Describe the Newton's ring method for measuring the wave length of reflected monochromatic light. Give the necessary theory.
2. Describe the construction and working of Michelson interferometer to find the wave length of a monochromatic light?

Short questions – 5 M

3. Illustrate the conditions for interference of light?
4. Deduce Cosine law in Interference due to reflected light
5. Explain the formation of colours in thin films.

Problems - 5 M

6. In Newton's rings experiment, the diameter of 10^{th} dark ring is 0.433 cm. Find the wave length of incident light, if the radius of curvature of the lens is 70 cm
7. In a Newton's ring experiment, the diameter of the 5^{th} ring was 0.3 cm and the diameter of 25^{th} ring was 0.8 cm. If the radius of curvature of Plano-convex lens is 100 cm. Find the wave length of light used.
8. The diameter of 9^{th} dark ring in Newton's rings experiment is 0.28cm, find the radius of curvature of plano-convex lens used and the diameter of the 16^{th} dark ring

UNIT: 2- DIFFRACTION OF LIGHT

Essay questions - 10 M

9. Discuss Fraunhofer diffraction due to a single slit.
10. Derive the expression for the wavelength of the Monochromatic light using the diffraction grating in normal incidence.
11. Explain the construction and working of zone plate? Derive the formula for its focal length.

Short questions - 5 M

12. Distinguish between Fresnel's and Fraunhofer diffractions.
13. Describe Fresnel's half period zones.

UNIT: 3–POLARISATION OF LIGHT

Essay questions - 10 M

14. Describe the construction and working of Nicols prism.
15. Describe the construction and working of Laurent's half shade Polarimeter.

Short questions - 5 M

16. State and prove Brewster's law.

17. State and explain Malus law.
18. Elaborate Quarter wave plate.
19. Elaborate Half wave plate.

Problems - 5 M

20. Calculate the specific rotation if the plane of polarization is turned through 26.4^0 traversing 20 cm length of 20% sugar solution?
21. A glass slab is to be used as a polarizer. Find the angle of polarizationfor it. Also find the angle of refraction. Given μ for glass = 1.54
22. Calculate the thickness of (a)a quarter wave plate (b) half wave plate given μ_e=1.533,μ_0=1.544 and λ=5000A^o
23. Calculate the thickness of a quarter wave plate made of quartz to be used with sodium light of λ=6000A^o,μ_e=1.533,μ_0=1.544

UNIT: 4 – ABERRATIONS AND FIBRE OPTICS

Essay questions-10 M

1. State Spherical aberration? Discuss the various methods to minimize it.
2. State Chromatic aberration? Derive the condition for achromatism when two lenses are separated by a distance
3. State Chromatic aberration? Derive the condition for achromatism when two lenses are in contact.

Short questions – 5 M

4. Differentiate different modes in Optical fibres
5. Explain the principles of fibre optical communication

UNIT: 5 – LASERS AND HOLOGRAPHY

Essay questions - 10 M

24. Describe the construction and working of Ruby laser
25. Describe the construction and working of He-Ne laser?

Short questions - 5 M

26. State laser principle and population inversion?
27. Distinguish between Spontaneous and Stimulated emissions
28. Express the term LASER? Give any 3 applications of lasers

P.R. Government College (A), Kakinada.

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

Wave Optics – Blue Print

Course Code : PH2202 **No. of Credits : 04**

MODEL QUESTION PAPER

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

Time: $2\frac{1}{2}$Hrs. **Max.Marks:50**

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

BLUE PRINT

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

P.R. Government College (A), Kakinada.

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

Wave Optics – Model Paper

Course Code: PH 2202 **No. of Credits : 04**

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

1Essay 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- V

6. Essay question from UNIT-IV

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

	P.R Government College (Autonomous) Kakinada	Program & Semester I B.Sc. (II Sem) W.e.f. 2020 - 21 ADMITTED BATCH			
Course Code **PH2202P**	**Wave Optics Lab**				
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites:	Spectrometer, Travelling Microscope	-	-	2	1

Course Outcomes:

1. Gain hands-on experience of using various optical instruments like spectrometer, polarimeter and making finer measurements of wavelength of light using Newton Rings experiment, diffraction grating etc.
2. Know the techniques involved in measuring the resolving power of telescope and dispersive power of the material of the prism.
3. Be familiar with the determination of refractive index of liquid by Boy's method and the determination of thickness of a thin wire by wedge method.

Minimum of 6experimentstobedoneandrecorded

1. Determination of radius of curvature of a given convex lens - Newton'srings.
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. Resolving power of a telescope.
8. Refractive index of a liquid-hallow prism
9. Determination of thickness of a thin wire by wedge method
10. Determination of refractive index of liquid-Boy's method.

Virtual LabLinks:

- https://ocw.mit.edu/resources/res-6-006-video-demonstrations-in-lasers-and-optics-spring-2008/
- https://nptel.ac.in/courses/115/105/115105120/
- http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/engg_physics/labs/exp1/simulation/simulator.html
- https://vlab.amrita.edu/
- https://micro.magnet.fsu.edu/optics/lightandcolor/java.html
- http://physics.bu.edu/~duffy/classroom.html

P.R. Government College (A), Kakinada.

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

Wave Optics - Practical

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 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)

A. Measurable:

1. Assignments on:, Newton's rings in reflected light-Theory and experiment, Determination of wavelength of monochromatic light, Michelson interferometer and determination of wavelength. Distinction between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction at a single slit, Plane diffraction grating, Determination of wavelength of light using diffraction grating, Zone plate, comparison of zone plate with convex lens. Brewster'slaw, Malus law, Nicol prism, Nicol prism as polarizer and analyzer, Quarter wave plate, Half wave plate, 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. Laser principle, Einstein coefficients, Types of lasers-He-Ne laser, Ruby laser, Applications of lasers; Holography:
2. Student seminars (Individual presentation of Courses) on topics relating to: Interference, Aberrations, Optical fiber communication, Holography, Diffraction, Polarization, Lasers.
3. Quiz Programmes on: Interference, Diffraction, Polarization, Optical fibers, Lasers, Aberrations
4. Individual Field Studies/projects:
5. Group discussion on: Interference, Diffraction, Polarization
6. Group/Team Projection: Lasers, Optical fibers

B. General

1. CollectionofnewsreportsandmaintainingarecordofCourse-cuttingsrelatingtotopics 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.

	P.R. Government College (Autonomous) Kakinada	Program & Semester II B.Sc (III Sem)			
Course Code **PH3202**	**HEAT AND THERMODYNAMICS**				
Teaching	Hours Allocated: 60 (**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)	4	0	-	4

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

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

Course with focus on employability / entrepreneurship / Skill Developmentmodules

Skill Development		Employability		Entrepreneurship	

P.R. Government College (A), Kakinada.

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

Heat and Thermodynamics

Course Code: PH3202 **No. of credits: 04**

w.e.f. 2020-21 ADMITTED BATCH

Hours/Week 4 **[Total : 60hrs.]**

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

Kinetic Theory of gases-Introduction, Maxwell's law of distribution of molecular velocities (qualitative treatment only) and its experimental verification, Mean free path, Degrees of freedom, Transport phenomenon in ideal gases: viscosity, Thermal conductivity and diffusion of gases.

UNIT II: Thermodynamics: (12hrs)

Introduction- Isothermal and Adiabatic processes, **work done in isothermal and adiabatic processes,** Reversible and irreversible processes, Carnot's engine and its efficiency, Carnot's theorem, ~~Thermodynamic scale of temperature and its identity with perfect gas scale,~~ Second law of thermodynamics: Kelvin's and Clausius statements~~, Principle of refrigeration~~Entropy: Physical significance, Change in entropy in reversible and irreversible processes; -Entropy and disorder-Entropy of Universe; Temperature-Entropy (T-S) diagram and its uses ; change of entropy when ice changes into steam.

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

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

UNIT IV: Low temperature Physics:(12hrs) Methods for producing very low temperatures, Joule Kelvin effect, Porous plug experiment , Joule expansion, Distinction between adiabatic and Joule Thomson expansion, Expression for Joule Thomson cooling,~~Liquefactionofairby Linde's method~~, **Liquefaction of Helium gas by Kapitza's method**,Production of low temperatures by adiabatic demagnetization (qualitative) ~~Practical applications of substances at low temperatures~~.

UNIT V: Quantum theory of radiation (I): (12 hrs) Black body and its spectral energy distribution of black body radiation, **Fery's Black body**~~, Kirchoff's law~~ ,Wein's displacement law, ~~Stefan-Boltzmann's law and Rayleigh Jean'slaw(Noderivations),~~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 pyroheliometer, Estimation of surface temperature of Sun.

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

Reference books:

1. BSc Physics, Vol.2, Telugu Akademy, Hyderabad

2. Thermodynamics, R.C.Srivastava, S.K.Saha&AbhayK.Jain, Eastern Economy Edition.

3. Unified Physics Vol.2, Optics & Thermodynamics, Jai PrakashNath&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/

P.R. Government College (A), Kakinada.

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

Heat and Thermodynamics - QUESTION BANK

Module – I (KINETIC THEORY OF GASES)

Essay questions - 10 M

1. Derive an expression for the Maxwell's law of distribution of molecular speeds in a gas.
2. Define Coefficient of Viscosity. On the basis of kinetic theory of gases, derive an expression for the coefficient of Viscosity.
3. Define Coefficient of Thermal Conductivity. On the basis of kinetic theory of gases, derive an expression for the coefficient of Thermal Conductivity.

Short answer questions - 5 M

4. Explain the Transport Phenomena with reference to a gas.
5. Explain Mean free path.
6. Derive the Coefficient of Diffusion of gases.

Module – II (THERMODYNAMICS)

Essay questions - 10 M

7. Describe the working of Carnot's Engine and derive an expression for its Efficiency.
8. Define Entropy. Give the Physical significance of the entropy. Calculate the change in Entropy in irreversible cycle.
9. Explain T-S diagram? Give its uses. Obtain an expression for the efficiency of a Carnot's engine using T-S diagram.

Problems - 5 M

10. Calculate the efficiency of a reversible engine working between 327^0C and 127^0C
11. Carnot engine has the same efficiency between 1500K and 500K and T K and 1000K. Find the value of T.
12. The efficiency of a carnot engine is 40%. If heat absorbed at 727^0C, then what is the low temperature in ^{0}C.
13. An engine absorbs 2000 Joule of heat at a high temperature and exhausted 1200 Joule of heat at a low temperature. What is the efficiency of the engine.
14. Calculate the change of entropy when 300g of lead melts at 327^0C. Lead has a latent heat of fusion of 5.85 Cal g^{-1}

Module – III (THERMODYNAMIC POTENTIALS & MAXWELLS EQUATIONS)

Essay questions - 10 M

1. Illustrate Thermodynamic Potentials? Derive the Maxwell's Thermodynamic Equations from Thermodynamic Potentials.
2. Derive the Maxwell's Thermodynamic relations from a general equation.

Short questions - 5 M

3. Derive the Equation for the difference of two specific heats of a perfect gas
4. Prove that the Joule Kelvin Effect for an ideal gas is zero
5. Derive Clausius – Clapeyron's equation from Maxwell's Equations.
6. Discuss Thermodynamic Potentials.

Module – IV (LOW TEMPERATURE PHYSICS)

Essay questions - 10 M

7. State Joule – Thomson Effect? Obtain an expression for the Cooling produced in this effect.
8. Describe Adiabatic demagnetization? Explain how low temperatures can be produced from Adiabatic demagnetization.

Problems - 5 M

9. Calculate the temperature of inversion of helium gas. Given that a = 3.44x13-3 nt-m^4/mol^2 and b = 0.0237x10^{-3} m^3/mol and R = 8.31 joule/(mol – K)
10. Calculate the temperature of inversion in case of H_2 and CO_2 from the given date. T_c for H_2 is -239.9^oC and fro Co_2 is 31^oC.

Module – V (QUANTUM THEORY OF RADIATION 1)

Essay questions - 10 M

11. State Planck's hypothesis. Derive Planck's formula for the distribution of energy in black body radiation.
12. Derive Wein's law and Rayleigh-Jeans law from Planck's radiation law.
13. How do you determine Solar constant experimentally by using Angstrom Pyroheliometer?

Short answer questions - 5 M

14. Describe Fery's black body
15. Define a black body and discuss the properties of black body radiation?
16. Explain Solar constant.
17. How temperature of sun is to be calculated?

Problems - 5 M

18. Determine the temperature of sun with the help of wien's law, given b = 2.92 X 10^{-3}mK. Maximum wavelength = 4900 A^0.
19. A black body radiator at 0^0 c radiates energy of 3.2 X10^2 Jm^{-2} sec^{-1}. Calculate the value of Stefan's constant.
20. Calculate the temperature of the sun from the following data. S = 1.34 KW/ m^2, radius of the Sun = 7.92 X 10^5 Km. Distance of the sun from the earth = 1.5 x10^5 Km and Stefan's constant =5.7 X 10^{-8} W m^{-2} K^{-4}.

P.R.Government College (A), Kakinada.

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

Heat and Thermodynamics (Blue Print)

w.e.f. 2021-22 ADMITTED BATCH

Course Code: PH3202 **No. of Credits: 04**

MODEL QUESTION PAPER

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

Time: $2\frac{1}{2}$Hrs. **Max.Marks:50**

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**

P.R.GOVERNMENT COLLEGE (A), KAKINADA

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

Heat and Thermodynamics

w.e.f.2021 - 22Admitted Batch

Course Code : PH3202 **No. of credits : 04**

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

	P.R.Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (III Sem) w.e.f. 2020-21 ADMITTED BATCH			
Course Code **PH3202P**	**Heat and Thermodynamics Lab**				
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites:	Voltmeter, Ammeter, Rheostat, steam generators, Thermometer types.	0	0	2	1

Minimum of 6 experiments to be done and recorded

1. Specific heat of a liquid –Joule's calorimeter –Barton's radiation correction
2. Thermal conductivity of bad conductor-Lee's method
3. Thermal conductivity of rubber.
4. Measurement of Stefan's constant.
5. Specific heat of a liquid by applying Newton's law of cooling correction.
6. Heating efficiency of electrical kettle with varying voltages.
7. Thermoemf- 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 LabLinks

- 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)

7. **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 forJoule Thomsoncooling,LiquefactionofairbyLinde'smethod,Productionoflowtemperatures by adiabatic demagnetization

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

8. **General**

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

P.R. Government College (A), Kakinada.

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

Heat and Thermodynamics Practicals

Scheme of Valuation for Practicals

Time:3hrs Max.Marks:50

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

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

	P.R. Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (III Sem) (A.Y. 2022 – 2023)			
Course Code	**APPLICATIONS OF SOLAR CELLS IN HOME ENERGY SYSTEMS (Add-on Certificate Course)**				
Teaching	Hours Allocated: 30 (**Theory**)	L	T	P	C
Pre-requisites:	Basic idea about Latitudes and Longitudes, Introduction to semiconductors, PN junction diode and its characteristics	2	0	-	2

UNIT – I **5 hrs.**

Fundamentals of electric circuits: Conductance, Resistance, Electrical Potential, Ohm's law, Photo electric effect, series and parallel circuits of Resistance and Potential difference.

UNIT –II **5 hrs.**

Types of Solar Cells: Different types of Solar PV cells, Amorphous and crystalline Solar Cells, Efficiency of Solar cells, Advancements in Solar PV cells.

UNIT – III **10 hrs.**

Solar PV modules : Series and Parallel connection of Solar cells, Design and structure of PV modules, Number of solar Cells in a module, Wattage of modules, Fabrication of PV modules.

UNIT – IV **10 hrs.**

Solar PV module system and trouble shoot : Solar PV system connections, Solar Home systems (plug and play), Connecting a charge regulator/controller to the Solar Panel, Types of Solar Batteries, Connecting a Battery to a Solar system, Trouble shooting the Solar Battery, Connecting an Inverter to the Solar module, A Summary of the complete Solar system.

Text books & Reference books :

1.) Electrical Technology volumes by B.L. Theraja and A.K. Theraja.

2.) Build your own Solar Panel by Philip Hurley.

3.) Solar Photovoltaics Fundamentals, Technologies and Applications Third edition by Chetan Singh Solanki.

4.) Solar PV Training and Referral Manual SNV Zimbambwe.

P.R. Government College (A), Kakinada.

Department of Physics & Electronics

II B.Sc – Semester – III (A.Y. 2022 – 2023)

APPLICATIONS OF SOLAR CELLS IN HOME ENERGY SYSTEMS
(Add-on Certificate Course)

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

Hour/Week :2 Total Hours : 30

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

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

Blue Print

Module		No. of Qs.	Marks allotted
1	Fundamentals of electricity	10	10
2	Different types of electrical wiring / installations	20	20
3	Testing procedure of voltage current /Importance of Earthling	10	10
4	Tools and equipment	5	5
5	Safety measures and precautions	5	5
	TOTAL	50	50

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

	P.R. Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (IV Sem) w.e.f. 2020-21 ADMITTED BATCH			
Course Code **PH4202**	**ELECTRICITY, MAGNETISM AND ELECTRONICS (Paper-IV)**				
Teaching	Hours Allocated: 60 (**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.	4	0	-	4

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.
- Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.
- Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.
- Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.
- Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor of series resonant circuits.
- Describe the operation of p-n junction diodes, zener diodes, and transistors
- Understand the operation of basic logic gates and universal gates and their truth tables.

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 ie 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 Developmentmodules

Skill Development		Employability		Entrepreneurship	

UNITI:

Electrostatics: (6hrs) : Gauss's law-Statement and its proof, **Differential form of Gauss law**, Electric field intensity due to (i) uniformly charged solid sphere ~~and (ii) an infinite conducting sheet of charge,~~ Deduction of Coulomb's law from Gauss law, Electrical potential–Equipotential surfaces, **Potential due to i) a point charge, ii) Dipole,**~~Potential due to a uniformly charged sphere.~~

Dielectrics: (6 hrs): Dielectrics-Polar and Non-polar dielectrics- Effect of electric field on dielectrics,~~Dielectricstrength~~, Capacitanceofaparallelplatecondenserwithdielectricslabbetween the plates, Electric displacement D, electric polarization P,Relation between D, E and P, Dielectric constant and electric susceptibility.

UNITII:

Magnetostatics: (6 hrs): Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, **Magnetic induction due to a long straight wire**, Ampere's Circuital Law and its application to Solenoid, Hall effect, determination of Hall coefficient and applications.

Electromagnetic Induction: (6 hrs): Faraday's laws of electromagnetic induction, Lenz's law,Self induction and Mutual induction,Self inductance of a long solenoid, Mutual inductance of two coils, Energy stored in magnetic field, ~~Eddy currents~~.

UNITIII:

Alternating currents: (6 hrs): 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.

Electromagnetic waves-Maxwell's equations:(6 hrs) : Idea of displacement current,Maxwell's

equations-Derivation, Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves, Poynting theorem (Statement andproof). Velocity of wave equation using maxwell's relations in vaccum.

UNITIV:

Basic Electronic devices:(12 hrs): PN junction diode, Zenerdiode and ~~Light Emitting Diode (LED)~~ and their I-V characteristics, Zener diode as a regulator- Transistors and its operation, CB, CE and CC configurations, Input and output characteristics of a transistor in CE mode, Relation between alpha, beta and gamma; Transistor as an amplifier.

UNIT-V:

Digital Electronics: (12 hrs): 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, DeMorgan's laws-Statements and Proofs, Basic logic gates, NAND and NOR as universal gates, Exclusive-OR gate, Half adder and Full adder circuits.

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

REFERENCEBOOKS

1. BSc., Physics,Vol.3,TeluguAkademy,Hyderabad.
2. Electricity and Magnetism, D.N.Vasudeva.S.Chand&Co.
3. Electricity and Magnetism, B.D.Duggal and C.L.Chhabra.Shobanlal&Co.
4. Electricity, Magnetism with Electronics,K.K.Tewari,R.Chand&Co.,
5. Electricity and Magnetism, R.Murugeshan,S.Chand&Co.
6. Principles of Electronics, V.K.Mehta,S.Chand&Co.,
7. Digital Principles and Applications, A.P. Malvino and D.P.Leach, McGrawHillEdition.

WebLinks:

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

P.R. Government College (A), Kakinada.

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

Electricity, Magnetism & Electronics

QUESTION BANK

UNIT-I (Electrostatics)

Essay questions-10M

1. State and Prove Gauss theorem in electrostatics
2. State Gauss theorem and derive an expression for the electric field due to uniformly charged sphere?
3. Define Electric dipole. Derive an expression for Electric potential due to a dipole.

Short questions- 5M

4. Derive an expression for electric potential due to a point charge
5. Explain equipotential surfaces?
6. Deduce Coulomb's law from Gauss law

UNIT-I (Dielectrics)

Essay questions-10M

7. Define D, E and P and deduce relation between them.
8. Derive the Capacitance of a parallel plate condenser with dielectric slab between the plates

Short questions- 5M

9. Explain the effect of electric field on dielectrics.
10. Deduce the relation between Susceptibility and Dielectric Constant.

UNIT-II(Magneto statics &Electromagnetic Induction)

Essay questions-10M

11. Derive an expression for the magnetic induction at a point due to an infinitely long straight current carrying current.
12. Derive an expression for the magnetic induction on the axis due to circular loop.
13. Define Hall Effect? Derive an expression for hall coefficient? Mention its applications.
14. Define Coefficient of Self-induction and obtain an expression for self-inductance of a solenoid.

Short questions- 5M

15. State and explain Biot-Savart's law.
16. Obtain an expression for the energy stored in a solenoid.
17. State and explain Faraday's and Lenz's law?
18. Explain self-inductance and mutual inductance.

Problems – 5M

19. A long straight wire carries a current 3.5A. Find the magnetic induction at a point 0.2m from the wire.
20. A current of 1A is flowing in a circular coil of radius 10 cm and 20 turns. Calculate the magnetic field at a distance 10cm on the axis of the coil and centre.
21. The single carrier holes in a shaped silicon sample are 2.05×10^{22} $m^{-3.}$ Calculate its Hall Coefficient.

UNIT-III (Alternating currents, Electromagnetic waves-Maxwell's equations)

Essay questions-10M

22. Design the series LCR circuit? Derive an expression for the resonant frequency of the circuit.
23. Derive the equation of Electromagnetic wave. Show that the velocity of EM wave is equal to velocity of light in free space.
24. Derive Maxwell's equations in differential form.

Short questions – 5M

25. Explain Poynting Vector.
26. Define Q-factor and power factor
27. Derive the relation between voltage and current in LR circuit
28. Derive the relation between voltage and current in LR circuit

UNIT-IV(Basic Electronic Devices)

Essay questions-10M

29. Describe the construction & working of a PN junction diode. Explain the V-I characteristics of PN junction diode.
30. Describe the construction & working of a Zener diode. Explain the V-I characteristics of Zener diode.
31. Explain the Input & Output characteristics of PNP transistor in CE configuration.

Short questions- 5M

32. Define α, β&Υ of a transistor. Obtain a relation between them.
33. Explain a Zener diode as a voltage regulator.
34. How does a transistor work as an amplifier?

Problems-5M

35. Current Amplification factor of a common base configuration is 0.88. Find the value of base current when the emitter current is 1mA.
36. For a transistor $\beta = 40$ and $I_B = 25\ \mu A$. Find the value of I_E.

UNIT- V(Digital Electronics)

Essay questions-10M

37. State and prove De-Morgan's theorem?
38. Draw the circuit diagrams of Half adder & full-adder and explain its operation with truth table.

Short questions - 5M

39. Draw the truth table of AND, OR & NOT logic gates?
40. Show that NAND Gate is a universal gate?
41. Show that NOR Gate is a universal gate?

Problems-5M

42. Convert the following (A) 55_{10} = ……$_2$ (b) 10010.1011_2 = ……$_{10}$
43. Using 2's complement , subtract $(100111)_2$ from $(110011)_2$
44. Add the following using binary addition method $(10111)_2$ and $(10101)_2$

P.R.GOVERNMENT COLLEGE (A), KAKINADA

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

Electricity, Magnetism & Electronics

w.e.f. 2020 - 21 Admitted Batch

Time: 2 ½ Hrs. Max. Marks: 50

MODEL QUESTION PAPER

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

Time: $2\frac{1}{2}$Hrs. Max.Marks:50

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

UNIT	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	15
V	1	1	1	20
Total Marks				**95**

P.R.GOVERNMENT COLLEGE (A), KAKINADA

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

Electricity, Magnetism & Electronics (Model Question Paper)

w.e.f. 2020 - 21 Admitted Batch

Time: 2 1/2Hrs. **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

	P.R.Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (IV Sem) w.e.f. 2020 - 21 Admitted Batch			
Course Code **PH4202P**	**ELECTRICITY, MAGNETISM AND ELECTRONICS**				
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

Minimum of 6 experiments to be done and recorded:

1. Figure of merit of a moving coil galvanometer.
2. LCR circuit series/parallel resonance, Q factor.
3. Determination of ac-frequency–Sonometer.
4. Verification of Kirchoff's laws and Maximum Power Transfer theorem.
5. Field along the axis of a circular coil carrying current-Stewart &Gee's apparatus.
6. PN Junction Diode Characteristics
7. Zener Diode–V-I Characteristics
8. Zener Diode as a voltage regulator
9. Transistor CE Characteristics-Determination of hybrid parameters
10. Logic Gates-OR, AND, NOT and NAND gates. Verification of Truth Tables.
11. Verification of DeMorgan's Theorems.
12. Construction of Half adder and Full adders-Verification of truth tables
13. Universal gates construction and verification of truth tables.

Virtual Lab Links:

- 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

P.R.GOVERNMENT COLLEGE (A), KAKINADA

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

Electricity,Magnetism&Electronics

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, Electric field 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.CollectionofnewsreportsandmaintainingarecordofCourse-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:

	P.R Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (IV Sem) **w.e.f. 2020-21 ADMITTED BATCH**			
Course Code **PH4226**	**MODERN PHYSICS** **Paper – V**				
Teaching	Hours Allocated: 60 (**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:

- Develop an understanding on the concepts of Atomic and Modern Physics, basic elementary quantum mechanics and nuclear physics.
- Develop critical understanding of concept of Matter waves and Uncertainty principle.
- Getfamiliarizedwiththeprinciplesofquantummechanicsandtheformulationof Schrodinger wave equation and its applications.
- Examine the basic properties of nuclei, characteristics of Nuclear forces, salient features of Nuclear models and different nuclear radiation detectors.
- Classify Elementary particles based on their mass, charge, spin, half life and interaction.
- Get familiarized with the nano materials, their unique properties and applications.
- 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 nano materials, classification, properties. Students would also learn about Introduction to Superconductivity, types and applications.	Application & Understanding

Course with focus on employability / entrepreneurship / Skill Developmentmodules

Skill Development		Employability		Entrepreneurship	

P.R. Government College (A), Kakinada.

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

Modern Physics

w.e.f. 2020-21 ADMITTED BATCH

Course Code: PH4226 **No. of Credits: 04**
No.of Hrs/Wk: 04 **Total Hrs:60**

UNITI:

Atomic and Molecular Physics:(12 hrs): Vector atom model and Stern-Gerlach experiment, Quantum numbers associated with it,Angular momentum of the atom, Coupling schemes, Spectral terms and spectral notations, Selection rules, Intensity rules, ~~Fine structure of Sodium D-lines, Zeemaneffect,Experimentalarrangementtostudy Zeemaneffect;~~Ramaneffect,Characteristics of Raman effect. Experimental arrangement to study Raman effect, Quantum theory of Raman effect, Applications of Raman effect.

UNITII:

Matter waves &Uncertainty Principle:(12 hrs): Matter waves, de Broglie's hypothesis, Wave length of matter waves, Properties of matter waves, Davisson and Germer's experiment, Phase and group velocities, Heisenberg's uncertainty principle for position and momentum& energy and time, ~~Illustration of uncertainty principle using diffraction of beam of electrons and photons (Gamma ray microscope),Bohr's principle of complementarity~~.

UNITIII:

Quantum (Wave) Mechanics:(12 hrs): 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 (i) one dimensional potential box of infinite height(Infinite Potential Well) ~~and (ii) three dimensional box – tunneling effect.~~

UNITIV:

Nuclear Physics:(12 hrs): Nuclear Structure: General Properties of Nuclei, Mass defect, Binding energy; Nuclear forces: Characteristics of nuclear forces- Yukawa's meson theory; **Nutrino hypothesis of β-decay**, **energy spectrum of β-decay** Nuclear Models: Liquid drop model, The Shell model, Magic numbers; Nuclear Radiation detectors: G.M. Counter, Cloud chamber, Solid State detector; Elementary Particles: Elementary Particles and their classification.

UNIT-V:

Nano materials:(7hrs): Nanomaterials – Introduction, Electron confinement, Size effect, Surface to volumeratio, Classification of nanomaterials–(0D,1D,2D); Quantumdots, Nanowires, Fullerene, CNT, Graphene (Mention of structures and properties), Distinct properties of nano materials (Mention-mechanical, optical, electrical, and magnetic properties); Mention of applications of nano materials: (Fuel cells, Phosphors for HD TV).

Superconductivity: (5 hrs): Introduction to Superconductivity, Experimental results-critical

temperature, critical magnetic field, Meissner effect , Isotope effect, Type I and Type II superconductors, BCS theory (elementary ideas only), Applications of superconductors

	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

REFERENCEBOOKS

1. BScPhysics,Vol.4,TeluguAcademy,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-HillEdition.
5. NuclearPhysics, D.C.Tayal, Himalaya Publishing House.
6. S.K.Kulkarni, Nanotechnology: Principles & Practices (CapitalPubl.Co.)
7. K.K.Chattopadhyay & A.N.Banerjee, Introd.to Nanoscience and Technology (PHI Learning Priv. Limited).
8. Nanomaterials, AKB and opadhyay. New Age International Pvt Ltd (2007)
9. Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj, BBRath and J Murday-Universities Press-IIM

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/115/104/11510409 6/

P.R. Government College (A), Kakinada.

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

Modern Physics- Question Bank

w.e.f. 2020-21 ADMITTED BATCH

QUESTION BANK

UNIT-I (Atomic & Molecular Physics)

Essay Questions - 10M

1. Explain the Quantum Numbers associated with Vector Atom model.
2. Describe the Stern- Gerlach experiment to prove vector Atom Model.
3. State and explain Raman Effect? How it is experimentally studied.

Short Questions - 5M

4. Explain L – S Coupling and j – j Coupling Schemes.
5. Explain the selection rules of spectral lines.
6. Illustrate the characteristics of Raman lines
7. Explain the quantum theory of Raman Effect.
8. Using L-S coupling, calculate the spectral terms of 4p,4d configuration

UNIT II (Matter Waves & Uncertainty Principle)

Essay Questions - 10M

14. Describe the Davisson and Germer Experiment to demonstrate the wave nature of electrons.
15. Discuss about matter waves? Derive an expression for de-Broglie wavelength of matter waves.
16. State and Explain Heisenberg's uncertainty principle for position and momentum. Extend it to Energy and Time.

Short Questions - 5M

9. Review the properties of matter waves.
10. State and Explain Heisenberg's uncertainty principle.
11. Explain de – Broglie hypothesis of matter waves.

Problems - 5M

12. If the uncertainty in the momentum of an electron is 1.65×10^{-24} kg m/sec. calculate the uncertainty in its position.
13. If the de-Broglie wavelength of a particle is 100 A^0, find the momentum and energy($h=6.62 \times 10^{-34}$JS)
14. Find the de-Broglie wavelength of a neutron of energy 12.8MeV.

Given mass of neutron=1.675×10^{-27}Kg

UNIT – III (Quantum (Wave)Mechanics)

Essay Questions - 10M

15. Derive Schrodinger time dependent wave equation.
16. Derive Schrodinger time independent wave equation.
17. Obtain the expressions for energy levels of a particle in one dimensional infinite potential well.

Short Questions - 5M

18. Explain the physical interpretation of wave function.
19. Explain Eigen functions and Eigen values.

UNIT –IV (Nuclear Physics)

Essay Questions - 10M

20. Explain liquid drop model.
21. Explain shell model of nucleus.
22. Discuss about magic numbers?
23. Explain Nutrino hypothesis of β-decay

Short Questions - 5M

24. Ex plain the characteristics of nuclear forces
25. Define Mass Defect and Binding Energy.
26. Explain the Binding Energy of a nucleus?
27. Discuss about Elementary Particles?

Problems - 5M

28. Estimate the binding energy per nucleon of $_3Li^7$ if masses of proton, neutron and lithium nucleus are1.00813amu, 1.00893amu and 7.01600 amu respectively(1amu=932MeV)
29. The binding energy of $_{17}Cl^{35}$ nucleus is 298MeV. Find its atomic mass if the masses of proton, neutron are1.007825amu, 1.008665amu respectively(1amu=931.5MeV)

UNIT –V (Nano Materials ; Super Conductivity)

Essay Questions - 10M

30. Describe any three properties of nano particles.
31. Explain Type-I and Type-II superconductors?
32. State and Explain Meissner Effect

Short Questions - 5M

33. How the nano materials are classified?
34. Explain the concept of Quantum well, Quantum wire, Quantum dot.
35. Mention any 5 applications of nano materials.
36. Explain the concept of critical temperature and critical magnetic field.

P.R. Government College (A), Kakinada.

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

Modern Physics – Blue Print

w.e.f. 2020-21 ADMITTED BATCH

Course Code: PH4226 **No. of Credits: 04**

MODEL QUESTION PAPER

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

Time: $2\frac{1}{2}$Hrs. **Max.Marks:50**

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

.

UNIT	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**

P.R. Government College (A), Kakinada.

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

Modern Physics

w.e.f. 2020-21 ADMITTED BATCH

Course Code: PH4226 **No. of Credits: 04**

Time: 2 1/2Hrs. **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

SECTION-B

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

PART-2

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)			
Course Code **PH4226P**	**MODERN PHYSICS LAB**				
Teaching	Hours Allocated: 60 (**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 J.J.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 colors.
5. Determination of M&H.
6. Energy gap of a semiconductor using junction diode.
7. Energy gap of a semiconductor using thermistor
8. Study of photocell characteristics.

Virtual LabLinks:

- 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 studyZeeman 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 principle 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, The Shell 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. CollectionofnewsreportsandmaintainingarecordofCourse-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:

P.R. Government College (A), Kakinada.

Department of Physics & Electronics

III B.Sc – Semester – V (A.Y. 2022 – 2023)
w.e.f. 2020-21 ADMITTED BATCH

For Semester–V, for the domain subject **PHYSICS**, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).

Note 2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations.

Note 3: To insert assessment methodology for Internship/ on the Job Training/Apprenticeship under the revised CBCS as per APSCHE Guidelines.

- **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 (the detailed guidelines are enclosed).
- **CreditForCourse:04 for 100 marks**

- **Second Internship (After 2nd Year Examinations):** Apprenticeship / Internship / on the job training / In-house Project / Off-site Project. To make the students employable, this shall be undertaken by the students in the intervening summer vacation between the 2nd and 3rd years (the detailed guidelines are enclosed).
- **Credit For Course: 04 for 100 marks**

- **Third internship / Project work (6th Semester Period):**
  During the entire 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 (the Detailed guide lines are enclosed).
- **Credit For Course: 12 for 200 marks**

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code PH	**TITLE OF THE COURSE- 6A** **OPTICAL INSTRUMENTS AND OPTOMETRY (Skill Enhancement Course (Elective)**	III Year B. Sc. Semester – V			
Teaching	Hours Allocated: 50,Max.marks 100(**Theory**)	L	T	P	C
Pre-requisites	Learn aberrations, basic principles of travelling microscope and Telescope	4	-	-	4

Learning Outcomes:

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

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

CourseOutcomes:

On Completion of the course, the students will be able to		cognitive domain
CO1	Understand the construction and working principles of various optical instruments used in daily life.	Understanding
CO2	Acquire a critical knowledge on the various defects of eye and their correcting methods with suitable lenses	Remembering
CO3	Demonstrate skills of using biological microscope through hands on experience	Applying
CO4	Comprehend the various applications of microscopes and telescopes	Analyzing and Applying

Course with focus on Employability / Entrepreneurship / Skill Developmentmodules

Skill Development		Employability		Entrepreneurship	

Syllabus: *Total Hours:90 (instruction hours 50 andLab,FieldTraining,Unittestsetc-40.)*

UNITI: OPTICAL MICROSCOPES (10hrs)

Introduction to Microscopes**,** Need of a Microscope**,** Different types of microscopes and their uses ,Simple microscope-Construction, Magnifying power, normal adjustment; Compound microscope-Construction, Magnifying power, normal adjustment, Phase contrast microscope-Operating principle, Travelling microscope-Construction, working and uses

UNITII: TELESCOPES **(10hrs)**

Introduction to Telescopes**,** Different types of Telescopes and their uses, Refracting Telescopes and Reflecting telescopes, Construction, working and magnifying power of Astronomical Telescope and Terrestrial Telescopes, Binoculars – working principle and applications.

UNITIII:APPLICATIONS OF OPTICALINSTRUMENTS (10hrs)

Introductory ideas and applications of various microscopes *viz*., (i) Optical microscopes (Compound microscope, Stereo microscope, Confocal microscope) (ii) Electron microscopes (TEM, SEM), (iii) Scanning Probe microscope (iv) Scanning Acoustic microscope and (v) Xraymicroscope.

Introductory ideas and applications of various telescopes *viz*., (i) Optical telescopes (ii) Radio telescopes (iii) Solar telescopes (iv) Infrared telescope (v) Ultraviolet telescope (vi) X-ray telescope and (vii) Gamma ray telescope

UNITIV:OPTICALVISION **(10hrs)**

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

UNITV:OPHTHALMICTECHNIQUES AND OPTOMETRY (10hrs)

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

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	1
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	2

REFERENCESBOOKS:

1. Optics and Optical Instruments: AnIntroduction by B.K.Johnson,DoverPublications.
2. Modern Optical Instruments and their construction byor ford Henry-Publisher: BiblioLife, LLC.
3. A Text Book of Optics by BrjLal and N.Subramanyam, S.Chand & Co.
4. Practical Optics by MennNaftly,ElsevierSciencePublishing.
5. ApplicationsofOpticsindailylife|CK-12Foundation.https://flexbooks.ck12.org›
6. Web sources suggested by the teacher concerned and the college librarian including Reading material.

Weblinks:

- https://flexbooks.ck12.org. Applications of Optics in daily life | CK-12 Foundation

III B.Sc Physics – V SEM

6A: OPTICAL INSTRUMENTS AND OPTOMETRY

Question Bank

UNIT-I

1. Discuss about the construction and normal adjustment of Simple microscope
2. Describe the construction and working of a Travelling microscope
3. Define Microscope
4. Write the uses of microscope
5. State the operating principle of a Phase contrast microscope
6. Write about different types of microscopes
7. Explain about the need of microscope
8. How do you determine magnifying power of a Compound microscope

UNIT-II

1. Differentiate between Astronomical telescope and Terrestrial telescope
2. Explain briefly about Refracting and Reflecting telescopes
3. How do you determine the magnifying power of an Astronomical telescope
4. Write the uses of a Telescope
5. Write about working principle and applications of Binoculars
6. Discuss about various types of Telescopes

UNIT-III

1. Explain briefly about Optical microscopes like Compound microscope, Stereo microscope, Confocal microscope
2. Write about the applications of various microscopes
3. Give explanation for Scanning Probe Microscope
4. Write short notes on ideas and applications of Telescopes
5. Discuss about Electron microscopes like TEM and SEM
6. Distinguish between Microscopes and Telescopes
7. Describe (i) Optical telescopes (ii) Radio telescopes (iii) X-ray telescope

UNIT-IV

1. Explain about how an Eye act as an optical instrument
2. Write about optical vision
3. Define ophthalmic lenses. Give explanation for Removal of defects in vision using ophthalmic lenses
4. Write short notes on Far points and near points
5. Discuss about Myopia and Hypermetropia defects
6. Distinguish between ophthalmic lenses and contact lenses
7. Interpret the phenomenon of Formation of image in the eye and the camera
8. Describe the Working principle of contact lenses

UNIT-V

1. Write about Ophthalmoscope
2. Explain about keratometer and their working principle
3. Give explanation for checking the power of lenses
4. Write short notes on Evaluation of eye disorders
5. Discuss about Evaluation of eye disorders
6. Interpret the Principles of Computer based eye testing

III B.Sc Physics – V SEM

6A: OPTICAL INSTRUMENTS AND OPTOMETRY

MODEL QUESTION PAPER

Max.Marks: 60 **Time: 2 1/2 hrs**

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

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	12	5	60	6	5	30
TOTAL		18		120	9		60

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	2	2	-	30
II	1	2	-	20
III	1	2	1	25
IV	1	2	-	20
V	1	2	1	25
Total Marks				**120**

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics – V SEM

6A: OPTICAL INSTRUMENTS AND OPTOMETRY

MODEL PAPER

Time: 2½hrs **Max. Marks: 60M**

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

SECTION-A

Answer **any Three** of the following questions 3 X 10= 30 Marks

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

SECTION-B

Answer **any Six** Questions from the following 6 X 5= 30 Marks

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

Course Code PH	**TITLE OF THE PRACTICAL** **Course 6A: Optical Instruments and Optometry**	IV Year B. Sc.(Hons) – Semester – V			
Practical	Hours Allocated: 30 hrs, Max Marks: 50 (**Lab**)	L	T	P	C
Pre-requisites	Least count of microscope, refraction, lenses, errors of eyes, focal length, spectacle power	-	-	2	1

LearningOutcomes: On successful completion of this practical course, student shall be able to:

1. Listout, identify and handle various equipments like binoculars, telescopes and microscopes.
2. Learn the procedures of operation of various optical instruments.
3. Demonstrate skills on testing the power of lenses, improving the resolution of telescopes and microscopes.
4. Acquire skills in observing and measuring the power, focal length and different refractive errors of eye.
5. Performsometechniquesrelatedtotestingthebloodandotherbiologicalsamples.
6. UnderstandthetechniqueofoperationofComputereyetestingandevaluation.

Practical(Laboratory) Syllabus: *(30hrs*)

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

LABREFERENCES:

1. A Practical Guide to Experimental Geometrical Optics by YuriyA. Garbovskiy-Cambridge Univ. Press
2. https://physics.columbia.edu/sites/default/files/content/Lab%20Resources/1292%20Lab%20Manual.pdf
3. https://www.lnmiit.ac.in/Department/Physics/uploaded_files/lab-manual.pdf
4. Basic Optics Experiments-http://www.phys.unm.edu›OpticsLab›Basics
5. A Practical Guide to Experimental Geometrical Optics by YuriyA. Garbovskiy, Anatoliy V. Glushchenko, Cambridge Univ. Press
6. Web sources suggested by the teacher concerned.
   http://www.phy.olemiss.edu/~thomas/weblab/Optics_lab_Items/Telescope_Microscope_PROCED_Spring_2018.pdf

Co-Curricular Activities

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

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

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

1. Max marks for Fieldwork/Projectwork:05.
2. Suggested FormatforFieldwork/Projectwork:*Titlepage,studentdetails,indexpage, details of place visited, observations, findings and acknowledgements*.
3. Unit tests(IE).

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

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

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

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

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

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

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

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code PH	**TITLE OF THE COURSE** **OPTICAL IMAGING AND PHOTOGRAPHY-7A (Skill Enhancement Course (Elective)**	IV Year B. Sc.(Hons) – Semester – V **w.e.f. 2020-21 ADMITTED BATCH**			
Teaching	Hours Allocated: 50,Max.marks 100 (**Theory**)	L	T	P	C
Pre-requisites	Different optical lenses, aberrations of lenses, drones, image sensors, Data storage devices, resolutions of a lenses	4	-	-	4

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

1. Identify the different types of cameras and camera lenses according to different purposes.
2. Identify and understand the focal length of the different types of lenses
3. Acquire a critical knowledge on natural and artificial sources of light and their application in photography.
4. Demonstrate skills of camera usage especially Digital Cameras.
5. Understand the various Image development and editing techniques.
6. Comprehend the concept of different types of common shooting techniques.

Syllabus: *Total Hours:90 (instruction hours 50 andLab,FieldTraining,Unittestsetc-40.)*

CourseOutcomes:

On Completion of the course, the students will be able to		**cognitive domain**
CO1	Identify and understand the focal length of the different types of lenses, different types of cameras and camera lenses according to different purposes.	Remembering and understanding
CO2	Acquire a critical knowledge on natural and artificial sources of light and their application in photography	Applying
CO3	Demonstrate skills of camera usage especially Digital Cameras. Understand the various Image development and editing techniques	Evaluating
CO4	Comprehend the concept of different types of common shooting techniques	Analyzing

Course with focus on Employability / Entrepreneurship / Skill Developmentmodules

Skill Development		Employability		Entrepreneurship	

UNITI:INTRODUCTIONTOPHOTOGRAPHY: **(10hrs)**

Photography-Introduction, Working principle of a camera, Image formation in simple camera and human eye, Types of cameras , Pin-hole camera , Single Lens Reflex (SLR) camera, Twin Lens Reflex (TLR) camera , Digital Single-lens reflex camera (DSLR), Digital camera, Drone flying cameras, Care and maintenance of camera, Factors influencing choice of camera

UNITII:DIGITALPHOTOGRAPHY: **(10hrs)**

Different types of Digital cameras and their parts, Working of DSLR camera, Types of lenses-Normal, Wide angle, telephoto, Zoom lenses, Digital Image formation, Digital camera image sensors, Size of the image, Depth of focus, Depth of field, Exposure time, Aperture, Shutter speed, ISO, filters, knowledge on pixels and their uses , resolution, Camera accessories

UNITIII: PHOTOGRAPHIC LIGHT SOURCES: **(10hrs)**

Need for the light in photography, Light sources- Natural light, Sun light, Moon light, Ambient light, Artificial light sources-Flood light, Spot light, Halogen light, Halogen flash light, Digital lights, Exposure, Studio photography

UNITIV:PHOTOGRAPHIC SHOOTING TECHNIQUES: **(10hrs)**

Significance and role of Camera lens in photo shooting, Arrangement of lenses in a Camera-Positioning, Techniques involved in the use of DSLR cameras, Usage of Filters, Techniques of Photomicrography, High speed Photography with motor driven camera, Basic ideas on Underwater Photography, Medical Photography, Astronomical Photography, Infra-Red (IR) Photography, Ultra Violet (UV) Photography and Forensic Photography.

UNITV: PHOTOMANIPULATION: **(10hrs)**

Developing and printing the photographs, equipment and materials used in developing and printing, image mixing and printing, Image editing through image editing software's like Adobe Photoshop – Adjustment of Brightness, Contrast, Tonal and Colour Values, Factors influencing quality of digital image, Methods of storing and processing, Image transportation through Pen drive, CD, HDD and CLOUD [Internet]

CO-PO Mapping:

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

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

REFERENCEBOOKS:

1. Object and image ;An introduction to photography by George MCraven,PHI
2. AnIntroductiontoDigitalPhotoImagingAgfa,1994
3. Advance Photography by M.Langford.
4. DigitalPhotography-AhandsonIntroductionbyPhillipKrejcarek,DelmerPublishers
5. Multimedia–An Introduction by JohnVillamil, PHI
6. https://www.adobe.com/in/creativecloud/photography/discover/dslr-camera.html
7. Web sources suggested by the teacher concerned and the college librarian including reading material.

Web links:

- https://www.adobe.com/in/creativecloud/photography/discover/dslr-camera.html

P. R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics – V SEM

OPTICAL IMAGING AND PHOTOGRAPHY-7A

Question Bank:

1. Discuss about Image formation in simple camera and human eye
2. Describe the Working principle of a camera
3. Define Photography
4. Discuss the factors influencing choice of camera
5. Write about Care and maintenance of camera
6. Explain about Digital cameras and Drone flying cameras
7. Differentiate between Single Lens Reflex (SLR) camera, Twin Lens Reflex (TLR) camera

UNIT-II

1. Discuss about different types of Digital cameras and their parts
2. Explain about the working of DSLR camera
3. How do you determine Depth of focus, Depth of field
4. Explain about the knowledge on pixels and their uses
5. Write briefly about normal, wide angle and zoom lenses
6. Discuss about Digital Image formation, Aperture, Shutter speed, ISO and filters

UNIT-III

1. Explain the need for the light in photography
2. Write short notes on Artificial light sources like Flood light, Spot light, Halogen light, Halogen flash light, Digital lights
3. Discuss about Studio photography
4. Interpret the phenomenon of exposure
5. Describe about Light sources like Natural light, Sun light, Moon light, Ambient light

UNIT-IV

1. Discuss about Techniques of Photomicrography
2. Describe the significance and role of Camera lens in photo shooting
3. Explain about Techniques involved in the use of DSLR cameras
4. What are uses of filters
5. Write about Medical Photography and Astronomical Photography
6. Explain High speed Photography with motor driven camera and Basic ideas on Underwater Photography
7. Write about Forensic Photography

UNIT-V

1. Discuss about developing and printing the photographs
2. Describe the equipment and materials used in developing and printing, image mixing andprinting
3. ExplainbrieflyhowtheImageeditingthroughimageeditingsoftware"slikeAdobePhotoshop
4. Write a note on adjustment of Brightness, Contrast
5. Illustrate the factors influencing quality of digital image

6. Explain the methods of storing and processing of image

P. R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics – V SEM

OPTICAL IMAGING AND PHOTOGRAPHY-7A MODEL PAPER

Time: 2½hr **Max. Marks:60M**

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	12	5	60	6	5	30
TOTAL		18		120	9		60

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	2	2	-	30
II	1	2	-	20
III	1	2	1	25
IV	1	2	-	20
V	1	2	1	25
Total Marks				**120**

P. R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics – V SEM

OPTICAL IMAGING AND PHOTOGRAPHY-7A MODEL PAPER

Time: 2½hrs **Max. Marks: 60M**

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

Time: 2½hrs **Max. Marks: 60M**
Note:-Set the question paper as per the blue print given at the end of this model paper.

SECTION-A

Answer **any Three** of the following questions 3 X 10= 30 Marks

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

SECTION-B

Answer **any Six** Questions from the following 6 X 5= 30 Marks

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

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code PH	**TITLE OF THE PRACTICAL** **Course 7A: Optical Imaging and Photography**	III Year B. Sc Semester – V			
Practical	Hours Allocated: 30 hrs, Max Marks: 50 (**Lab**)	L	T	P	C
Pre-requisites	Camera principle, digital image analysis, Basic ICT usage, editing software's etc.	-	-	2	1

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

1. List out, identify and understand various image formation techniques including Eye.
2. Learn the procedures of using Analog and Digital cameras.
3. Demonstrate the focusing techniques of Analog and Digital cameras.
4. Acquire skills in the editing and development of photos and videos.
5. Perform some experimental skills related to images, videos using the equipment available in the lab or in a local studio.

Practical(Laboratory)Syllabus:*(30hrs*)

1. Construction of a simple pinhole Camera and study it's working.
2. Capture an image using a Digital Camera and apply editing techniques.
3. Understanding various image formats and convert one image format into other(For ex: JPEG toBMP)
4. Convert a video stream into image stream by using a suitable editing software.
5. Evaluate the number of pixels and size of digital Image.
6. Comparisonofthequalityofa8-bit, 16-bit and32bit images.
7. Perform the reduction and enlargement of a given Digital Image.
8. Change the appearance of an image by applying the filters (For ex: from the IR image of the given digital Image by suitable IR filter)

LABREFERENCES:

1. DSLR Photography for Beginners by BrianBlack
2. The Art of Photography by BruceBarnbaum
3. Photo shop for Photographers by JohnSlavio
4. https://www.youtube.com/channel/UCwWyFRy2l6aUFMsRemP51Sw.YouTu beresource.
5. https://www.udemy.com/course/complete-photography-course/
6. Web sources suggested by the teacher concerned.

Co-CurricularActivities

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

1. **For Teacher**: Training of students by the teacher (if necessary, by a local expert) in laboratory/field for not less than 15 hours on the field techniques/skills of Image formation by using lenses and mirrors. Also to make students to understand the construction, operation and the Physics principles involved in a normal Camera and Digital Camera.

2. **For Student**: Students shall (individually) visit a local Photo studio or any such facility in a university/research organization/private and observe

(i) the operation of different digital cameras, compact and SLR and in taking photographs using different types of lenses by varying aperture, shutter speed for still camera, video camera, CCTV and spy camera

or (ii) the use of natural light, tungsten light, fluorescent light, electronic flash reflectors, exposure meters, studio flash and its accessories

or(iii)theusageofvariouslightingtechniquesfordifferentlensesandwilldopracticeonspecialareasofphotography inoutdoorandindoorconditions

or(iv) the different processes viz., audio video recording, mixing, editing, dubbing of sound, using different types of microphones

or(v) the handling of the digital video cameras, DVD, HDD, accessories and exposure to take different common shots, dimension of images and movements as per requirement

or (v)the computer system by digital editing software, printing the photographs taken by digital cameras and the image transportation to the storage media, sending photographs through E- mail and Scanning the photographs, capture frames and analysis of images and record their observations and submit a hand-written Fieldwork/Project work not exceeding 10 pages in the given format to the teacher.

3. Max marks for Fieldwork/ Project work: 05.

4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements*.

5. Tests (IE).

(b) Suggested Co-Curricular Activities:

1. Training of students by a related skilled person from a Photo studio.
2. Assignments (including technical assignments like identifying the tools &techniques involved in photography and handling, operational techniques of different Cameras with safety and security)
3. Seminars, Group discussions, Quiz, Debates etc.(on related topics).
4. Preparation of videos on tools and techniques related to Image formation and Photographic Techniques.
5. Practice taking outdoor photographs with a digital camera in (i) Black & White and (ii) Colour in the following conditions**:**

   Landscapes – Street / Building – Sculpture – Insect / Animal movement– Industrial plant (outside view) – Children, birds (close up / long shot / model photography)- slow and fast moving objects-Night photography etc.
6. Shooting of different areas and topics such as sports, wildlife, modeling, drama, documentary, serial, story board making, news, interview, seminar/ workshop, industrial, live broadcasting, musical event, advertisement, etc.
7. Collectionofmaterial/figures/photosrelatedtovariouscomponentsofaCamera,writing and organizing them in a systematic way in a file.
8. Visits to any local Photo Studio or any Lab in universities, research organizations, private firms, etc.
9. Invited lectures and presentations on related topics by field/industrial experts.

	P.R Government College (Autonomous) Kakinada	Program & Semester III Year B. Sc. Semester – V **w.e.f. 2020-21 ADMITTED BATCH**			
Course Code PH	**TITLE OF THE COURSE** **Low Temperature Physics & Refrigeration (Skill Enhancement Course (Elective) -6B**				
Teaching	Hours Allocated: 50,Max.marks 100 (**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. Comprehend the applications of Low Temperature Physics and refrigeration.

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 their effects on environment	Understanding
CO4	Comprehend the applications of Low Temperature Physics and refrigeration	Analyzing

Course with focus on Employability / Entrepreneurship / Skill Developmentmodules

Skill Development		Employability		Entrepreneurship	

Syllabus: *Total Hours:50 instruction 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 LOW TEMPERATURE & REFRIGERATION (10hrs.)

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

Applications of refrigeration: Domestic refrigerators, Water coolers, Cold storages, Ice plants, Food preservation methods, Chemical and Process industries, ~~Cold treatment of metals, Construction field~~, Desalination of water, ~~Data centers~~.

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.ChandPublishers.
2. Thermal Physics by SCGarg,RMBansal&CKGhosh, McGrawHillEducation,India
3. Heat and Thermodynamics by MMZemansky, McGrawHillEducation(India).
4. Low-Temperature Physics by Christian E.&SiegfriedH., Springer.
5. Thermal Engineering by S.Singh, S.Pati,Ch:18 Introduction to Refrigeration.
6. The Physics Hyper TextBook. Refrigerators. https://physics.info/refrigerators/
7. Refrigeration and Air Conditioning by Manohar Prasad, New age international(P) limited, New Delhi
8. AcourseinRefrigerationandAirConditioningbyS.C.AroraandS.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

P.R.GOVERNMENT COLLEGE (A), KAKINADA

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

Low Temperature Physics & Refrigeration

(Skill Enhancement Course (Elective)

Question Bank

UNIT-I 10 MQs

1. Describe the Joule-Thomson effect for an ideal gas
2. Explain adiabatic demagnetization for producing low temperatures
3. Describe the production of liquid hydrogen and nitrogen

UNIT-I 5 MQs

4. Write about the Freezing mixtures
5. Write any five Properties of materials at low temperatures
6. Discuss about different methods of liquefaction of gases
7. Explain Curie's temperature and superconductivity of materials

Problems - 5 M

8. Calculate the temperature of inversion of helium gas. Given that a = 3.44x13-3 nt-m^4/mol^2 and b = 0.0237x10^{-3} m^3/mol and R = 8.31 joule/ (mol – K)
9. Calculate the temperature of inversion in case of H_2 and CO_2 from the given data. T_c for H_2 is -239.9^{o}C and for Co_2 is 31^{o}C.

UNIT-II 10M Qs

10. Explain secondary thermometers with examples
11. Give a brief account on Resistance thermometers, Vapour pressure thermometers and Magnetic thermometers?
12. Distinguish between thermocouples and thermometers?

UNIT-II 5M Qs

13. Discuss about various types of thermometers?
14. Write a short note on Gas thermometer

UNIT-III 10M Qs

15. Explain about Refrigeration? Mention the types of Refrigeration?
16. Discuss about the Stages of refrigeration?
17. Draw the block diagram and explain Refrigeration cycle

UNIT-III 5M Qs

18. Distinguish between Natural and artificial refrigeration
19. Write the different Stages of refrigeration
20. Give a brief account on ideal refrigerant and commonly used refrigerants
21. Discuss the properties of an ideal refrigerant
22. Interpret the phenomenon of Eco-friendly refrigerants

UNIT-IV 10M Qs

23. Discuss about Refrigerator and its working with Block diagram
24. Explain compressors, evaporators and condensers of a refrigerator and their functions

UNIT-IV 5M Qs

25. Define Coefficient of Performance (COP) and Energy Efficiency Ratio(EER)

26. Write about defrosting in a refrigerator

27. Explain Refrigerant leakage and detection

UNIT-V 10M Qs

28. Explain the applications of Low temperatures

29. Discuss about Preservation of biological material

30. Describe the role of liquid nitrogen, liquid hydrogen and super conducting magnets in medical field

UNIT-V 5M Qs

31. Write about Food freezing?

32. Write briefly about Cryogenic rocket propulsion system

33. Write the applications of low temperatures in medicine

34. Write the domestic applications of Refrigeration

35. Write the industrial applications of Refrigeration

36. Write the methods of food preservation

37. Discuss the desalination of water

P.R.GOVERNMENT COLLEGE (A), KAKINADA

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

Low Temperature Physics & Refrigeration

(Skill Enhancement Course (Elective)

2020-21ADMITTED 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 1/2 Hrs. Max. Marks: 60

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	12	5	60	6	5	30
TOTAL		18		120	9		60

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	2	2	1	35
II	1	2	1	25
III	1	2	-	20
IV	1	2	-	20
V	1	2	-	20
Total Marks				**120**

P.R.GOVERNMENT COLLEGE (A), KAKINADA

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

Low Temperature Physics & Refrigeration

(Skill Enhancement Course (Elective)

2020-21 ADMITTED BATCH

Time: 2½hrs **Max. Marks: 60M**

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

SECTION-A

Answer **any Three** of the following questions 3 X 10= 30 Marks

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

SECTION-B

Answer **any Six** Questions from the following 6 X 5= 30 Marks

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

	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,
2. identify and handle equipment used in refrigeration and low temperature lab.
3. Learn the procedures of preparation of Freezing Mixtures.
4. Demonstrate skills on developing various Freezing mixtures and materials and their applications in agriculture, medicine and day to day life.
5. Acquire skills in observing and measuring various methodologies of very low Temperatures
6. Perform some techniques related to Refrigeration and Freezing in daily life.

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. Study the operation of are frigerat or and understand the working of differentparts.
5. Study the properties of refrigerants like chlorofluorocarbons-hydro chloro fluoro- carbons and record the lowest temperatures obtained.
6. Consider a simple faulty refrigerator and try to troubleshootthesimpleproblemsby 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. ExperimentaltechniquesinlowtemperaturephysicsbyGuyWhite,PhilipMeeson.
2. ExperimentallOw-temperaturephysicsbyA.Kent,Macmillanphysicalscienceseries
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%20

Cryogenics.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 super market 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 Fieldwork/Projectwork:05.
4. Suggested Format for Fieldwork/Projectwork: *Titlepage, student details, indexpage, details of place visited, observations, findings and acknowledgements*.
5. Unit tests (IE).

(b) Suggested Co-Curricular Activities

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 security)
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. VisitstoIce 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.https://edu.rsc.org/experiments/modelling-the-greenhouse-effect/1543.articlehttps://sealevel.jpl.nasa.gov/files/archive/activities/ts1hiac1.pdf

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code PH	**TITLE OF THE COURSE** Solar Energy and Applications -7B **(Skill Enhancement Course (Elective)**	III Year B. Sc Semester – V			
Teaching	Hours Allocated: 50,Max.marks 100 (**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:

1. Understand Sun structure, forms of energy coming from the Sun and its measurement.
2. Acquire a critical knowledge on the working of thermal and photovoltaic collectors.
3. Demonstrate skills related to callus culture through hands on experience
4. UnderstandtestingproceduresandfaultanalysisofthermalcollectorsandPVmodules.
5. 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

CourseOutcomes:

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:*Total Hours:90:instruction hours 50,(Lab,FieldTraining,Unittestsetc.40Hours)*

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. Pyroheliometer -working principle, direct radiation measurement, Pyrometer-working Principle, diffuse radiation measurement, Distinction between the two meters.

UNITII:SOLARTHERMALCOLLECTORS (10hrs)

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

UNITIII: 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

UNITIV: 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

UNITV: SOLAR PHOTOVOLTAIC 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-POMapping:

(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. SolarPhotovoltaics-Fundamentals,technologiesandapplications,ChetanSingh 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

P.R.GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper – 7B – Semester – V (Model Paper)

Solar Energy and Applications
(Skill Enhancement Course (Elective)

Question Bank

UNIT-I 10M Qs

1. Explain the Spectral distribution of solar radiation
2. Describe the working of Pyroheliometer
3. Explain the working of Pyrometer

UNIT-I 5M Qs

4. Define and explain Solar constant
5. State and explain zenith angle?
6. Differentiate standard time and local apparent time
7. Analyze pyrometer and Pyroheliometer

UNIT-II 10M Qs

8. Discuss the types of Solar Thermal Collectors
9. Explain Solar cookers, Solar dryers, Solar desalinators

UNIT-II 5M Qs

10. Derive Energy balance equation and efficiency of thermal collectors
11. Define collector efficiency factor, collector heat-removal factor and collector flow factor
12. Describe solar water heating system

UNIT-III 10M Qs

13. Discuss the advantages and drawbacks of photo voltaic cells
14. Discuss the Effect of light intensity, inclination and temperature on efficiency of photo voltaic cells

UNIT-III 5M Qs

15. Explain the Schottky barrier of a solar cell?
16. Draw and explain I-V characteristics of a Solar cell
17. Describe the effect of series and shunt resistance on the efficiency of solar cells
18. Discuss about Photovoltaic cells

UNIT-IV 10 M Qs

19. Explain different types of solar cells
20. Describe briefly about the various steps involved in Module fabrication

UNIT-IV 5MQs

21. Illustrate the advantages and limitations of solar cells
22. Discuss the Module fabrication steps of solar cells
23. Analyze the Bypass and blocking diodes of solar cells?

UNIT-V 10M Qs

24. Explain the Mechanical storage in Flywheel
25. Describe the Electrical storage in a Super capacitor

UNIT-V 5M Qs

26. Describe the Energy storage in PV systems
27. Discuss various types of Energy storage modes
28. Explain about electrochemical storage
29. Describe primary and secondary batteries
30. Compare lead acid and dry batteries

P.R.GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper – 7B – Semester – V (Model Paper)

Solar Energy and Applications

(Skill Enhancement Course (Elective)
w.e.f. 2020-21ADMITTED 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 1/2 Hrs. Max. Marks: 60

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**	12	5	60	6	5	30
TOTAL		18		120	9		60

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	2	2	-	30
II	1	2	-	20
III	1	3	-	25
IV	1	2	-	20
V	1	3	-	25
Total Marks				**120**

P.R.GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc Physics Paper – 7B – Semester – V (Model Paper)

Solar Energy and Applications

(Skill Enhancement Course (Elective)
w.e.f. 2020-21ADMITTED BATCH

Time: 2½hrs **Max. Marks:60M**

SECTION-A

Answer **any Three** of the following questions 3 X 10= 30 Marks

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

SECTION-B

Answer **any Six** Questions from the following 6 X 5= 30 Marks

7. Short answer question from UNIT – I
8. Short answer question from UNIT – I
9. Short answer question from UNIT – II
10. Short answer question from UNIT – II
11. Short answer question from UNIT - III
12. Short answer question from UNIT – III
13. Short answer question from UNIT - III
14. Short answer question from UNIT - IV
15. Short answer question from UNIT - IV
16. Short answer question from UNIT - V
17. Short answer question from UNIT – V
18. 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, Volatage, current, solar radiation	-	-	2	1

Practical(lab)work*(30hrs,MaxMarks:50)*
Learning Outcomes: On successful completion of this practical course, student Shall be able to:

1. Listoutandidentifyvariouscomponentsofsolarthermalcollectorsandsystems, solar photovoltaic modules and systems.
2. Learntheproceduresformeasurementofdirect,globalanddiffusesolarradiation,I -V characteristics and efficiency analysis of solar cells and modules.
3. Demonstrateskillsacquiredinevaluatingtheperformanceofsolarcell/module in connecting them appropriately to get required power output.
4. Acquireskillsinidentificationandeliminationofthedamagedpanelswithout 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. Determination of series and shunt resistance of a solar cell/module.
6. Determinationofefficiencyoftwosolarcells/modulesconnectedinseries.
7. Determination of efficiency of two solar cells/modules connected in parallel.
8. Study the effect of input intensity on the performance of solar cell /module.
9. Study the influence of cell /module temperature on the efficiency.
10. Study the effect of cell/ module inclination on the efficiency.

LAB REFERENCES:

1. SolarPhotovoltaic-Alabtrainingmanual,C.S.Solankietal.,FoundationBooks Publishers,2012.
2. Laboratory Manual on Solar thermal experiments, HPGarg, TCKandpal,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 bythe 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 Fieldwork/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.
7. Visitstonearbysolarthermalsystemaswellassolarphotovoltaicpowerstations, firms, research organizations etc.

	P.R. Government College (Autonomous) Kakinada	Program & Semester			
Course Code PH	**TITLE OF THE COURSE** **APPLICATIONS OF ELECTRICITY & ELECTRONICS** **(Skill Enhancement Course (Elective) -6C**	IIIYear B. Sc. Semester – V			
Teaching	Hours Allocated: 50,Max.marks 100 (**Theory**)	L	T	P	C
Pre-requisites	Basics of Electric field and potentials, Electro Magnetic Induction, Fraday's Law, Ampere's, Fleming Left Hand rule,	4	-	-	4

1. Knowledge on Resistors, Capacitors andInductors
2. Introduction to energy storagebatteries
3. Learning about various powersupplies

CourseOutcomes:

On Completion of the course, the students will be able to		**cognitive domain**
CO1	Identify various components present in Electricity &Electronics Laboratory... Acquire a critical knowledge of each component and its utility (like resistors, capacitors, inductors, power sources etc.)	Remembering& Understanding
CO2	Demonstrate skills of constructing simple electronic circuits consisting of basic circuit elements	Applying
CO3	Understand the need & Functionality of various DC &AC Power sources	Understanding
CO4	Comprehend the design, applications and practices of various electrical& Electronic devices and also their trouble shooting.	Analysing

Course with focus on Employability / Entrepreneurship / Skill Developmentmodules

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

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

1. IdentifyvariouscomponentspresentinElectricity&ElectronicsLaboratory.
2. Acquire a critical knowledge of each component and its utility (like resistors, capacitors, inductors, power sources etc.).
3. Demonstrateskillsofconstructingsimpleelectroniccircuitsconsistingof basic circuit elements.
4. Understand the need & Functionality of various DC&AC Power sources.
5. Comprehend the design, applications and practices of various electrical & Electronic devices and also their trouble shooting.

Syllabus:*(Total Hours:90includingTeaching, Lab, Field Training, Unit tests etc.)*

UNITI: Introduction To Passive Elements (10hrs.)

Passive and Active elements-Examples, **Resistor**-Types of Resistors, Color coding -Applications of a Resistor as a heating element in heaters and as a fuse element. **Capacitor**-Types of Capacitors, Color coding, Energy stored in a capacitor, Applications of Capacitor in power supplies, motors(Fans) etc.**, Inductor**-Types of Inductors, EMF induced in an Inductor, Applications of Inductor, Application of choke in a fan and in a radio tuning circuit, Series resonance circuit as a Radio tuning circuit.

UNITII: Power Sources (Batteries) (10hrs.)

Types of power sources – DC & AC sources, Different types of batteries, Rechargeable batteries– Leadacidbatteries,Ni-MHbatteries, Li-ion batteries, Li-PO batteries, Series, Parallel & Series-Parallel configuration of batteries, Constant Voltage source - Constant Current Source-Applications of Current sources & Voltage sources, SMPS used in computers.

UNITIII: Alternating Currents (10hrs)

A.C Power source-Generator, Construction and its working principle, Transformers-Construction and its working principle, Types of Transformers-Step-down and Step-up Transformers, Relation between primary turns and secondary turns of the transformer with emf.,Use of a Transformer in a regulated Power supplies, Single phase motor –working principle, Applications of motors(like water pump, fan etc.).

UNIT IV: Power Supplies (Skill Based) (10hrs.)

Working of a DC regulated power supply, Construction of a 5 volts regulated power supply, Designofastep-down(ex:220-12V)andstep-up(ex:120-240V)transformers-Simple Design of FM Radio circuit using LCR series resonance (tuning) circuit, Checkingthe output
voltage of a battery eliminator using a MultiMate.(Trouble shooting), Design ofa simple 5volts DC charger, Power supply forcomputers(SMPS)

UNIT V: Applications of Electromagnetic Induction (10hrs.) DC motor –Construction and operating principle, Calculation of power, voltage and current in a DC motor, Design of a simple Motor(for example Fan) with suitable turns ofcoil-DC generator-Construction, operating principle and EMF equation, Construction of a simple DC
generator, Difference between DC and AC generators

CO-POMapping:

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

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

REFERENCESBOOKS:

1. Grob'sBasicElectronicsbyMitchelSchultz,TMHorMcGrawHill
2. ElectronicandElectricalServicingbyIanRobertsonSinclair,JohnDunton,Elsevier Publications
3. TroubleshootingElectronicEquipmentbyR.S.Khandapur,TMH
4. Websourcessuggestedbytheteacherconcernedandthecollegelibrarianincluding reading material.

Weblinks:

- https://courses.edx.org/c4x/DelftX/ET.3034TU/asset/solar_energy_v1.1.pdfmodify
- https://www.sku.ac.ir/Datafiles/BookLibrary/45/John%20A.%20Duffie,%20William%20A.%20Beckman(auth.)Solar%20Engineering%20of%20Thermal%20Processes,%20Fourth%20Edition% 20(20 13).pdf

P.R.GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics – V SEM

APPLICATIONS OF ELECTRICITY & ELECTRONICS -6C

Question Bank:

UNIT-I

1. Explain Passive and Active elements
2. Define the terms Resistor, Capacitor and Inductor
3. Discuss about Applications of a Resistor as a heating element in heaters and as a fuse element
4. Describe the Applications of Capacitor in power supplies, motors
5. Define and explain Energy stored in a capacitor
6. Write about Series resonance circuit as a Radio tuning circuit
7. Explain Application of choke in a fan and in a radio tuning circuit

UNIT-II

1. Write the differences between AC and DC
2. Describe different types of AC & DC sources
3. Explain briefly about Rechargeable batteries i.e Lead acid batteries, Ni-MH batteries, Li-ion batteries- Li- PO batteries
4. Describe Series, Parallel & Series-Parallel configuration of batteries
5. Discuss about Constant Voltage source-Constant Current Source
6. What are the applications of Current sources & Voltage sources
7. Discuss about SMPS used in computers

UNIT-III

1. Draw and explain the working principle of a transformer
2. Describe construction and working principle of a Generator,
3. Distinguish between Step-up and Step-down transformers
4. Define emf? Explain relation between primary turns and secondary turns of the transformer
5. What is the use of a transformer in a regulated power supplies
6. Discuss about working principle of single phase motor
7. Write the Applications of motors

UNIT-IV

1. Discuss about working of a DC regulated power supply
2. Describe the construction of a 5 volts regulated power supply
3. Define FM? Describe simple design of FM Radio circuit using LCR series resonance (tuning)circuit
4. Explain about the design of a simple 5 volts DC charger
5. Write a short note on power supply for computers(SMPS)
6. Explain the design of a step-down (ex: 220-12V)transformer
7. How do you checking the output voltage of a battery eliminator using a Multi Meter (Troubleshooting)

UNIT-V

1. Discuss about
2. Describe the construction and operating principle of a DC motor
3. Define the terms (i) calculation of power (ii) voltage and (iii) current in a DC motor
4. Explain briefly about the design of a simple Motor (Fan) with suitable turns of coil
5. Explain the construction, operating principle and EMF equation of a DC generator
6. Write the differences between DC and AC generators

P.R.GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics – V SEM

APPLICATIONS OF ELECTRICITY & ELECTRONICS -6C
(Skill Enhancement Course (Elective)
w.e.f. 2020-21ADMITTED BATCH

MODEL PAPER

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

Time: 2 1/2 Hrs. Max. Marks: 60

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	12	5	60	6	5	30
TOTAL		18		120	9		60

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	2	2	-	30
II	1	2	-	20
III	1	2	1	25
IV	1	2	-	20
V	1	2	1	25
Total Marks				**120**

P.R.GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics – V SEM

APPLICATIONS OF ELECTRICITY & ELECTRONICS -6C
(Skill Enhancement Course (Elective)
w.e.f. 2020-21ADMITTED BATCH

MODEL PAPER

Time: 2½hrs **Max. Marks:60M**

SECTION-A

Answer **any Three** of the following questions 3 X 10= 30 Marks

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

SECTION-B

Answer **any Six** Questions from the following 6 X 5= 30 Marks

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

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code PH	**TITLE OF THE PRACTICAL -6C** **Applications of Electricity & Electronics Lab**	III Year B. Sc Semester – V			
Practical	Hours Allocated: 30 hrs, Max Marks: 50 (**Lab**)	L	T	P	C
Pre-requisites	Power supply, Transformers, Multimeter, Diode, Transistors, Digital and analog systems	-	-	2	1

PRACTICALSYLLABUS*(30hrs,MaxMarks:50)*

Learning Outcomes: On successful completion of this practical course, tudent shall be able to:

1. Listout, identify and handle various equipment in Electrical & Electronics laboratory.
2. Learn the procedures of designing simple electrical circuits.
3. Demonstrate skills on the utility of different electrical components and devices.
4. Acquire the skills regarding the operation, maintenance and trouble shooting of various Devices in the lab.
5. Understand the different applications of Electromagnetic induction.

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

1. Acquainting with the soldering techniques
2. DesignandConstructionofa5VoltsDCunregulatedpowersupply
3. ConstructionofaStepdownTransformerandmeasurementofitsoutputvoltage.And to compare it with the calculated value.
4. Connect two or three resistors or capacitors or inductors and measure the Series, Parallel Combination values using a Multimeter and compare the values with the Calculated values.
5. Use the Digital Multimeter and Analog Multimeter to measure the output voltage of an AC & DC power supply and also the voltage and frequency of a AC signal using CRO.
6. Use the Multimeter to check the functionality of a Diode and Transistor. Also test whether the given transistor is PNP or NPN.
7. Construct a series electric circuit with R, L and C having an AC source and study the frequency response of this circuit. Find the Resonance Frequency.
8. Construct a Parallel electric circuit with R, L & C having an AC source and study the frequency response of this circuit .Find the resonant frequency.
9. TestwhetheracircuitisaOpencircuitorShortCircuitbymeasuringcontinuitywitha Multimeter and record your readings.

Lab References:

1. LaboratoryManualforIntroductoryElectronicsExperimentsbyMaheshwari,L.K. Anand, M.M.S., New Age International (P) Ltd.
2. Electricity-ElectronicsFundamentals:AText-labManualbyPaulB.Zbar,JosephSloop, &Joseph G. Sloop , McGraw-Hill Education
3. LaboratoryManualBasicElectricalEngineeringbyUmeshAgarwal,NotionPress
4. BasicElectricalandElectronicsEngineeringbyS.K.Bhattacharya,Pearson

Publishers.

5. Web sources suggested by the teacher concerned.

Co-Curricular Activities:

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

1. **For Teacher**: Training of students by the teacher (if necessary, bya local expert) in laboratory/field for not less than15 hours on the understanding of various electronic &electrical components and devices. And also understand the functional knowledge of these components and devices so that the student can safely handle these electronic components.

2. **For Student**: Students shall (individually) visit a local Radio, TV or Mobile repair shop to understand the testing and soldering techniques and different electronic components in the devices that we use daily life. And also to understand the troubleshooting and working of domestic appliances such as cell phone chargers, fan, electric iron, heater, inverter, micro oven, washing machine etc.(Or)Students shall also visit the Physics/Electronics or Instrumentation Labs of nearby local institutions and can get additional knowledge by interacting with the technical people working there. (Or)Students shall also visit the local motor winding shop to understand the motor winding and working of different types of motors. After the observations, a hand- written Fieldwork/Project work not exceeding 10 pages in the given format to be submitted to the teacher.
3. Max. marks for Fieldwork/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 experts.
2. Assignments (including technical assignments like identifying various electrical and electroniccomponents&devicesandtheirhandling,operationaltechniqueswithsafety and security)
3. Seminars, Group discussions, Quiz, Debates etc.(on related topics).
4. Preparation of videos ontoolsand techniques in Electrical & Electronic Appliances in daily life.
5. CollectionofmaterialfiguresphotosrelatedtoElectricalproductslikeHeaters, Motors, Fans etc. and writing and organizing them in a systematic way in a file.
6. Visitstonearbyelectricalorelectronicindustriesorlaboratoriesinuniversities, research organizations, private firms, etc.
7. Invitedlecturesandpresentationsonrelatedtopicsbyfield/industrialexperts

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code PH	**TITLE OF THE COURSE -7C** ELECTRONIC INSTRUMENTATION **(Skill Enhancement Course (Elective)**	III Year B. Sc. Semester – V			
Teaching	Hours Allocated: 50,Max.marks 100 (**Theory**)	L	T	P	C
Pre-requisites	Direct current, Alternating currents, Resistors, Inductors, Capacitors, Ohm"s Law, Semiconductors, Diodes, Potential difference, Ultra sounds	4	-	-	4

Course Objectives

1. Need and Different types of microscopes

CourseOutcomes:

On Completion of the course, the students will be able to		cognitive domain
CO1	Identify various facilities required to set up a basic InstrumentationLaboratory.	Remembering
CO2	Acquire a critical knowledge of various Electrical Instruments used in theLaboratory	Understanding
CO3	Demonstrate skills of using instruments like CRO, Function Generator, Multimeter etc. through hands onexperience.	Applying
CO4	Comprehend the applications of various biomedical instruments in daily life like B.P. meter, ECG, Pulse oximeter etc. and know the handling procedures with safety and security..	Analysing

Course with focus on Employability / Entrepreneurship / Skill Developmentmodules

Skill Development		Employability		Entrepreneurship	

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

1. IdentifyvariousfacilitiesrequiredtosetupabasicInstrumentationLaboratory.
2. AcquireacriticalknowledgeofvariousElectricalInstrumentsusedintheLaboratory.
3. Demonstrate skills of using instruments like CRO, Function Generator, Multimeter etc. through hands on experience.
4. Understand the Principle and operation of different display devices used in the display systems and different transducers
5. Comprehend the applications of various biomedical instruments in daily life like B.P. meter, ECG, Pulse oxymeter etc. and know the handling procedures with safety and security.

Syllabus: *(TotalHours:90includingTeaching, Lab, Field Training, Unittestsetc.)*

UNIT I: INTRODUCTION TO INSTRUMENTS(10hrs)

Types of electronic Instruments-Analog instruments & Digital Instruments, DC Voltmeter and AC Voltmeter, Construction and working of an Analog Multimeter and Digital Multimeter (Block diagram approach),Sensitivity, 3½display and 4½ display Digital multimeters, Basic ideas on Function generator

UNIT II: OSCILLOSCOPE(10hrs)

Cathode Ray Oscilloscope-Introduction, Block diagram of basic CRO, Cathode ray tube, Electron gun assembly, Screen for CRT, Time base operation, Vertical deflection system, Horizontal deflection system, Use of CRO for the measurement of voltage (DC and DC), frequency, phase difference, Different types of oscilloscopes and their uses, Digital storage Oscilloscope

UNIT III: TRANSDUCER(10hrs)

Classification of transducers, Selection of transducers, Resistive, capacitive & inductive transducers, Resistive and capacitive touch screen transducer used in mobiles, Displacement transducer-LVDT, Piezoelectric transducer, Photo transducer, Digital transducer, Fibre optic sensors

UNIT IV: DISPLAY INSTRUMENTS (10hrs)

Introduction to Display devices, LED Displays, Seven Segment Displays, Construction and operation (Display of numbers),Types of SSDs(Common Anode &Common Cathode type), Limitations of SSDs, Liquid Crystal Displays, Principle and working of2x16display and 4x16 LCD modules, Applications of LCD modules.

UNIT V: BIOMEDICAL INSTRUMENTS (10hrs)

Basic operating principles and uses of (i) Clinical thermometer (ii) Stethoscope (iii) Sphygmomanometer (iv) ECG machine (v) Radiography (vi) Ophthalmoscope (vii) Ultrasound scanning (viii) Ventilator (ix) Pulse oxymeter (x) Glucometer, Basic ideas of CT scan and MRI scan

REFERENCEBOOKS:

1. Electronic Instrumentation by H.S.Kalsi,TMHPublishers
2. Electronic Instrument Hand Book by ClydeF.Coombs ,McGrawHill
3. Introduction to Biomedical Instrumentation by MandeepSingh,PHILearning.
4. Biomedical Instrumentation and Measurements by LeslieCromwell,PrenticeHallIndia.
5. Electronic Measurements and Instrumentation by Kishor,KLal,Pearson,NewDelhi
6. ElectricalandElectronicMeasurementsbySahan,A.K.,DhanpatRai,NewDelhi
7. Electronic Instruments and Measurement Techniques by Cooper, W.D. Halfrick, A.B.,PHI Learning, New Delhi
8. Web sources suggested by the teacher concerned and the college librarian including reading material.

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	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	2

P.R Government College (Autonomous) Kakinada
III B.Sc Physics – V SEM
7C: ELECTRONIC INSTRUMENTATION

MODEL PAPER

Time: 2½hrs **Max. Marks:60M**

Question Bank

UNIT-I

1. Discuss about construction and working of an Analog Multimeter with a Block diagram
2. Describe the construction and working of a Digital Multimeter with Block diagram
3. Define Voltmeter
4. Define sensitivity and how do you determine the sensitivity of an instrument
5. Differentiate between DC Voltmeter and AC Voltmeter
6. Explain about basic ideas on Function generator
7. Write a note on Analog instruments &Digital Instruments

UNIT-II

1. Draw the block diagram and explain the parts of a CRO
2. Write down the use of CRO for the measurement of voltage
3. Explain different types of oscilloscopes and their uses
4. How do you determine (i) frequency and (ii) phase difference in CRO
5. Discuss about Digital Storage Oscilloscope
6. Discuss about various functions of a CRO

UNIT-III

1. Explain about Resistive and capacitive touch screen transducer used in mobiles
2. Interpret the Selection of transducers
3. Write about transducer? Classify them
5. Write short notes on fibre optic sensors
6. Discuss about Piezoelectric transducer
7. Distinguish between Photo transducer, Digital transducer

UNIT-IV

1. What are display devices? Write down the types of display devices
2. Discuss about construction and operation LED displays
3. Describe the construction and operation of seven segment displays
4. Write about SSD? Mention the limitations of SSDs
5. Write about Liquid Crystal Displays and applications of LCD modules
6. Explain principle and working of 2x16 display and 4x16 LCD modules

UNIT-V

1. Discuss about basic operating principle and use of (i) Clinical thermometer (ii)Stethoscope
2. Describe the basic ideas of CT scan and MRI scan
3. Discuss about operating principle and use of Radiography
4. Explain about Ultrasound scanning and its uses
5. Explain the terms (i) Ventilator (ii) Pulse oxymeter (iii)Glucometer
6. How do you get the functioning of heart using ECG machine

P.R Government College (Autonomous) Kakinada

III B.Sc Physics – V SEM

7C: ELECTRONIC INSTRUMENTATION

MODEL PAPER

Time: 2½hrs **Max. Marks:60M**

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	12	5	60	6	5	30
TOTAL		18		120	9		60

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	2	2	-	30
II	1	2	-	20
III	1	2	1	25
IV	1	2	-	20
V	1	2	1	25
Total Marks				**120**

P.R Government College (Autonomous) Kakinada
III B.Sc Physics – V SEM
7C: ELECTRONIC INSTRUMENTATION

MODEL PAPER

Time: 2½hrs **Max. Marks:60M**

SECTION-A

Answer **any Three** of the following questions 3 X 10= 30 Marks

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

SECTION-B

Answer **any Six** Questions from the following 6 X 5= 30 Marks

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

	P.R Government College (Autonomous) Kakinada	Program & Semester			
Course Code PH	**TITLE OF THE PRACTICAL 7C** **Electronic Instrumentation Lab**	III Year B. Sc Semester – V			
Practical	Hours Allocated: 30 hrs, Max Marks: 50 (**Lab**)	L	T	P	C
Pre-requisites	Cathode Ray Oscilloscope, Diode ,Transistor,7 Segment display, thermometer, Blood pressure, ECG	-	-	2	1

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

1. List out, identify and handle various equipment in Instrumentation Laboratory or Electronic Laboratory.
2. Learn the construction, operational principles of various instruments.
3. Demonstrate skills on handling, Maintenance & trouble shooting of different instruments used in the Labs.
4. Acquireskillsinobservingandmeasuringvariouselectricalandelectronic quantities.
5. PerformsometechniquesrelatedtoBiomedicalInstrumentationandmeasurement of Certain physiological parameters like body temperature, B.P. and sugar levels etc.

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

1. Familiarisationofdigitalmultimeteranditsusageinthemeasurementsof(i)resistance (ii) current, (iii)AC & DC voltages and for (i)continuity test (ii) diode test and(iii) transistor test
2. Measure the AC and DC voltages, frequency using a CRO and compare the values Measured with other instruments like Digital multimeter.
3. Formation of Sine, Square wave signals on the CRO using Function Generator and measure their frequencies. Compare the measured values with actual values.
4. Display the numbers from 0 to 9 on a single Seven Segment Display module by Applying voltages.
5. Display the letters **a** to **h** on a single Seven Segment Display module by applying voltages.
6. Measurement of body temperature using a digital thermometer and list out the error and corrections.
7. Measurement of Blood Pressure of a person using a B.P. meter and record your values and analyze them.
8. Get acquainted with an available ECG machine and study the ECG pattern to understand the meaning of various peaks
9. ObserveandunderstandtheoperationofaDigitalPulseoxymeterandmeasurethe pulse rate of different people and understand the working of the meter.

LABREFERENCES:

1. ElectronicMeasurementandInstrumentationbyJ.P.Navani.,SChand&CoLtd
2. Principles of Electronic Instrumentation by A De Sa, Elsevier SciencePubl.
3. Electronic Measurements and Instrumentation byS.P.Bihari, YogitaKumari, Dr. Vinay Kakka, Vayu Education of India .
4. LaboratoryManualForIntroductoryElectronicsExperimentsbyMaheshwari,New Age International (P) Ltd., Publishers.

5. Electricity-ElectronicsFundamentals:AText-labManualbyPaulB.Zbar,Joseph Sloop, & Joseph G. Sloop, McGraw-Hill Education.
6. Web sources suggested by the teacher concerned.

Co-Curricular Activities

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

1. **ForTeacher**:Trainingofstudentsbytheteacherintheinthelaboratory/fieldfornot less than 15 hours on the field techniques/skills of understanding the operation, Maintenance and utility of various electrical and electronic instruments both in the Laboratory as well as in daily life.

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

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

(b)Suggested Co-Curricular Activities

1. Training of students by related industrial /technical experts.
2. Assignments (including technical assignments like identifying different measuring instruments and tools and their handling, operational techniques with safety and security.
3. Seminars, Group discussions, Quiz, Debates etc.(on related topics).
4. Making your own stethoscope at home.
5. Making seven segment display at home.
6. Preparationofvideosontoolsandtechniquesinvariousbranchesofinstrumentation.
7. Collectionofmaterial/figures/photosrelatedtoproductsofMeasuringInstruments, Display Modules and Biomedical Instruments and arrange them in a systematic way in a file.
8. Visits to Instrumentation Laboratories of local Universities or Industries like Cement, Chemical or Sugar Plants etc. or any nearby research organizations, private firms, etc.
9. InvitedlecturesandpresentationsonrelatedtopicsbyTechnical/industrialexperts

P .R . GOVT. COLLEGE (A), KAKINADA

LIST OF EXAMINERS/ PAPER SETTERS IN PHYSICS
2022-2023

S.No.	Name of the examiner	Subject	Name of the College
1	L.MalleswaraRao 9985137973	Physics	Y.N.College, Narsapur
2.	Dr.A.NirmalaJyotsna 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.Ramesh	Physics	C.R.R. College (M),Eluru
6	K.B.S.Gopal	Physics	C.R.R. College (M),Eluru
7	P.P.Divakar	Physics	Y.V.N.R. GDC, Kaikaluru.
8	R.SuryanarayanaRaju	Physics	K.G.R.L.College , Bhimavaram
9	Smt.V.Vidyamallika	Physics	K.G.R.L.College , Bhimavaram
10	P.Rajyalakshmi	Physics	C.R.R. College (W), Eluru
11	K.Sireesha	Physics	C.R.R. College (W), Eluru
12	M.Jayalakshmi Devi	Physics	C.R.R. College (W), Eluru
13	N.S.Satyanarayana Murthy	Physics	S.K.B.R.College, Amalapuram
14	K.Nagavarma	Physics	S.K.B.R.College, Amalapuram
15	V.V.SubbaRao	Physics	S.K.B.R.College, Amalapuram
16	J.PrabhakaraRao	Physics	S.K.B.R.College, Amalapuram
17	S.V.KumaraSastry	Physics	S.K.B.R.College, Amalapuram
18	V.Radha Krishna	Physics	S.K.B.R.College, Amalapuram
19	K.SrinivasaRao	Physics	Govt. Deg.College,Razole
20	ValluriSrinivasaRao	Physics	Govt. College (W) Nidadavolu
21	T.K.VisweswaraRao	Physics	Govt. College (A),Rajahmundry
22	E.NageswaraRao	Physics	Govt. College, Eleswaram
23	EsubBasha Sheik	Physics	Govt. College (A), RJY
24	P.S. Brahamachari	Physics	Govt. College , Tadepalligudem
25	K.Ganesh Kumar	Physics	Govt. College , Tadepalligudem
26	P. V. L.Narayana	Physics	GDC Tanuku
27	M.Sudhadhar	Physics	Govt. College (A), RJY
28	B.DurgaLakshmi	Physics	Govt. College (A), RJY
29	T.Y.H.A.G.Gandhi	Physics	Govt. College , Ravulupalem

30	A.P.V. AppaRao	Physics	Y.N. College (A), Narasapur
31	J. Rammohan	Physics	Y.N. College (A), Narasapur
32	P. Rama Krishna Rao	Physics	Y.N. College (A), Narasapur
33	D. Gangadharudu	Physics	M.R. College, Peddapuram
34	A.Satyanarayana Murthy	Physics	M.R. College, Peddapuram
35	N. Veer Kumar	Physics	M.R. College, Peddapuram
36	N. Sridhar	Physics	M.R. College, Peddapuram
37	S. Rama Rao	Physics	M.R. College, Peddapuram
38	K.G. KrishnamRaju	Physics	D.N.R. College (A), Bhimavaram
39	S. VenkataRaju	Physics	D.N.R. College (A), Bhimavaram
40	Smt. M. Satyavani	Physics	D.N.R. College (A), Bhimavaram
41	M.V.S. Prasad	Physics	D.N.R. College (A), Bhimavaram
42	Smt. N. Udaya Sri	Physics	D.N.R. College (A), Bhimavaram
43	A. Veeraiah	Physics	D.N.R. College (A), Bhimavaram
44	N. Srinivasarao	Physics	Govt. College , Tadepalligudem
45	K.Srinivasa Rao	Physics	GDC, Mandapeta

P.R. GOVERNMENT COLLEGE (A), KAKINADA

DEPARTMENT OF PHYSICS & ELECTRONICS

Particulars of Work Load for the Ac. Year 2022-23

Name of the Subject : PHYSICS
Total No. of Hours : **156**
No. of Permanent posts sanctioned : **09**
No. of Permanent staff working : **07 (R) + 02 (C)**

S. No	Strength	Name of the class	Theory hours/Wk	Practical Hours	No. of Batches	Total Practical Hours	Total hrs.(Theory + Practical)
1	45	I MPC EM (1)	4	2	3	6	10
2	45	I MPC EM (2)	4	2	3	6	10
3	30	I MPE	4	2	2	4	8
4	30	I MPCS	4	2	2	4	8
5	45	II MPC EM (1)	4	2	3	6	10
6	45	II MPC EM(2)	4	2	3	6	10
7	30	II MPE	4	2	2	4	8
8	30	II MPCS	4	2	2	4	8
9	60	III MPC TM Sem V Paper VI	4	2	4	8	12
10	60	III MPC TM Sem V Paper VII	4	2	4	8	12
11	30	III MPC EM Sem V Paper VI	4	2	2	6	10
12	30	III MPC EM Sem V Paper VII	4	2	2	6	10
13	30	III MPE Sem V Paper VI	4	2	2	6	10
14	30	III MPE Sem V Paper VII	4	2	2	6	10
15	30	III MPCS Sem V Paper VI	4	2	2	6	10
16	30	III MPCS Sem V Paper VII	4	2	2	6	10
		Total Work load for the Department of PHYSICS					**156**

Consolidated Work Load for the Academic Year 2022-23

Group	Work Load	Staff Required
Physics	156	9
Electronics	120	6
M Sc	72	4
Total Work Load	**348**	**19**

P. R. GOVERNMENT COLLEGE (A), KAKINADA

Department of Physics & Electronics

Action Plan - 2022-23

The department of Physics and Electronics is planning to conduct the following programs for the academic year 2022-23

S.No.	Activity	Probable date to be conducted	Remarks
1	Post admission test, Student Counseling Discussion on Result Analysis	Oct3th week	
2	Sensitization on Departmental Activities particularly on Kasarabada Scholarship and Endowment Prizes	Oct4th week	
3	**Parent -Teacher meeting**	Nov 1st week	
4	Disbursement of Kasarabada Scholarship both for UG and PG	Nov 2nd week	
5	Celebration of Birth day of Sir C.V.Raman	7.11.2022	
6	Guest Lecture -1	Nov3rdweek	
7	Launching Upkar Scheme	Nov4thweek	
8	Extension activity - **Open Lab for School students**	Dec 2nd week	
9	Awareness programme on IMD	Dec3rd week	
10	Guest Lecture -2	Jan 3rd week	
11	Study Area Programme / CSP	Jan4th week	
12	Workshop / Intercollegiate Science Competitions	February 2nd week	
13	**National Science day celebrations**	**28.02.2023**	
14	Student Counseling before commencement of semester end exams	Feb 4th week	
15	Guest Lecture - 3	Mar 2nd week	
16	Parent Teacher Meeting	April 1st week	
17	Online Quiz programme	May 1st week	
18	Field visit	Jun 2nd week	

19	Guest Lecture - 4	July 1st week	
20	Observing World Chess Day	20.07.2023	
21	Parent Teacher Meeting	Aug 1stweek	
22	Observing Hiroshima/ Nagasaki Day	6.8.2023/ 9.08.2023	
23	UPKAR scheme – Disbursement of scholarships to the students	August 3rd week	
24	Observing World Ozone Day	16.09.2023	

P. R. GOVERNMENT COLLEGE (A), KAKINADA

Department of Physics & Electronics

Budget Proposal for the Academic Year 2022-23

S.No.	PURPOSE	EXPENDITURE ESTIMATED	REMARKS
1.	Upgradation of 1st year Lab	Rs. 50,000=00	
2.	Upgradation of 2nd year Lab and dark room	Rs. 50,000=00	
3.	Upgradation of final year Lab	Rs. 50,000=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. 2,00,000=00	
8.	Departmental Activities @ National Sc.Day, Guest Lectures, Intercollegiate competitions	Rs.1,00,000=00	
9.	Miscellaneous @ Stationery, Maintenance of Laboratories etc.	Rs. 50,000=00	
	TOTAL:	Rs. 10,00,000=00	

Budget Estimated is Rupees Ten Lakhs only.

BOS CERTIFICATION

P. R. GOVERNMENT COLLEGE (A), KAKINADA

Department of Physics & Electronics

This is to certify that the proposed agenda of board of studies meeting held in Department of Physics& Electronics on 31 -10-2022, for the Academic Year 2022-23 have been discussed and approved by the board members unanimously. The valuable suggestions have been adopted for effective implementation of Curricular/Co-curricular and Research activities for the academic year 2022-23.

- Syllabi regarding all semesters of B.Sc program.
- Following the scheme of evaluation for CIA&SEE for all the semesters I-V of I,II &III B.Sc. Programs.
- Following the allocation of Credits for all the semesters of B.Sc. Programme
- Offering one "Community Service Project" as a credit course to I year students, one skill enhancement course as a credit course for II year and internship for III year before completion of the course during summer vacation in either V or VI semester.
- Certificate courses offered by the Department of Physics& Electronics
- List of Examiners
- Departmental action plan for the academic year 2022-23.
- Budget proposal for the academic year 2022-23.

S.No.	Members of Board of Studies		Signature
1	Sri U.V.B.B. Krishna Prasad; HoD	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	31/10/2022

4	Sri K.VenkateswaraRao	Subject Expert, Lec.in charge/ Phy/A.S.D. Degree College (W), Kakinada.	K. Venkat 31/1/22
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	K Nanda Gopal
7	Ms. M. Surekha	Member	M. Surekha
8	Dr. K.Jayadev	Member	
9	Ms. G. Sridevi	Member	
10	Ms.. A. Padmavathi	Member	A. Padma
11	Dr.SVGVA Prasad	Member	SVGVA Prasad
12	Sri P.Himakar	Member	P. Hima
13	Sri B.Srikanth	Member	B. Srikanth
14	Sri K. Durga Rao	Member	K. Durga
15	Mr.G.John,II MPCTM	Student Member	G. John.
16	Kum. A.Rani, II MPCs	Student Member	M. Rani
17	Kum.U.S.K.Mahalakshmi I B.Sc MPC(EM)	Student Member	U.S.K. Mahalakshmi
18	Kum.P.Satwika, IMPCs	Student Member	P. Sathwika