SYLLABUS

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS),
SIVAKASI – 626 123.

(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade by NAAC,
College with Potential for Excellence by UGC and Mentor Institution under UGC PARAMARSH)

DEPARTMENT OF PHYSICS

SYLLABUS

2017 AND LATER

THE STANDARD FIREWORKS RAJARATNAM

COLLEGE FOR WOMEN (AUTONOMOUS)

(Reaccredited with 'A' Grade by NAAC and
College with Potential for Excellence by UGC)

SIVAKASI – 626 123

Affiliated to Madurai Kamaraj University, Madurai

REVISED

Programme Scheme, Scheme of Examination and Syllabi

(With effect from June 2017)

DEPARTMENT OF PHYSICS

UG PROGRAMME

Curriculum Design & Development Cell

CHAIRMAN OF THE BOARD	DEAN CDDC	DEAN ACADEMIC AFFAIRS	COE
	B. (B. DEEPA)	CDAU 15/07/19	E. Ponnaian 25/7/19

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI – 626 123.
(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade by NAAC and College with Potential for Excellence by UGC)

DEPARTMENT OF PHYSICS

Vision and Mission of the Department

Vision:

- To stimulate the interest of the students in Physics and lay a strong foundation in the subjects, to motivate them towards research and render them competent and socially committed.

Mission:

- To design a relevant curriculum to suit the growing trends of technology.
- To train the students to apply laboratory skills.
- To develop the potentials of the students for independent thinking and creativity through project work.
- To promote collaborative research culture.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI – 626 123.

(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade by NAAC and College with Potential for Excellence by UGC)

DEPARTMENT OF PHYSICS

UG DEGREE PROGRAMME IN PHYSICS

GUIDELINES FOR OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

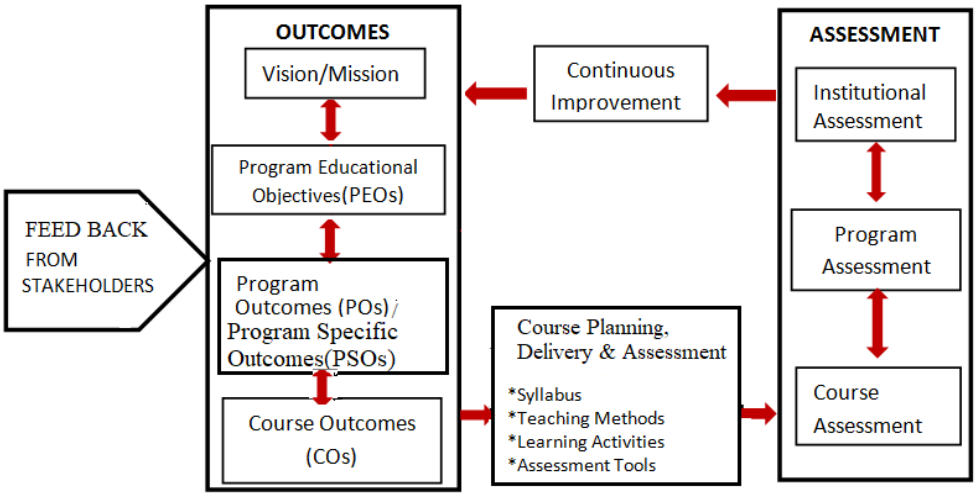
(For those admitted in June 2017 and later)

I. A. PREAMBLE

The institutional vision is to emerge as a premier institution offering need-based, value conscious and career-oriented quality education to empower rural women with communicative competency and employment potential. With the advent of Autonomy in the year 2005, Choice Based Credit System (CBCS) is followed and it offers much flexibility to innovate and design the contents of each programme and align it with the institutional mission. Quality assurance developments in higher education have encouraged us to move towards outcomes-based approach to teaching, learning and assessment. Programme specifications define the students in terms of what they can do at the end of a programme or a particular level of study. This is a change from the more traditional approach where teachers tended to define courses in terms of what is taught, rather than what the student can do at the end of the course or programme. More directed and coherent curriculum, "more relevant" Graduates to industry and other stakeholders and Continuous Quality Improvement (CQI) are the benefits of OBE.

A student-centered paradigm in higher education entails a shift from a more input-oriented curricular design based on the description of course content, to outcomes-based education in which the course content is developed in terms of learning outcomes. The implementation of **Outcome Based Education with CBCS** as per the UGC guidelines from the academic year 2019-2020 will definitely mark a paradigm shift from traditional education.

B. OUTCOME BASED EDUCATION (OBE) FRAMEWORK



C. PROGRAMME EDUCATIONAL OBJECTIVES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Programme Educational Objectives (PEOs):

PEOs are broad statements that describe the career and professional achievements that the programme is preparing the graduates to achieve within the first few years after graduation. PEOs should be consistent with the mission of the Institution. PEO's can be measured by a PO-PEO matrix. The PEO's should evolve through constant feedback from alumnae, students, industry, management etc,. It is mandatory that each PEO should be mapped to atleast one of the POs.

The Graduates will

PEO1: take up careers as educationalist, researcher, technical specialist and pursue higher studies in related fields including teaching and management.

PEO2: explore physical systems through theoretical models, experiments and communicate findings of the scientific work.

PEO3: become self employed in technical fields and consultancy services.

PEO4: posses moral responsibility to be self disciplined, socially concerned and environment friendly individuals.

Programme Outcomes (PO):

Programme Outcomes are narrower statements that describe what students are expected to know and be able to do upon the graduation. These relate to the skills, knowledge and behaviour that students acquire in their study through the programmes.

PO1: Disciplinary knowledge

Apply the knowledge of Arts, Science and Humanities to address fundamental and complex questions appropriate to their programmes.

PO2: Critical thinking, Problem solving and Analytical reasoning

Make use of appropriate knowledge and skills to identify, formulate, analyze and solve problems in order to reach substantiated conclusions.

PO3: Research related skills and scientific reasoning

Critically analyze research processes, products and practices with a view of strategic use of data in their field.

PO4: Communication skills and Digital literacy

Demonstrate skills in oral and written communication and make use of ICT in various learning ambience.

PO5: Team work and Leadership quality

Interact productively with people from diverse backgrounds as both leaders/mentors and team members with integrity and professionalism.

PO6: Multicultural competence with Moral and ethical awareness

Defend the society against gender and environmental issues with moral and ethical awareness.

PO7: Self-directed and Life-long learning

Formulate their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

Programme Specific Outcomes (PSO):

Programme Specific Outcomes denote what the students should be able to do at the time of graduation. They are programme specific. It is mandatory that each PO should be mapped to the respective PSO specified in the programme in order.

By the completion of the UG Physics programme, the learners will be able to

PSO1: elucidate and demonstrate the fundamental principles and concepts of physics which include optics, mechanism, electricity, electromagnetism, thermodynamics, digital electronics, wave mechanics etc.

PSO2: collect, analyze data critically and interpret the results to achieve valid conclusions.

PSO3: explore systematically the physical phenomenon by solving problems and performing projects and justify their report scientifically

PSO4: communicate physics concepts, processes and results both in verbal and written form effectively using ICT tools.

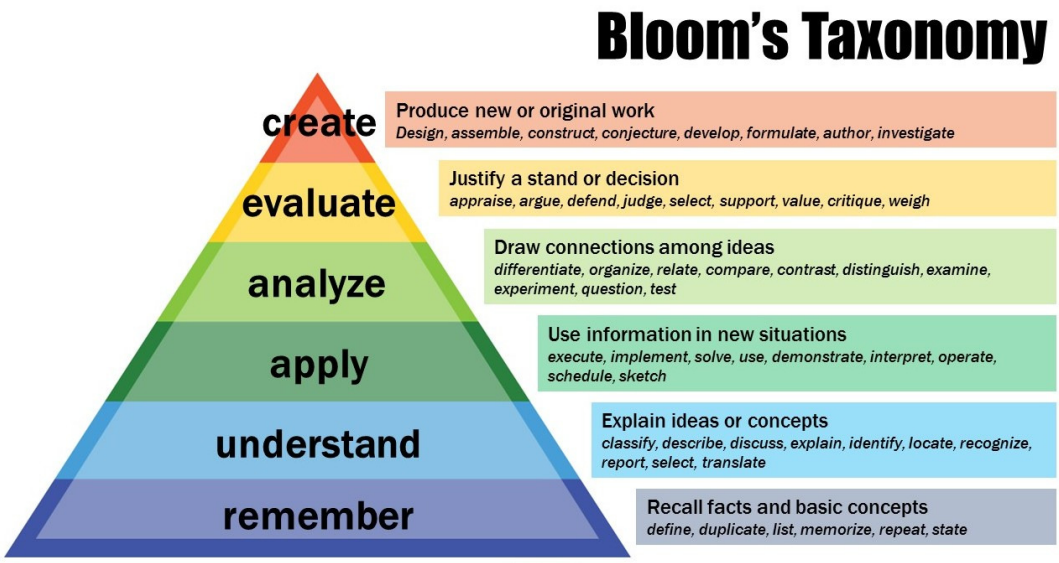
PSO5: plan with team members, execute experiments, investigate the experimental results and prepare the documentation for the findings

PSO6: project the true results of scientific findings and conscientious attempt to describe the physical phenomena accurately, without bias and any hyperbole

PSO7: adapt to changes in technology by means of self directed and lifelong learning in various fields like biopolymers, thin films, crystal growth, nanotechnology, fuel cell etc.

BLOOM'S TAXONOMY:

Bloom's Taxonomy was created in 1956 by an educational psychologist Dr. Benjamin Bloom in order to promote higher forms of thinking in education, such as analyzing and evaluating concepts, processes, procedures, and principles, rather than just remembering facts. It is most often used when designing educational, training, and learning processes.



The K-levels mentioned in the diagram are usually denoted as [k1] to [k6] respectively from the bottom.

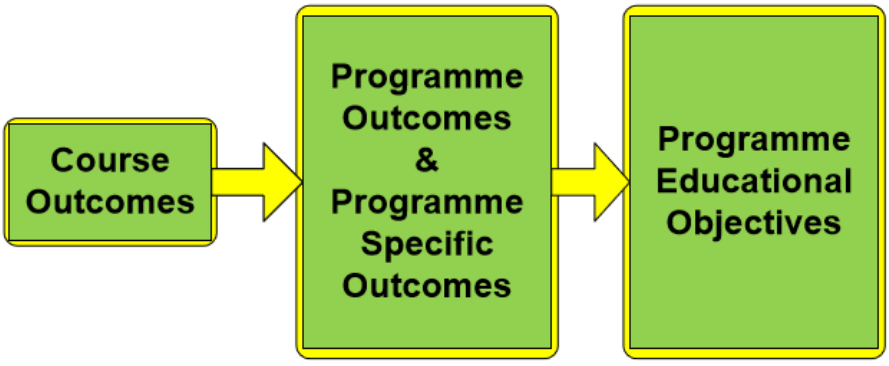
Course Outcomes (CO):

Course Outcomes are narrower statements that describe what students are expected to know and be able to do at the end of each course. These relate to the skills, knowledge, and behaviour that students acquire in their study through the course. Each course comprises five COs and the keywords used to define COs are based on Bloom's Taxonomy [k1] to [k6].

On successful completion of the course, the learners should be able to

CO1: [k1] / [k2]
CO2: [k3]
CO3: [k4]
CO4: [k5]
CO5: [k6]

D. CO-PO &PO-PEO relationship:



E. CO – PO MAPPING OF COURSES:

After CO statements are developed by the course in-charge, COs will be mapped with any possible POs based on the relationship exist between them. A CO must be mapped to atleast one PO. The PO's which are not related to any of the COs in a particular course may be left blank. All the courses together must cover all the POs. The CO-PO matrix for a course is as shown below.

The correlation between COs and PO can be defined by three levels using the Letter Grades H, M, L which denotes respectively High (H), Medium (M), Low (L) and '-' for no correlation.

The concept of Six Sigma is used for calculating weighted percentage of contribution of each course in attainment of respective POs. As per Six Sigma Tool- Cause and Effect Matrix, the weightage of H, M and L are 9, 3 and 1 respectively.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1							
CO2							
CO3							
CO4							
CO5							
Weightage of the course							
Weighted percentage of Course contribution to POs							

The levels of contribution are denoted by Grades and weightages H-High (9), M-Medium (3), L-Low (1)

Weighted percentage of Contribution of the Course in attainment of PO1= Weightage of the course / Total weightage of all courses contributing PO1 computed based on correlation between COs and POs X 100

Programme Articulation Matrix (PAM):

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Total Weightage of all courses contributing to POs								

PO-PEO Mapping Matrix:

PEOs / POs	PEO1	PEO2	PEO3	PEO4
PO1	**X**	**X**	**X**	
PO2	**X**	**X**		
PO3	**X**	**X**		
PO4	**X**		**X**	
PO5	**X**		**X**	**X**
PO6			**X**	**X**
PO7		**X**		

(Mark X to map a PO to a PEO)

F. MEASUREMENT OF ATTAINMENT OF DESIRED GOALS:

Course Outcome (CO) is measured through the performance of students by the various assessment tools adopted for that particular course. Each evaluation tool is mapped to a particular verb in Bloom's Taxonomy and further each verb is mapped to a particular CO. Once the Course Outcome is measured, the PO can be measured using a CO-PO matrix.

Measurement of PO attainment shall be done by direct and indirect methods. Direct assessment method and indirect assessment method are considered for 80% and 20% weightages respectively. Target levels of attainment shall be fixed by the Course teacher and Heads of the respective departments.

Direct assessments (rubric based) - Conventional assessment tools such as Term Test, Quiz, Seminar, Assignment and End Semester Examination.

Indirect assessments – Course Survey, Graduate Exit Survey, Feedback from Alumnae, Employer and Parents.

G. ASSESSMENT PROCESS:

Assessment is one or more processes carried out by the institution that identify, collect and prepare data to evaluate the achievement of course outcomes and programme outcomes.

Assessment Process for CO Attainment:

For the evaluation and assessment of CO's and PO's, rubrics are used.

(i) **CO Assessment Rubrics:**

Course Outcome is evaluated based on the performance of students in the Continuous Internal Assessments and in End Semester Examination of a course. Internal assessment contributes 25% and End Semester assessment contributes 75% to the total attainment of a CO.

(ii) **CO Assessment Tools:**

The description of Assessment tools used for the evaluation of COs and POs is given below.

Mode of Assessment	Assessment Tool	Description	Evaluation of Course Outcomes	Related POs
Direct (Weightage 80%)	**Theory Courses- Internal Assessment (Weightage 25%)**			
	Theory-Term Test	Three written examinations are conducted and average of best two is considered	The questions in the three Term Tests, Quiz and Assignment are framed in such a way that they cover all the COs of respective course. The final attainment for each CO under direct assessment is calculated by taking average of the CO attainments from Term Tests, Assignment and Quiz.	PO1 to PO7
	Assignment	One Assignment is given per course		
	Quiz/Seminar	One Quiz/Seminar is conducted for each course		
	Theory Courses- External Assessment (Weightage 75%)			
	End Semester Examination	Examination at the end of the course of 3- hour duration	It covers the entire syllabus of the course. It would generally satisfy all course outcomes for a particular course. The COs are evaluated based on the set attainment levels.	PO1 to PO7
	Practical Courses - Internal Assessment (Weightage 40%)			
	Observation	Day to day evaluation	Lab exercises are planned to cover all COs and CO attainment is calculated.	PO1 to PO7
	Model Practical	Model Exam is conducted		

	Examination	for each lab course.		
	Practical Courses - External Assessment (Weightage 60%)			
	End Semester Practical Examination	Examination at the end of the course of 3- hour duration	The final attainment for each CO under direct assessment is calculated by taking average of the CO attainments in Observation, Model Practicals and End Semester Practical Examination	PO1 to PO7
Indirect (Weightage 20%)	Course Survey	This survey gives the opinion of the students on attainment of Course Outcomes	At the end of each course an exit survey is collected from the students and Considered for the CO attainment under Indirect assessment	PO1 to PO7

(iii) **CO Attainment:**

Direct CO Attainment:

Course outcomes of all courses are assessed and the CO wise marks obtained by all the students are recorded for all the assessment tools mentioned above. The respective CO attainment level is evaluated based on set attainment rubrics.

Attainment Levels of COs

Assessment Methods	Attainment Levels	
Internal Assessment	Level 1	60% of students scoring more than average marks or set target marks in internal assessment tools
	Level 2	70% of students scoring more than average marks or set target marks in internal assessment tools
	Level 3	75% of students scoring more than average marks or set target marks in internal assessment tools
End Semester Examination	Level 1	60% of students scoring more than average marks or set target marks in End Semester Examination
	Level 2	70% of students scoring more than average marks or set target marks in End Semester Examination
	Level 3	75% of students scoring more than average marks or set target marks in End Semester Examination

Target setting for Assessment method:

For setting up the target of internal assessment tools, the average of last three tests must be taken into consideration and it should be kept as target. If the average marks are not available then current average can also be used as target.

For setting up the target of End Semester Examination, the average of the last year examination shall be set as target. If the average marks are not available then current average can also be used as target.

Formula for Attainment for each CO:

Attainment = Percentage of students who have scored more than the target marks

$$\% \text{ of Attainment } = \frac{\text{Number of students who scored more than the target}}{\text{Total number of students}} * 100$$

- Internal Attainment is the average of attainments obtained using various internal assessment tools.
- For Theory Courses,
  Direct CO Attainment =25% of internal attainment + 75% of End Semester attainment

- For Practical Courses,
  Direct CO Attainment =40% of internal attainment + 60% of End Semester attainment

Indirect CO Attainment:

At the end of each course, an exit survey is collected from the students and it gives the opinion of the students on attainment of Course Outcomes. A questionnaire is designed to reflect the views of the students about the attainment of course outcomes.

Overall CO Attainment = 80% of Direct CO Attainment + 20% of Indirect CO Attainment

In each course, the level of attainment of each CO is compared with the predefined targets, if the target is not reached, the course teacher takes necessary steps for the improvement to reach the target.

If the average attainment of a particular course for two consecutive years is greater than 80% of the maximum attainment value (i.e. 80% of 3 = 2.4), then for that particular course the current rubrics for attainment must be changed to analyze continuous improvement.

II. ASSESSMENT PROCESS FOR OVERALL PO ATTAINMENT

With the help of CO against PO mapping, the PO attainment is calculated. PO assessment is done by giving 80% weightage to direct assessment and 20% weightage to indirect assessment. Direct assessment is based on CO attainment, where 75% weightage is given to attainment through End Semester examination and 25% weightage is given to

attainment through internal assessments. Indirect assessment is done through Graduate exit survey.

PO Assessment Tools

Mode of Assessment	Assessment Tool	Description
Direct Attainment (Weightage 80%)	CO Assessment	This is computed from the calculated CO Attainment value for each Course
Indirect Attainment (Weightage 20%)	Graduate Exit survey	At the end of the programme, Graduate Exit Survey is collected from the graduates and it gives the opinion of the graduates on attainment of Programme Outcomes

Direct Attainment of POs for all Courses

At the end of the each programme, the direct PO assessment is done from the CO attainment of all courses. The direct PO attainment for a particular course is determined from the attainment values obtained for each course outcome related to that PO and the CO-PO mapping values. For the evaluation and assessment of CO's and PO's, the same set of rubrics is used.

Programme Articulation Matrix (PAM):

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Average Direct PO Attainment								
Direct PO Attainment in %								

Indirect Attainment of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Graduate Exit survey							
Indirect PO Attainment							

Indirect PO Attainment = 20% of PO Attainment from Graduate Exit survey

Attainments of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Direct Attainment (Weightage 80%)							
Indirect Attainment (Weightage 20%)							
Overall PO Attainment							

Overall PO Attainment = 80% of Direct PO Attainment + 20% of Indirect PO Attainment

III. ASSESSMENT PROCESS FOR PROGRAMME EDUCATIONAL OBJECTIVES

The curriculum is designed so that all courses contribute to the achievement of PEOs. The marks secured by the students in these courses indicate the level of achievement of the PEOs. In addition, Alumnae survey, Placements of students and progression to higher studies also contribute to the attainment of PEOs.

Type of Assessment	Assessment Tool	Assessment criteria	Data collection frequency	Responsible entity	Indicators for Attainment of PEO
Direct Weightage 70%	PO Assessment	This is computed from the calculated PO Attainment values for each Course			PEO-1 PEO-2 PEO-3 PEO-4
Indirect Weightage 30%	Alumnae Survey Weightage 10%	Once in a year, Alumnae Survey is collected from the alumnae and it gives the opinion of the alumnae on attainment of Programme Outcomes and their achievements			PEO-1 PEO-2 PEO-3 PEO-4
	Placement Record Weightage 10%	Number of students Placed	Once in a year	Placement cell	PEO-1 PEO-2 PEO-3 PEO-4
	Higher Education Weightage 10%	Number of students opted for higher education	Once in a year	Department	PEO-1 PEO-2 PEO-3 PEO-4

The attainment of the PEOs

Direct Evaluation of Programme Outcomes (POs) of the concerned PEO

POs	PEO1	PEO2	PEO3	PEO4
PO1				
PO2				
PO3				
PO4				
PO5				
PO6				
PO7				
Average Direct PEO Attainment in %				
Total Direct PEO Attainment				

Indirect Attainment of PEOs

PEOs	PEO1	PEO2	PEO3	PEO4
Alumnae Survey				
Average PEO Attainment from Alumnae Survey				

$$\% \text{ of Indirect Attainment from placement } = \frac{\text{Number of students who have got placement}}{\text{Total number of students}} * 100$$

$$\% \text{ of Indirect Attainment from higher studies } = \frac{\text{Number of students who pursue higher studies}}{\text{Total number of students}} * 100$$

Indirect PEO Attainment = 10% attainment of Alumnae survey + 10% Attainment from placement+ 10 % Attainment from higher studies

Overall PEO Attainment = 70% of Direct PEO Attainment+ Indirect PEO Attainment
Expected Level of Attainment for each of the Programme Educational Objectives

PEO	Level of Attainment
Value >=70%	Excellent
Value > = 60 and value < 70	Very good
Value > = 50 and value < 60	Good
Value > = 40 and value < 50	Satisfactory
Value < 40	Not Satisfactory

Level of PEO attainment

Graduation Batch	Overall PEO Attainment	Whether Expected level of PEO is achieved?

Process of Redefining the PEOs:

The college has always been involving the key stake holders in collecting information and suggestions with regard to curriculum development and curriculum revision. Based on the information collected the objectives of the programme are defined, refined and are inscribed in the form of PEO's. The level of attainment of PEO's defined earlier will be analyzed and will identify the need for redefining PEOs. Based on identified changes in terms of curriculum, regulations and PEOs, the administrative system like BOS, Academic Council and Governing Body involve appropriate actions.

IV. Eligibility condition for admission:

1. For admission to Under Graduate Programmes (U.G) a candidate must have passed the Higher Secondary Examination of Tamil Nadu or an examination (like the CBSE) recognized by the universities as equivalent there to who have opted Group I in Plus Two with the following subjects in part III Physics (200), Mathematics (200), Chemistry (200), Biology/Computer Science (200).

2. Based on the rank list prepared for a total of 800 marks in the above subjects and subject to the norms as specified by the Government, admission will be made.

3. The upper age limit for admission to U.G. Programmes will be 21 (twenty one) years as on 1st July of the year of admission. For SC/ST/BC/MBC/DNC candidates and women candidates, the age limit is relaxed by 3 years. In the case of candidates selected under merit the upper age limit may be relaxed by the Principal. A relaxation of 5 years is permitted for physically handicapped as per G.O.Ms.No.239, dated 3-9-93.

V. Duration of the Programme:

The duration of the programme is three academic years. Each Academic Year consists of two semesters. The duration of a semester is 90 working days.

VI. Attendance:

The Rules regarding the attendance for regular classes for the candidates to appear for the End Semester examinations are framed as given below:

a) Each student must put in a minimum attendance of 68 days (75% of 90 days per semester) so as to become eligible to appear for the End Semester Examinations.

Shortage of attendance:

b) Those students with an attendance of 67 days and less but 59 days (65%) and above, can be permitted to appear for the End Semester Examinations provided, they get the condonation certificate from the Principal stating the proper reasons for the absence, within 5 days after the last working day of the concerned class. The Certificate may be obtained from the office on payment of penalty as per Madurai Kamaraj University norms.

c) In case of attendance with 58 days and less but 45 days (50%) and above, the students cannot appear for the End Semester Examinations of that semester but can appear for the next End Semester Examinations by obtaining special permission from the Principal providing necessary documents supporting the reasons for absence on payment of penalty as per Madurai Kamaraj University norms.

d) Students with an attendance of 44 days and less should repeat the whole semester.

Attendance for Part V

A student of the first or second year undergraduate class should put in a minimum attendance of 75% for each semester (Total No. of hours as fixed by the concerned Officers / Staff in-charge) in anyone of the Co-Curricular activities namely NCC/ NSS/ Physical Education/ Extension Activities/ Youth Red Cross/ Social Service League/ Red Ribbon Club / Citizen Consumer Club/ Environmental Club to be eligible to get the degree.

In case of shortage of attendance, the student has to complete the required attendance before the completion of the U.G Programme. If she fails to do so, the student can appear for the End Semester Examinations, but she is ineligible to get the degree.

VII. Evaluation Procedure:

Evaluation of each theory course will be 25% for CIA and 75% for End Semester examinations. Evaluation of each Practical Course will be 40% for CIA and 60% for End Semester Examinations. Project will be evaluated for 100% in the End Semester Examinations. A Mark Statement will be issued to every student at the end of every semester.

VIII. Passing Minimum:

For a pass in each course a student should secure a minimum of 35% marks in the End Semester Examinations and a minimum of 40% marks in aggregate (i.e. marks of CIA and

End Semester Examinations put together). The same rule is applicable for Dissertation/Project report and Viva – Voce.

Minimum credits to be earned for B.Sc. Physics Programme is 140 credits.

IX. Eligibility condition for getting the Degree:

A Candidate undergoing the B.Sc degree Programme in Physics will be eligible for the award of degree in Physics, if she completes the entire Programme and pass all the examinations prescribed for the Programme.

As per UGC guidelines, a student who is not able to complete the Programme within three years may be allowed for 2 years period beyond the three years duration to clear the backlog to be qualified for the degree.

X. Classification of Successful Candidates:

The successful candidates will be classified as per the details given in the table below:

CGPA	Grade	Classification of Final Result
9.50000 – 10.00000	O+	First Class
9.00000 – 9.49999	O	
8.50000 – 8.99999	D++	
8.00000 – 8.49999	D+	
7.50000 – 7.99999	D	
7.00000 – 7.49999	A++	
6.50000 – 6.99999	A+	
6.00000 – 6.49999	A	
5.50000 – 5.99999	B+	Second Class
5.00000 – 5.49999	B	
4.50000 – 4.99999	C+	Third Class
4.00000 – 4.49999	C	
0.00000 – 3.99999	U	Re-appear

XI. Award of Ranks :

Candidates who qualify themselves for the respective Degree Programme, passing all the examinations in the first attempt are eligible for ranking based on the CGPA gained in the Major & Allied courses.

CUMULATIVE GRADE POINT AVERAGE [CGPA] = $\frac{\sum_i C_i G_i}{\sum_i C_i}$

$$\textbf{CGPA} = \frac{\text{Sum of the multiplication of grade points by the respective credits of the course cleared in the entire programme}}{\text{Sum of the credits of all the courses cleared in the programme}}$$

C_i = Credits earned for course *i* in any semester

G_i = Grade point obtained for course *i* in any semester

$\sum_i$ = Summation of all courses cleared in a semester in the case of GPA and all courses cleared in all semesters in the case of CGPA.

XII. Other Provisions:

1. In the Mark Statement, 'AA' will be marked against the courses for which the candidate was absent for the examination.
2. If a candidate is found indulging in malpractice, she will be expelled from the examination hall right away and debarred from appearing in all examinations of that particular semester. She can be allowed to take up examination only in the consecutive semester.
3. The courses she has already appeared during that semester will not be considered.
4. A student can appear for any number of arrear courses.
5. Repeat Examinations will be conducted for the final semester papers within a month after the publication of final semester result.
6. Revaluation is permitted.

XIII. Transitory Provisions

Students from other institutions will be granted year exemption alone and she has to appear and pass all the courses of all semesters under CBCS pattern in order to get the consolidated Statement of Marks/Grade.

Those students who have discontinued in the middle of the Programme may be admitted in the respective semester if they want to rejoin and complete the Programme, provided they had not got their transfer certificate.

The Standard Fireworks Rajaratnam College for Women, Sivakasi.

Department of Physics

Allotment of Hours and Credits

UG Programme

(For those who joined in June 2017 and later)

Subject			Semester						
			I	II	III	IV	V	VI	Total Credit
Part I – Tamil Language Courses			6(3)	6(3)	6(3)	6(3)	-	-	**12**
Part II - English Language Course			6(3)	6(3)	6(3)	6(3)	-	-	**12**
Part III – Major and Allied course:									
a) Major	Theory	Course I	4(4)	5(5)	4(4)	5(5)	6(5)	6(5)	
		Course II	3(3)	-	3(3)	-	**5(5)**	5(5)	
		Course III	-	-	-	-	**5(5)**	**5(5)**	
	Practical	Lab I	3(*)	3(4)	3(*)	3(4)	6(5)	6(5)	
		Project	-	-	-	-	3(*)	3(3)	
b) Allied		Theory	4(4)	4(4)	6(5)	6(5)	-	-	
		Practical	2(*)	2(2)	-	-	-	-	
Total			**11**	**15**	**12**	**14**	**20**	**23**	**95**
Part IV Non Major/Value Added Courses									
Peace Education			2(2)	-	-	-	-	-	
Environmental Studies			-	2(2)	-	-	-	-	
I. NME I			-	-	2(2)	-	-	-	
II. NME II			-	-	-	2(2)		-	
1. Computer literacy			-	2(2)	-	-	-	-	
2**.** Discipline Specific courses			-	-	-	2(2)		-	
3. Career Guidance and Subject Viva			-	-	-		2(2)	-	
4. Women Studies			-	-	-	-	2(2)		
5. Skill Based Courses : Self Employment / Job Oriented Courses – **Theory**			-	-	-	-	-	2(2)	
6. Skill Based Courses : Self Employment / Job Oriented Courses – **Practical / Field work / Project**			-	-	-	-	-	2(2)	
Library and Information Science			-	-	-	-	1(*)	1(*)	
Total No.of Credits			**2**	**4**	**2**	**4**	**4**	**4**	**20**
Part V: Extension Activities–Physical Education & Social Awareness Programme									
NSS/NCC/Physical Education/Extension Activities/Youth Red Cross/Social Service League			(*)	(1)	-	-	-	-	**1**
Total									**140**

The Standard Fireworks Rajaratnam College for Women, Sivakasi
Department of Physics
UG Programme
(For those who joined in June 2017 and later)

Semester.	Course Code	Course Title	Teaching Hours Per Week	Credits	Duration of Exam. (hrs.)	Marks allotted		
						Internal	External	Total
Part III - - Major courses								
I	GLPH11	Mechanics and Properties of Matter	4	4	3	25	75	100
	GLPH12	Physics applications in Everyday life	3	3	3	25	75	100
II	GLPH21	Optics	5	5	3	25	75	100
I & II	GLPH2L	Lab I	3+3	4	3	40	60	100
III	GLPH31	Electricity	4	4	3	25	75	100
	GLPH32	Electromagnetism	3	3	3	25	75	100
IV	GLPH41	Analog Electronics	5	5	3	25	75	100
III & IV	GLPH4L	Lab II	3+3	4	3	40	60	100
V	GLPH51	Classical Mechanics	6	5	3	25	75	100
	GLPH5EA	Elective 1	5	5	3	25	75	100
	GLPH5EB	Elective 2	5	5	3	25	75	100
	GLPH5L	Lab III	6	5	3	40	60	100
VI	GLPH61	Solid State Physics	6	5	3	25	75	100
	GLPH62	Wave mechanics	5	5	3	25	75	100
	GLPH6EC	Elective 3	5	5	3	25	75	100
	GLPH6L	Lab IV	6	5	3	40	60	100
V & VI	GLPH6P	Project Work	3+3	3	-	-	100	100
Elective courses								
V (Any two)	GLPH5E1	Digital Electronics	5	5	3	25	75	100
	GLPH5E2	Atomic and Nuclear Physics	5	5	3	25	75	100
	GLPH5E3	Fibre optics	5	5	3	25	75	100
	GLPH5E4	Energy physics	5	5	3	25	75	100
VI (Any one)	GLPH6E1	Thermodynamics	5	5	3	25	75	100
	GLPH6E2	Bio physics	5	5	3	25	75	100
Allied I & II								
I	GLPH1A	Fundamental Physics (Maths & Chemistry)	4	4	3	25	75	100
II	GLPH2A1	Digital Electronics (Maths)	4	4	3	25	75	100
	GLPH2A2	Solid State Physics and	4	4	3	25	75	100

		Digital Electronics(Chemistry)						
I & II	GLPH2AL	Allied Lab (Maths & Chemistry)	2+2	2	3	40	60	100
Part IV – Non major courses								
III	GLPH3N	Physics for the new world	2	2	2	25	75	100
IV	GLPH4N	Solar Energy and its Applications	2	2	2	25	75	100
Discipline Specific course								
IV	GLPH4DSL	Lab - Scientific Skill Development	2	2	3	40	60	100
Self Employment/Job Oriented Course								
VI	GLSE66	Domestic Electrical Appliances Servicing	2	2	2	25	75	100
	GLSE66L	Domestic Electrical Appliances Servicing - Lab	2	2	3	40	60	100

B.Sc Physics

Programme Articulation Matrix (PAM) -Weights

Course Code	Course title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
GLGT11/ GLGH11/ GLGF11	சங்க இலக்கியமும் உரைநடையும்/ Hindi Language Course - I/, French Language Course - I	15	27	3	5	3	1	1
GLGE11	Communicative English-I	11	12	3	27	0	0	9
GLPH11	Mechanics and Properties of Matter	19	31	13	5	0	0	0
GLPH12	Physics Applications In Everyday Life	25	22	18	5	0	0	5
GLCH1A	Fundamentals of Chemistry	25	6	12	9	0	0	0
GLPE11	Peace education	19	13	0	16	24	21	9
GLGT21/ GLGH21/ GLGF21	காப்பிய இலக்கியமும் புதினமும்/ Hindi Language Course -II /French Language Course - II	15	7	11	5	3	3	2
GLGE21	Communicative English-II	15	15	3	15	0	0	6
GLPH21	Optics	15	39	15	5	0	0	0
GLPH2L	Lab I	22	21	3	2	12	15	5
GLCH2A	Physical and Industrial Chemistry	19	9	9	11	0	0	0
GLCH2AL	Volumetric Analysis	16	18	3	11	0	0	0
GLES21	Environmental studies	39	12	6	3	3	15	2
GLCL23	Introduction To Computers & MS Office	33	10	0	12	0	0	9
GLGT31/ GLGH31/ GLGF31	சமய இலக்கியமும் நாடகமும்/ Hindi Language Course –III /French Language Course - III	21	9	18	5	3	3	4
GLGE31	Communicative English-III	15	15	0	15	0	0	9
GLPH31	Electricity	9	21	11	5	0	0	0
GLPH32	Electromagnetism	31	29	20	5	0	0	0
GLMT3A1	Allied Mathematics – I	9	25	4	1	0	0	0
GLNM	Non Major Elective I	19	14	0	9	0	0	0
GLGT41/ GLGH41/ GLGF41	கவிதை இலக்கியமும் சிறுகதையும்/ Hindi Language Course -IV/French Language Course - IV	15	39	12	5	3	6	4
GLGE41	Communicative English-IV	15	15	3	12	0	0	9
GLPH41	Analog Electronics	31	30	36	5	0	0	3
GLPH4L	Lab II	10	9	9	15	0	3	5
GLNM	Non Major Elective II	19	14	0	9	0	0	0
GLPH4DSL	Lab-Scientific Skill Development	23	30	30	27	0	0	5

GLMT4A1	**Allied Mathematics - II**	**9**	**25**	**4**	**1**	**0**	**0**	**0**
GLPH51	**Classical Mechanics**	**19**	**31**	**11**	**5**	**0**	**0**	**0**
GLPH5EA	**Elective I**	**15**	**33**	**15**	**15**	**0**	**0**	**9**
GLPH5EB	**Elective II**	**15**	**12**	**18**	**5**	**0**	**0**	**5**
GLPH5L	**Lab III**	**30**	**21**	**27**	**12**	**0**	**3**	**5**
GLGV51	**Career Guidance and Subject Viva**	**22**	**24**	**3**	**1**	**0**	**0**	**2**
GLWS51	**Women Studies**	**45**	**18**	**0**	**9**	**13**	**3**	**30**
GLPH61	**Solid State Physics**	**25**	**39**	**36**	**5**	**0**	**0**	**0**
GLPH62	**Wave mechanics**	**13**	**12**	**10**	**10**	**0**	**0**	**2**
GLPH6EC	**Elective III**	**9**	**33**	**15**	**15**	**0**	**0**	**0**
GLPH6L	**Lab IV**	**30**	**21**	**27**	**18**	**0**	**3**	**5**
GLPH6P	**Project Work**	**24**	**30**	**45**	**36**	**15**	**15**	**5**
GLSE/GLJO	**Self Employment/ Job Oriented courses – Theory**	**19**	**14**	**0**	**9**	**0**	**0**	**6**
GLSE/GLJO	**Self Employment/ Job Oriented courses – Practical**	**19**	**14**	**0**	**9**	**0**	**0**	**6**
	Total	**799**	**819**	**453**	**394**	**79**	**91**	**162**

B.Sc Physics

Programme Articulation Matrix (PAM) –Weighted Percentage

Course Code	Course title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
GLGT11/ GLGH11/ GLGF11	சங்க இலக்கியமும் உரைநடையும்/ Hindi Language Course - I/, French Language Course - I	1.88	3.3	0.66	1.27	3.8	1.1	0.62
GLGE11	Communicative English-I	1.38	1.47	0.66	6.85	0	0	5.56
GLPH11	Mechanics and Properties of Matter	2.38	3.79	2.87	1.27	0	0	0
GLPH12	Physics Applications In Everyday Life	3.13	2.69	3.97	1.27	0	0	3.09
GLCH1A	Fundamentals of Chemistry	3.13	0.73	2.65	2.28	0	0	0
GLPE11	Peace education	2.38	1.59	0	4.06	30.38	23.08	5.56
GLGT21/ GLGH21/ GLGF21	காப்பிய இலக்கியமும் புதினமும்/ Hindi Language Course -II /French Language Course - II	1.88	0.85	2.43	1.27	3.8	3.3	1.23
GLGE21	Communicative English-II	1.88	1.83	0.66	3.81	0	0	3.7
GLPH21	Optics	1.88	4.76	3.31	1.27	0	0	0
GLPH2L	Lab I	2.75	2.56	0.66	0.51	15.19	16.48	3.09
GLCH2A	Physical and Industrial Chemistry	2.38	1.1	1.99	2.79	0	0	0
GLCH2AL	Volumetric Analysis	2	2.2	0.66	2.79	0	0	0
GLES21	Environmental studies	4.88	1.47	1.32	0.76	3.8	16.48	1.23
GLCL23	Introduction To Computers & MS Office	4.13	1.22	0	3.05	0	0	5.56
GLGT31/ GLGH31/ GLGF31	சமய இலக்கியமும் நாடகமும்/ Hindi Language Course –III /French Language Course - III	2.63	1.1	3.97	1.27	3.8	3.3	2.47
GLGE31	Communicative English-III	1.88	1.83	0	3.81	0	0	5.56
GLPH31	Electricity	1.13	2.56	2.43	1.27	0	0	0
GLPH32	Electromagnetism	3.88	3.54	4.42	1.27	0	0	0
GLMT3A1	Allied Mathematics – I	1.13	3.05	0.88	0.25	0	0	0
GLNM	Non Major Elective I	2.38	1.71	0	2.28	0	0	0
GLGT41/ GLGH41/ GLGF41	கவிதை இலக்கியமும் சிறுகதையும்/ Hindi Language Course - IV/French Language Course - IV	1.88	4.76	2.65	1.27	3.8	6.59	2.47
GLGE41	Communicative English-IV	1.88	1.83	0.66	3.05	0	0	5.56
GLPH41	Analog Electronics	3.88	3.66	7.95	1.27	0	0	1.85

GLPH4L	**Lab II**	**1.25**	**1.1**	**1.99**	**3.81**	**0**	**3.3**	**3.09**
GLNM	**Non Major Elective II**	**2.38**	**1.71**	**0**	**2.28**	**0**	**0**	**0**
GLPH4DSL	**Lab-Scientific Skill Development**	**2.88**	**3.66**	**6.62**	**6.85**	**0**	**0**	**3.09**
GLMT4A1	**Allied Mathematics - II**	**1.13**	**3.05**	**0.88**	**0.25**	**0**	**0**	**0**
GLPH51	**Classical Mechanics**	**2.38**	**3.79**	**2.43**	**1.27**	**0**	**0**	**0**
GLPH5EA	**Elective I**	**1.88**	**4.03**	**3.31**	**3.81**	**0**	**0**	**5.56**
GLPH5EB	**Elective II**	**1.88**	**1.47**	**3.97**	**1.27**	**0**	**0**	**3.09**
GLPH5L	**Lab III**	**3.75**	**2.56**	**5.96**	**3.05**	**0**	**3.3**	**3.09**
GLGV51	**Career Guidance and Subject Viva**	**2.75**	**2.93**	**0.66**	**0.25**	**0**	**0**	**1.23**
GLWS51	**Women Studies**	**5.63**	**2.2**	**0**	**2.28**	**16.46**	**3.3**	**18.52**
GLPH61	**Solid State Physics**	**3.13**	**4.76**	**7.95**	**1.27**	**0**	**0**	**0**
GLPH62	**Wave mechanics**	**1.63**	**1.47**	**2.21**	**2.54**	**0**	**0**	**1.23**
GLPH6EC	**Elective III**	**1.13**	**4.03**	**3.31**	**3.81**	**0**	**0**	**0**
GLPH6L	**Lab IV**	**3.75**	**2.56**	**5.96**	**4.57**	**0**	**3.3**	**3.09**
GLPH6P	**Project Work**	**3**	**3.66**	**9.93**	**9.14**	**18.99**	**16.48**	**3.09**
GLSE/GLJO	**Self Employment/ Job Oriented courses – Theory**	**2.38**	**1.71**	**0**	**2.28**	**0**	**0**	**3.7**
GLSE/GLJO	**Self Employment/ Job Oriented courses – Practical**	**2.38**	**1.71**	**0**	**2.28**	**0**	**0**	**3.7**
	Total	**100.04**	**100**	**99.98**	**100**	**100.02**	**100.01**	**100.03**

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER I
MAJOR COURSE
GLPH11 –MECHANICS AND PROPERTIES OF MATTER
(For those admitted in June 2017 and later)

Contact hours per week : 04
Total number of hours per semester : 60
Number of credits : 04

Course Outcomes:

On successful completion of the course, the learners should be able to

CO1: state Newton's laws, Kepler's laws, Archimedes' principle, Bernoulli's equation, Poisson's ratio and properties of simple harmonic motion.
CO2: explain the concepts of dynamics, oscillations, central force, fluid mechanics and elastic nature of matter .
CO3: use the concepts of dynamics, fluid mechanics, gravitation and oscillation to explain relevant phenomenon.
CO4: analyze the concepts behind conservation of angular momentum, simple harmonic motion, gravitational field, fluid mechanism and elastic constants.
CO5: apply the laws of mechanics and properties of matter to solve problems.

POs/PSOs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	1	0	0	0
CO2	3	3	3	1	0	0	0
CO3	9	9	3	1	0	0	0
CO4	3	9	3	1	0	0	0
CO5	3	9	3	1	0	0	0
Weightage of the course (w)	**19**	**31**	**13**	**5**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**2.38**	**3.79**	**2.87**	**1.27**	**0**	**0**	**0**

Unit – I **(12hrs)**

Dynamics:

Motions in Three Dimensions with Constant Acceleration- Newton's Laws in Three Dimensional Vector Form – Projectile Motion – Drag forces and the motion of projectile – Angular Momentum of a Particle and a system of particles– Angular Momentum and Angular velocity – Conservation of Angular Momentum.

Unit – II **(12hrs)**

Oscillations:

Oscillating systems - Simple Harmonic Oscillation – Simple Harmonic Motion – Energy in Simple Harmonic Motion – Applications of Simple Harmonic Motion– Damped Harmonic Motion – Forced Oscillations and Resonance– Two body oscillations.

Unit – III **(12hrs)**

Motion under central forces:

Introduction – Nature of central forces – Motion under central force – Newton's law of universal gravitation – Inertial and gravitational mass – Motion in gravitational field – Kepler's laws.

Unit –IV **(12hrs)**

Fluid Mechanics:

Introduction – Properties of fluids – Archimedes' principle – Euler's equation of motion for a moving fluid – Torricelli's theorem: Speed of efflux of a fluid from a large vessel – irrotational continuous flow of inviscid fluids- The continuity equation – The Bernoulli's equation: Steady flow of fluids – Venturimeter – Laminar and turbulent flows – Coefficient of viscosity – Reynold's number.

Unit –V **(12hrs)**

Elastic Properties of matter:

Introduction – Bending of beams – The cantilever-depression of its loaded end – Transverse vibration of a cantilever – Beam supported at both ends and loaded in the middle – Torsion of a cylinder – Torsional oscillations – Determination of elastic constants – origin of elastic forces – Determination of γ by bending – Determination of poisson's ratio of rubber.

Text Book:

1. Robert Resnick, David Halliday,
   Kenneth S. Krane – Physics -Volume– 1
   John Wiley & Sons, Inc.
   Fifth Edition, 2005
   Unit I – Chapter 4
   Sections 4.1- 4.4, (Page no: 65-73)
   Chapter 10
   Sections 10.1 – 10.4 (Page no: 207-216)
   Unit II – Chapter 17
   Sections 17.1 – 17.5, 17.7 – 17.9(Page no: 373-391
2. S.L.Kakani Hemarajani & Shubhra Kakani Mechanics
   _ Viva Books Private Limited, First published 2005.
   Unit III _ Chapter - 5

		Sections 5.1 – 5.7 (Page no: 235 – 251, 277-287)
Unit IV	–	Chapter - 7 Sections 7.1 – 7.13 (Page no: 366-388, 394-399)
Unit V	–	Chapter - 6 Sections 6.1, 6.6- 6.15. (Page no: 308,321-355)

Reference Book:

1. L.P.Sharma & C.Saxena _ Oscillations, Waves and Sound
   Chand & Company Ltd., New Delhi, 1st Edition 1984.

2. Prof. D.S.Mathur
   Revised by:
   Dr.P.S.Hemne _ Mechanics
   S.Chand & Company Limited, Revised Edition 2012

3. Brijlal Subrahmanyam _ Properties of Matter,
   S.Chand & Company Limited,Fifth Edition -1989.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER I
MAJOR COURSE
GLPH12 – PHYSICS APPLICATIONS IN EVERYDAY LIFE
(For those admitted in June 2017 and later)

Contact hours per week : 03
Total number of hours per semester : 45
Number of credits : 02

Course Outcomes (CO):

On successful completion of the course, the learners should be able to
CO1: recall the basics of electricity, fibre optics, lasers, geographic information system and solar energy.
CO2: explain the concepts of electricity, fibre optics, geographic information system, laser and solar energy.
CO3: differentiate the single phase supply with three phase supply, types of optical fibers and types of lasers.
CO4: analyze the applications of lasers, fiber optics and solar energy.
CO5: solve problems in the field of electricity, fibre optics and solar energy

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	1	0	0	1
CO2	3	1	0	1	0	0	1
CO3	3	3	0	1	0	0	1
CO4	9	9	9	1	0	0	1
CO5	9	9	9	1	0	0	1
Weightage of the course	**25**	**22**	**18**	**5**	**0**	**0**	**5**
Weighted percentage of Course contribution to POs	**3.13**	**2.69**	**3.97**	**1.27**	**0**	**0**	**3.09**

Unit – I

Electricity **(9hrs)**

Single phase supply – Three phase supply – Earthing for safety – Lightning arrestor for buildings – Treatment of electric shock – Electrical fires .

Unit – II

An Introduction to Fibre Optics **(9hrs)**

Principle of Optical fibre – Propagation of Optical Fibres – Acceptance angle – Structure of Optical Fibre – Numerical aperture – Fibre optic materials – Classification of optical fibres – Transmission characteristics of optical fibres – Fabrication of optical fibre – Applications.

Unit - III

Geographic Information System (GIS) **(9hrs)**

Introduction – Concept of GIS – Over view of information system – The Four Ms – GIS definitions and terminology – Entities – Attribute – Topology – Spatial data – GIS architecture – Components of GIS – GIS work flow.

Unit-IV

Fundamentals of Laser **(9hrs)**

Laser – spontaneous and stimulated Emission – Population Inversion – Pumping and active system – Ruby Laser – Gas Laser – Semi conductor Laser – uses of Laser.

Unit–V

Solar energy and its application **(9hrs)**

An introduction to solar energy and its prospects – solar radiation – measurement of solar radiation-solar water heating system- solar cooker – solar desalination –basic photovoltaic system for solar energy conversion.

Text Book:

Study material will be provided .

Reference Books:

1. B.Raja Rao - Electricity
   Technical Books Publishers,
   Chennai. Second Edition,2000.
2. V. Rajendran & A. Marikani - Applied Physics for Engineers , Third edn.,
3. Websites
4. R.K. Gaur & S.L. Gupta – Engineering Physics
   Seventh Edition
   Dhanpat Rai & Sons
   1682, Nai Sarak,
   Delhi – 110 006.

5. H.P.Garg, J.Prakash - Solar energy : Fundamentals and Applications
6. M. Anji Reddy, Remote Sensing and Geographical Information System. 3rd ed. Hyderabad: BS Publication, 2008
7. K. Thyagarajan, A. Ghatak, Laser: Fundamentals and Application, Springer Science & Business Media, 2011.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
SEMESTER- I
ALLIED COURSE - I
GLPH1A –FUNDAMENTAL PHYSICS
(FOR CHEMISTRY AND MATHEMATICS)
(For those admitted in June 2017 and later)

Contact Hours per Week : 04
Total number of Hours per Semester : 60
Total number of Credits : 04

Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1: recall basics of photo electricity, transport properties of gases, laws and parameters involved in electricity, rotational motion and gravitational laws
CO2: explain photo electric cells, Boy's experiment, laws related to electricity and gravitation
CO3: derive the expressions for transport properties of gases, time period, electric field for different charge distributions and parameters of rotational motion
CO4: analyze photoelectricity with respect to various parameters, 'g' using compound pendulum and compare the variation of 'g' with respect to latitude, depth and altitude
CO5: solve simple problems related to photo electricity, kinetic theory of gases, rotational motion, electricity and gravitation

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	0	0	1	0	0	0
CO2	9	3	0	1	0	0	0
CO3	3	3	0	1	0	0	0
CO4	3	9	0	1	0	0	0
CO5	9	9	0	1	0	0	0
Weightage of the course	**27**	**24**	**0**	**5**	**0**	**0**	**0**

Unit-I **(12hrs)**
Photo electricity:
Laws of Photo electricity – Einstein's equation - Photocells and their uses - Photo Emissive cell- Photo Conductive cell – Photo Voltaic cells – Solar cells – Photo detectors.

Unit – II **(12hrs)**

Kinetic theory of gases:

Mean free path –Expression for the Mean free path - Diffusion - Expression for Diffusion –Viscosity - Expression for the Viscosity - Thermal Conductivity - Expression for the Thermal Conductivity.

Unit-III **(12hrs)**

Gauss law and its applications:

Coulomb's law - Electric field - Electric field due to a point charge - Lines of force - Flux of the electric field - Gauss law - Electric field due to a uniformly charged sphere – Electric field due to a uniform infinite cylindrical charge.

Unit-IV **(12hrs)**

Rotational motion:

Angular velocity – Normal acceleration - Centripetal and Centrifugal forces – Torque and Angular Acceleration - Work and power in Rotational motion - Angular momentum – Angular impulse-KE of Rotation - Moment of inertia - Laws of parallel and perpendicular axes theorems.

Unit – V **(12hrs)**

Gravitation:

Newton's Law of gravitation - Kepler's laws of Planetary motion – Determination of G-Boys' Experiment- Variation of g with Latitude or rotation of the earth - Variation of g with Altitude - Variation of g with Depth – The Compound Pendulum - Expression for period – Equivalent Simple pendulum- Minimum time of oscillation of a compound pendulum-Determination of g with compound pendulum.

Text Books:

1.N.Venkatachalam **–** Ancillary Physics
Optics Spectroscopy and Modern Physics (2003)
Unit-I **-** Chapter 4 **-**Page No.4.1- 4.11, 4.26 - 4.30

2.R. Murugeshan **-** Mechanics, Properties of Matter and Sound, Thermal Physics (2002).
Unit-II – Chapter 4 – Section 4.11-4.16, Page No.55-69
Unit-IV–Chapter 3- Section 3.1-3.3,Page No.38 - 40

3. R. Murugeshan - Electricity and Magnetism, S.Chand and company ltd, Reprint 2008
Unit-III – Chapter – 1 – Section 1.1- 1.5, 1.11,Page No.1 – 5, 10.
Chapter – 2 - Section 2.1,2.2, page no.12-14
Section 2.5-2.8, Page No.15-17,19,20

4.M. Palaniappan - Ancillary Physics, L.M.N. Publications, Madurai (1999)
Unit–IV – Chapter – 2 , Section 2.1-2.7– Page No.25- 32

5. R. Murugeshan - Properties of Matter(1994), S. Chand and company ltd, New Delhi.
Unit–V – Chapter – 6 – Section 6.1-6.3, 6.7-6.10,Page No.118-123, 130-140.

Reference Books:

1. University Physics with Modern Physics – Sears & Zemansky, Pearson Publishers, 14th Edition.

2. Elements of Properties of matter - D.S.Mathur, S.Chand & Company Pvt Ltd, Reprint, 2014.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER II
MAJOR COURSE
GLPH21 - OPTICS
(For those admitted in June 2017 and later)

Contact hours per week : 05
Total number of hours per semester : 75
Number of credits : 05

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: define aberrations, dispersion, diffraction and their types
CO2: describe and compare various optical phenomena, optical theories and optical devices
CO3: solve problems in optics by selecting appropriate equations
CO4: explain conditions and ideas to produce desired images through optical devices
CO5: analyse various parameters involved in aberrations, dispersion and diffraction

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	1	0	0	0
CO2	3	9	3	1	0	0	0
CO3	3	9	3	1	0	0	0
CO4	3	9	3	1	0	0	0
CO5	3	9	3	1	0	0	0
Weightage of the course	**15**	**39**	**15**	**5**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**1.88**	**4.76**	**3.31**	**1.27**	**0**	**0**	**0**

Unit – I

Aberrations-I **(15hrs)**

Aberrations – First and Third order theory – Spherical aberration– Reducing spherical aberrations–Coma – Aplanatic points– Astigmatism – curvature of the field – distortion

Unit – II

Aberrations_II **(15hrs)**

Chromatic aberration – chromatic aberration in a lens – circle of least chromatic abberation – Achromatic lenses – conditions for achromatism of two thin lenses placed incontact and a finite distance – oil immersion objective of high power microscope- Achromatism of telescope objective – Achromatism of a camera lens- Collector plates.

Unit – III

Dispersion **(15hrs)**

Dispersion by a prism –Refraction through a prism – Angular dispersion - Dispersive power –Angular and Chromatic dispersions – Achromatic combination of prisms - Deviation without dispersion – Dispersion without deviation – Direct vision Spectroscope.

Unit – IV

Fresnel Diffraction **(15hrs)**

Introduction– Huygens Fresnel Theory – Fresnel's Assumptions – Rectilinear Propagation of light – Zone Plate – Action of a Zone plate for an incident spherical wave front – Difference between a Zone plate and a convex lens – Distinction between interference and Diffraction – Fresnel and Fraunhoffer types of diffraction.

Unit – V

Fraunhoffer Diffraction **(15hrs)**

Fraunhoffer diffraction at a single slit – Intensity distribution in diffraction pattern to a single slit – Fraunhoffer diffraction at a single slit(Calculus method)– Plane diffraction grating – Theory of plane transmission grating – Width of principal maxima – Oblique incidence – Absent spectra with a diffraction grating – Overlapping of spectral lines.

Text Book:

1. Dr.N. Subrahmanyam and Brijlal

   Dr.M.N.Avadhanulu – A Text book of Optics

   S. Chand and Company Ltd, NewDelhi

   25th Revised Edition, 2012, Reprint 2015

   Unit I - Chapter 9 – Sections: 9.2 – 9.9 (Page No : 172-187)

   Unit II - Chapter 9 – Sections: 9.10-9.16 (Page No :187-198,200-207)

   Unit III - Chapter 8 – Sections: 8.1 -8.8 (Page No :162-171)

   Unit IV - Chapter 17 – Sections: 17.1-17.7 (Page No :394-404, 422-424)

   Unit V - Chapter 18 - Sections: 18.2-18.2.2,18.7-18.7.5

   (Page No :425-433,440-446,456-461)

Reference Books:

1) Fundamentals of Optics – Francis A.Jenkins, Harvey E.White, Mc Graw Hill Book Company, Fourth Edition

2) Optics and Spectroscopy – R.Murugeshan, Kiruthiga Sivaprasath, S.Chand and Company Ltd, Seventh Revised Edition, 2010.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER I AND II
MAJOR COURSE
GLPH2L –LAB - I
(Any 16 experiments)
(For those admitted in June 2017 and later)

Contact hours per week : 03
Total number of hours per semester : 45
Total number of credits : 04

Course Outcomes (CO):

On successful completion of the course, the learners should be able to
CO1: recall the measurements of physical parameters, thermal and optical properties
CO2: describe the physical concepts underlying the experiments
CO3: perform experiments applying thermal and optical properties
CO4: collect and analyse the data mathematically and graphically
CO5: do experiments with laboratory ethics

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	0	3	3	1
CO2	3	3	1	0	3	3	1
CO3	9	9	1	0	3	3	1
CO4	9	9	1	1	3	3	1
CO5	0	0	0	1	0	3	1
Weightage of the course	**22**	**21**	**3**	**2**	**12**	**15**	**5**
Weighted percentage of Course contribution to POs	**2.75**	**2.56**	**0.66**	**0.51**	**15.19**	**16.48**	**3.09**

List of experiments

1. Finding the thickness of a thin object using microscope
2. Error Analysis – in the measurement of thickness of objects using vernier callipers and screw gauge
3. Uniform Bending – Pin and Microscope or telescope
4. Non Uniform Bending – Pin and Microscope or telescope
5. Surface tension by capillary rise
6. Compound pendulum
7. Torsional Pendulum
8. Sonometer – Verifying the laws of transverse vibration in stretched string.
9. Melde's string
10. Lee's disc method
11. Newton's law of cooling
12. Dispersive power of a prism using spectrometer
13. Determination of refractive index of the prism using spectrometer
14. Grating – Determination of wave length
15. Diode characteristics
16. Combinations of Harmonic motions – Lissajous' figures using CRO
17. Finding cardinal points of a lens system (in contact)
18. Finding cardinal points of a lens system (out of contact)
19. Computer oriented practical – Drawing graph for any one experiment using EXCEL
20. Self experiment / Project

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
SEMESTER- II
ALLIED COURSE - II
GLPH2A1 - DIGITAL ELECTRONICS
(FOR MATHEMATICS)
(For those admitted in June 2017 and later)

Contact Hours per Week : 04
Total number of Hours per Semester : 60
Total number of Credits : 04

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: explain the basic principles in digital systems.
CO2: interpret the functioning of gates, combinational logic circuits, number systems and flip flops.
CO3: identify logic gates, convert number system and codes
CO4: apply digital logic principles to solve simple circuits.
CO5: construct circuits for various arithmetic operations.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	1	0	0	0
CO2	3	3	0	1	0	0	0
CO3	3	3	0	1	0	0	0
CO4	9	3	3	1	0	0	0
CO5	9	3	9	1	0	0	0
Weightage of the course	**25**	**12**	**12**	**5**	**0**	**0**	**0**

Unit – I
Digital Logic **(12hrs)**

The basic gates – The AND gate – The OR gate – The NOT gate – The NOR gate – The NAND gate.

Unit – II
Combinational Logic Circuits **(12hrs)**

Boolean Laws and theorem – OR operation – AND operation - Double Inversion and De Morgan's theorems - Duality theorem - Sum Of Products methods – Truth table to Karnaugh Map - Pairs, Quads and Octets - Karnaugh Simplifications - Don't care conditions – Product Of Sum method - Product Of Sum Simplifications.

Unit – III

Number System and Codes : (12hrs)

Binary number system – Binary to Decimal Conversion - Decimal to Binary Conversion – Octal numbers - Hexadecimal numbers - The ASCII Code – Excess 3 code – Gray Code.

Unit – IV

Arithmetic Circuits: (12hrs)

Binary Addition - Binary Subtraction - 2's complement representation - 2's complement Arithmetic - Arithmetic building blocks – The Adder-Subtracter.

Unit – V (12hrs)

Flip – Flops:

RS Flip-Flop – Clocked RS flip flop – Clocked D flip flop - Edge triggered RS flip flop(positive edge triggered) - Edge triggered D flip flop(positive edge triggered).

Text Book:

Donald P.Leach & Albert Paul Malvino - Digital Principles and Applications
Tata McGraw – Hill Publishing Company Limited, New Delhi.
Sixth Edition 2002

Unit – I	Chapter 2 Sections (2-1 to 2-2)	(Pages : 40-58)
Unit – II	Chapter3 Sections (3.1-3.8)	(Pages: 76-107)
Unit – III	Chapter 5 Sections (5-1 to5-8)	(Pages: 176-200)
Unit – IV	Chapter 6 Sections (6.1, 6.2, 6.5 – 6.8)	(Pages: 209 - 215, 219 -235)
Unit – V	Chapter8 Sections (8-1 to 8-4)	(Pages: 273 - 286)

Reference book:

1. S.K. Mandal - Digital Electronics,
   Tata Mc Grawhill Education Pvt Ltd,
   New Delhi.
2. V.K. Puri - Digital Electronics circuits and systems,
   Tata Mc GrawHill Education Pvt Ltd,
   23rd reprint (2012)

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
SEMESTER II
ALLIED COURSE - II
GLPH2A2 –SOLID STATE PHYSICS & DIGITAL ELECTRONICS
(FOR CHEMISTRY)
(For those admitted in June 2017 and later)

Contact Hours per Week : 04
Total number of Hours per Semester : 60
Total number of Credits : 04

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: recall the concepts of crystal structures, X-ray diffraction, semiconductors and logic gates.
CO2: explain different crystal structures, xrd methods, types of semiconductors and logic gates.
CO3: apply different methods to simplify the equations using combinational logic circuits
CO4: analyze crystal structures, semiconductors and digital logic theorems
CO5: determine lattice parameters, prove digital logic laws and truth tables of logic gates.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	3	0	1	0	0	0
CO2	3	9	0	1	0	0	0
CO3	1	3	0	1	0	0	0
CO4	3	1	0	1	0	0	0
CO5	3	9	1	1	0	0	0
Weightage of the course	**11**	**25**	**1**	**5**	**0**	**0**	**0**

Unit-I

Crystal Structure: (12hrs)

Introduction - Crystal lattice and Translation vectors – Unit cell – Basis -Symmetry Operations – Point groups and Space groups – Types of lattices – Lattice directions and planes – Interplanar spacing – Structure of diamond, Zinc Blende and Sodium Chloride.

Unit-II

X-Ray Diffraction: (12hrs)

Introduction – X-Ray Diffraction - Bragg's law - Laue's Equations – X Ray Diffraction methods - The Laue's method - Rotating Crystal Method - Powder method.

Unit – III

Semiconductors: (12hrs)

Introduction - Pure or Intrinsic semiconductors- Impurity or Extrinsic semiconductors - Donor or N type semiconductor - Acceptor or P type semiconductor.

Unit – IV

Digital Logic (12hrs)

The basic gates – The AND gate – The OR gate – The NOT gate – The NOR gate – The NAND gate.

Unit – V

Combinational Logic Circuits (12hrs)

Boolean Laws and theorem – OR operation – AND operation - Double Inversion and De Morgan's theorems - Duality theorem - Sum Of Products methods – Truth table to Karnaugh Map - Pairs, Quads and Octets - Karnaugh Simplifications - Don't care conditions – Product Of Sum method - Product Of Sum Simplifications

Text Book:

1. Solid State Physics and Electronics -R.K.Puri& V.K.Babbar
First Edition 1997

Unit I Chapter 1 Section 1.1-1.9, 1.11-1.13
Page No.1- 20, 24-25

Unit II Chapter 2 Section 2.1-2.3.3
Page No.33-44

Unit III Chapter 7 Section 7.1-7.3.2
Page No.195-201

2. Donald P.Leach & Albert Paul Malvino - Digital Principles and Applications
Tata McGraw – Hill Publishing Company Limited, New Delhi.
Sixth Edition 2002

Unit – IV Chapter 2
Sections (2-1 to 2-2) (Pages : 40-58)
Unit – V Chapter3
Sections (3.1-3.8) (Pages: 76-107)

Reference Book :

1. S.O. Pillai - Solid State Physics
   New age Internation limited,
   Revised Sixth Edition 2005

2. Dr.G.Senthil Kumar - Engineering Physics – I
   VRB Publishers Pvt.Ltd.
   Revised & Animated Version 2012-2013.

3. S.K. Mandal - Digital Electronics,
   Tata Mc Grawhill Education Pvt Ltd, New Delhi.

4. V.K. Puri - Digital Electronics circuits and systems,
   Tata Mc GrawHill Education Pvt Ltd, 23rd reprint (2012)

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
SEMESTER II
GLPH2AL - ALLIED LAB
(FOR B.Sc MATHEMATICS AND CHEMISTRY)
(Any 16 experiments)
(For those admitted in June 2017 and later)

Contact hours per week : 02
Total number of hours per semester : 30
Total number of Credits : 02

Course Outcomes (CO):

On successful completion of the course, the learners should be able to
CO1: recall the principle of the experiment
CO2: construct electronic and electrical circuits
CO3: perform the experiments and record data
CO4: analyse the physical parameters both manually and graphically
CO5: perform the experiments with confidence following the laboratory ethics

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	1	3	3	0
CO2	3	3	0	1	3	3	0
CO3	1	3	0	1	3	3	0
CO4	9	3	1	1	3	3	0
CO5	1	3	1	1	3	3	0
Weightage of the course	**15**	**12**	**2**	**5**	**15**	**15**	**0**

List of Experiments

1. Carey Foster's Bridge – Determination of resistance and resistivity
2. De Sauty's Bridge – Comparison of Capacitances
3. Potentiometer – Ammeter Calibration
4. Potentiometer – Low range Voltmeter Calibration
5. Potentiometer – Comparison of e.m.f.s
6. Potentiometer – Comparison of Capacitances
7. Verification of Boolean Laws
8. RS Flip Flop Using NOR Gate

9. D Flip Flop Using NOR Gate
10. Bridge Rectifier – Measurement of input and output voltages
11. Zener diode characteristics
12. Junction diode characteristics
13. Logic Gates using discrete components
14. Logic Gates – Construction of AND, OR and NOT gates using NAND gate
15. Logic Gates – Construction of AND, OR and NOT gates using NOR gate
16. De Morgan's Theorems verification
17. Single Stage Amplifier
18. Adder using Operational amplifier.
19. Subtractor using Operational Amplifier
20. Series Resonance
21. Parallel Resonance
22. IC regulated power supply 0 – 5V
23. Transistor Characteristics.

Selected Experiments for Chemistry students

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER III
MAJOR COURSE
GLPH31 - ELECTRICITY
(For those admitted in June 2017 and later)

Contact hours per week : 04
Total number of hours per semester : 60
Total number of Credits : 04

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: state Gauss law and define electric potential, capacitance, electromotive force, direct and alternating current.
CO2: explain flux of an electric field, electric potential due to charges, electrical parameters, DC circuit, AC circuit and working of transformer.
CO3: solve problems related to electric field, potential, capacitance, electromotive force and power in AC circuits.
CO4: analyze various electrical parameters, capacitor with a dielectric, AC and DC circuits.
CO5: apply Gauss law to find the electric field in various charge distribution, Kirchhoff's voltage law and current law to examine the current and potential difference in circuits.

POs/PSOs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	3	1	1	0	0	0
CO2	3	3	3	1	0	0	0
CO3	3	9	3	1	0	0	0
CO4	1	3	3	1	0	0	0
CO5	1	3	1	1	0	0	0
Weightage of the course (w)	**9**	**21**	**11**	**5**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**1.13**	**2.56**	**2.43**	**1.27**	**0**	**0**	**0**

Unit – I

Gauss' Law : **(12hrs)**

Gauss' law – The Flux of a Vector field – Flux of an Electric field – Gauss' law – Applications of Gauss' Law – Gauss' Law and conductors

Unit – II

Electric Potential Energy and Electric Potential: **(12hrs)**

Potential Energy - Electric Potential Energy – Electric Potential – Calculating the Potential from the field – Potential due to Point Charges – Electric Potential of Continuous Charge Distributions - Calculating the field from the Potential

Unit – III **(12hrs)**

Capacitance:

Capacitors – Capacitance – Calculating the Capacitance – Capacitors in series and parallel - Energy storage in an Electric Field – Capacitor with a Dielectric**.**

Unit – IV

DC Circuits: **(12hrs)**

Electric current – Electromotive force – Analysis of circuits – Electric fields in circuits – Resistors in series and parallel – Energy transfers in an Electric circuit – RC circuits.

Unit – V

Alternating Current Circuits: **(12hrs)**

Alternating current- Three separate elements-The single loop RLC circuit- Power in AC circuits – The Transformer.

Text Book:

Halliday/ Resnick /Krane - Physics – Volume 2
Fifth edition, Reprint 2014
Wiley India Pvt. Ltd.,

Unit I - Chapter 27
Section 27.1 – 27.6(Pg.no. 611-623)
Unit II - Chapter 28
Section 28.1 – 28.7(Pg.no. 635-647)
Unit III - Chapter 30
Section 30.1 – 30.6(Pg.no.679-689)
Unit IV - Chapter 31
Section 31.1– 31.7(Pg.no.701-716)
Unit V - Chapter 37
Section 37.1– 37.5(Pg.no.845-854)

Reference Books:

1. R.Murugeshan - Electricity and Magnetism
S. Chand & Company LTD
Seventh Revised Edition
Reprint with correction 2008.
2. Sehgal Chopra Sehgal - Electricity and Magnetism
S.Chand & sons, Newdelhi.
5th edition,2002.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER III
MAJOR COURSE
GLPH32 - ELECTROMAGNETISM
(For those admitted in June 2017 and later)

Contact hours per week : 03
Total number of hours per semester : 45
Total number of Credits : 03
Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1:recall magnetic phenomena/laws, magnetic materials/properties, electromagnetic oscillations/circuits, electromagnetic waves/ basic equations and polarization.

CO2:describe the determination of magnetic phenomena/currents/laws, inductance, magnetic materials/properties, electromagnetic oscillations/circuits, electromagnetic waves/ basic equations and polarization phenomena.

CO3:apply magnetic phenomena/currents/laws, inductance,magnetic materials/properties, electromagnetic oscillations/circuits, electromagnetic waves/ basic equations and polarization phenomena to solve problems.

CO4:analyse magnetic phenomena/currents/laws, inductance, magnetic materials/properties, electromagnetic oscillations/circuits/waves/ basic equations and polarization phenomena.

CO5:criticize the magnetic phenomena/currents/laws, inductance, magnetic materials/properties, electromagnetic oscillations/circuits/waves/ basic equations and polarization phenomena.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	1	0	0	0
CO2	3	1	1	1	0	0	0
CO3	9	9	9	1	0	0	0
CO4	9	9	9	1	0	0	0
CO5	9	9	9	1	0	0	0
Weightage of the course	**31**	**29**	**20**	**5**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**3.88**	**3.54**	**4.42**	**1.27**	**0**	**0**	**0**

Unit – I

The Magnetic Field: **(9 hrs)**

Magnetic force on a moving charge - Magnetic force on a current carrying wire – Torque on a Current Loop

The Magnetic Field: of a Current:

The magnetic field due to a moving charge - The magnetic field of a current - Two Parallel Currents – The magnetic field of a Solenoid - Ampere's Law.

Unit – II

Faraday's Law of Induction: **(9hrs)**

Inductance - Calculating the Inductance – LR Circuit – Energy storage in a Magnetic Field – Electromagnetic oscillations : Quantative and Qualitative Analysis – Damped and Forced oscillations.

Unit – III

Magnetic Properties of Materials : **(9hrs)**

The magnetic Dipole –Force on a dipole in a non uniform field– Atomic and Nuclear Magnetism –Magnetization – Magnetic Materials.

Unit – IV

Maxwell's Equations and Electro Magnetic Waves : **(9hrs)**

The Basic Equations of Electromagnetism – Induced Magnetic Fields and the Displacement current – Maxwell's Equations – Generating an Electromagnetic Wave – Traveling Waves and Maxwell's Equations.

Unit – V

Polarization : **(9hrs)**

Polarization of electromagnetic waves - Polarizing sheets - Polarization by reflection – Double refraction – Circular polarization.

Text Book:

Halliday/ Resnick /Krane - Physics – Volume 2
Fifth edition, Reprint 2014
Wiley India Pvt. Ltd.,

Unit I - Chapter 32
Sections 32.2, 32.5, 32.6
Chapter 33
Sections 33.1 – 33.5
Page No : 727 - 731, 736 to 740, 749 to 764

Unit II - Chapter 36
Sections 36.1 – 36.7
Page No : 823 to 835

Unit III - Chapter 35
Sections 35.1 – 35.5

Page No : 801 to 811

Unit IV - Chapter 38
Sections 38.1 – 38.5
Page No : 861 - 870

Unit V - Chapter 44
Sections44.1 –44.5
Page No : 999 to 1008

Reference Book :

1. D.N. Vasudeva - Fundamentals of Magnetism and Electricity
S. Chand and Company Limited
Twelfth Revised Edition, 1983

2. R.Murugeshan - Electricity and Magnetism
S. Chand & Company LTD
Seventh Revised Edition
Reprint with correction 2008.

3. Paul Lorrain and
Dale R. Corson - Electromagnetic Fields and waves
CBS Publishers & Distributors (New Delhi)
II Edition, First Indian Edition 1986, Reprint 2003

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
SEMESTER III
NON-MAJOR ELECTIVE COURSE
GLPH3N - PHYSICS FOR THE NEW WORLD
(For those admitted in June 2017 and later)

Contact Hours per Week : 02
Total number of Hours per Semester : 30
Total number of Credits : 02

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: list the characteristics of lasers, ultrasonics and the basics of electrical safety and satellite communications.
CO2: describe the ultrasonic scanning methods, earthing for safety, global positioning system
CO3: compare the ordinary light with laser, single phase with three phase power supply and the types of satellites
CO4: explain the sonograms, lightning arrestor for buildings, treatment of electric shock, GPS receiver
CO5: discuss the applications of lasers, ultrasonics, satellites

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	0	0	0	0
CO2	3	1	0	0	0	0	0
CO3	3	3	0	9	0	0	0
CO4	9	9	0	0	0	0	0
CO5	3	1	0	0	0	0	0
Weightage of the course	19	14	0	9	0	0	0

Unit – I

Laser and Its Applications **(10hrs)**

Introduction – Characteristics of laser – Differences between ordinary light and laser beam – Engineering and medical applications of laser – Industrial applications.

Ultrasonics and Its Applications

Introduction **–** Industrial applications of ultrasonics – Ultrasonic flaw detector – Ultrasonic scanning methods – Applications of ultrasonics in medical field – Sonograms.

Unit – II

Electrical Safety **(10hrs)**

Single phase supply – Three phase supply – Earthing for safety– Lightning arrestor for buildings – Treatment of electric shock.

Unit – III

Satellite Communication **(10hrs)**

Introduction – Basics – Applications of satellites – communication satellites – Design considerations – Types of satellites.

Global Positioning System

Introduction – Working of global positioning system – How GPS determines a position – Sources of errors – GPS receiver.

Text Book:

Study material will be provided.

Reference book:

G. Senthil Kumar - Engineering Physics-I
VRB Publishers Pvt.Ltd, Chennai.
New and Animated version, 2013.

B. Raja Rao - Electricity
Technical Books Publishers, Chennai.
Second Edition, 2000.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
B.Sc PHYSICS
SEMESTER IV
MAJOR COURSE
GLPH41- ANALOG ELECTRONICS
(For those admitted in June 2017 and later)

Contact hours per week : 05
Contact hours per semester : 75
Total number of Credits : 05

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: define transistor parameters, transistor classifications, various types of transistor biasing, feedback concepts, switching action of transistor & diodes and op-amps.

CO2: explain various transistor biasing methods, working of single stage, multistage transistor amplifiers, different types of oscillators, multivibrators and op-amps.

CO3: analyze different types of coupling in transistor amplifier, significance of feedback circuits and oscillators.

CO4: construct electronic circuits using diodes, transistors and op-amps for various applications.

CO5: evaluate the necessary parameters for the proper functioning of electronic circuits by applying appropriate conditions.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	1	0	0	0
CO2	3	3	9	1	0	0	0
CO3	9	9	9	1	0	0	1
CO4	9	9	9	1	0	0	1
CO5	9	9	9	1	0	0	1
Weightage of the course	**31**	**30**	**36**	**5**	**0**	**0**	**3**
Weighted percentage of Course contribution to POs	**3.88**	**3.66**	**7.95**	**1.27**	**0**	**0**	**1.85**

Unit-I

Transistors: **(12Hrs)**

Transistor - Naming the transistor terminals - Some facts about the transistor-Transistor action – Transistor symbols – Transistor circuit as an amplifier– Common Emitter connection – Characteristics of Common Emitter connection – Transistor load line analysis – Operating point – Cut off and saturation points – Power rating of transistor.

Transistor Biasing :

Faithful amplification-Transistor biasing-Stabilisation-Essentials of a transistor biasing circuits – Stability factor – Methods of transistor biasing – Base resistor method – Biasing with collector feedback resistor – Voltage divider bias method.

Unit-II

Single stage transistor amplifiers: **(12Hrs)**

Single stage Transistor Amplifier - How transistor amplifies – Graphical demonstration of transistor amplifier – practical circuit of transistor amplifier – Phase reversal –Input/output Phase Relationships- D.C and A.C equivalent circuits – Load line analysis – Voltage gain – A.C emitter resistance – Formula for A.C emitter resistance –Classification of amplifiers – Amplifier equivalent circuit - Equivalent circuit with signal source.

Multistage transistor amplifiers:

Multistage transistor amplifiers – RC coupled transistor amplifier – Transformer coupled amplifier – Direct coupled amplifier – Comparison of different types of coupling.

Unit-III

Feedback Principles: **(12Hrs)**

Feedback – Principles of negative voltage feedback in amplifiers – Gain of negative voltage feedback amplifiers –Advantage of Negative Voltage feedback - Feedback circuit-Principles of negative current feedback - Current gain with negative current feedback – Effects of negative current feedback – emitter follower – D.C analysis of emitter follower – Voltage gain of emitter follower – Input impedance of emitter follower – Output impedance of emitter follower – Applications of emitter follower- Darlington amplifier.

Oscillators:

Essentials of transistor oscillator – Explanation of Barkhausen Criterion – Different types of transistor oscillators – Colpitt oscillator – Hartley oscillator – principle of Phase Shift oscillators - Phase Shift oscillator – Wien Bridge oscillator.

Unit-IV

Solid –State Switching Circuits: **(12Hrs)**

Switching action of a transistor – Multivibrators – Types of multivibrators – Transistor Astable multivibrator - Transistor Monostable multivibrator - Transistor Bistable multivibrator-Important applications of diodes-Clipping circuits-Applications of Clippers-Clamping circuits-Basic idea of a Clamper-Positive clamper-Negative Clamper.

Unit-V

Operational Amplifiers: **(12Hrs)**

Operational Amplifier – Differential amplifier – Basic circuit of differential amplifier – Operation of differential amplifier – Common-mode and differential-mode signals – Common mode rejection ratio – Schematic symbol of operational amplifier – Bandwidth of an OP-amp – Slew rate – Applications of summing amplifiers - OP-amp Integrators and Differentiators – Op-amp Integrator - OP-amp Differentiator – Comparators – Comparator circuits.

Text Book :

V.K.Mehta and Rohit Mehta - Principles of Electronics
S.Chand & Company Limited,
New Delhi. First Edition 1980,
Reprint 2010.

Unit I - Chapter 8 (Sections: 8.1 to 8.6,8.10, 8.12, 8.17 to 8.18, 8.22, 8.23)
Chapter 9 (Sections: 9.1 to 9.2, 9.4 to 9.8, 9.11 to 9.12)
(Pages 142-148,152-154,160-162,165-170,174-177,180-181, 193-205, 209-215)

Unit II - Chapter 10 (Sections: 10.1 to 10.11, 10.18 to 10.20)
Chapter 11 (Sections: 11.1,11.5 to 11.8)
(Pages 241-259,271-274,280-281,289-301)

Unit III - Chapter 13 (Sections: 13.1 to 13.15)
Chapter 14(Sections: 14.6 to 14.8, 14.10 to 14.14)
(Pages 335-358, 369-370,372-380)

Unit IV - Chapter18 (Sections: 18.9 to 18.14, 18.17-18.23)
(Pages 474-483,487-499)

Unit V - Chapter 25 (Sections: 25.1 to 25.5, 25.8, 25.16, 25.19 to 25.20, 25.33 to 25.35,25.37 to 25.39)
Pages (663-668,670-672,687-688,691-692,711-714, 717-721)

Reference Book:

Albert Malvino & David J.Bates - Electronic Principles
Tata Mc Graw Hill Publishing Company Limited, New Delhi.
7 th Edition (Special Indian Edition 2007)

N.N.Bhargava, D.C. Kulshreshtha & S.C Gupta - Basic Electronics and Linear Circuit
Tata Mc Graw Hill Education, 1984.
Technical Teachers Training Institution, Chandigarh.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER III AND IV
MAJOR COURSE
GLPH4L – LAB – II
(Any 16 Experiments)
(For those admitted in June 2017 and later)

Contact hours per week : 03
Total number of hours per semester : 45
Total number of Credits : 03

Course Outcomes (CO):

On successful completion of the course, the learners should be able to
CO1: recall the principles of the experiment
CO2: construct the electrical and electronic circuits, write C++ programme
CO3: perform the experiments and record data
CO4: analyze the data and draw conclusions mathematically and graphically
CO5: communicate the results of the experiments in an ethical manner

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	3	0	0	1
CO2	3	3	3	3	0	0	1
CO3	3	3	3	3	0	0	1
CO4	3	3	3	3	0	0	1
CO5	0	0	0	3	0	3	1
Weightage of the course	**10**	**9**	**9**	**15**	**0**	**3**	**5**
Weighted percentage of Course contribution to POs	**1.25**	**1.1**	**1.99**	**3.81**	**0**	**3.3**	**3.09**

List of experiments

1. Potentiometer – Comparison of EMF
2. Potentiometer – Resistance & Resistivity (Copper)
3. Table Galvanometer – Figure of Merit
4. Table Galvanometer – Conversion of Galvanometer into Voltmeter & Ammeter
5. Carey-Foster Bridge –Resistance & Resistivity
6. Anderson's Bridge
7. Determination of Thermo emf
8. Determination of Absolute Mutual Inductance
9. Field along the axis of the coil
10. Bridge Rectifier
11. IC Regulated Power Supply
12. Zener Regulated Power Supply
13. Transistor Characteristics - Common Emitter
14. Emitter follower
15. Inverting and Non-Inverting Amplifier – IC741
16. Summing Amplifier – IC741
17. Difference Amplifier – IC741
18. Astable Multivibrator – IC741
19. Volume of the sphere – C++ program
20. Factorial of a number – C++ program
21. Self experiment / Project

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
SEMESTER IV
NON-MAJOR ELECTIVE COURSE
GLPH4N – SOLAR ENERGY AND ITS APPLICATIONS
(For those admitted in June 2017 and later)

Contact Hours per Week : 02
Total number of Hours per Semester : 30
Total number of Credits : 02

Course Outcomes (CO):

On successful completion of the course, the learners should be able to
CO1: list the types of energy sources and solar energy devices.
CO2: explain solar radiation, principle and working of solar based water heating/cooking/air heating/desalination and photovoltaics system.
CO3: construct solar water heater, solar cooker, solar air heater, solar stills and solar cells.
CO4: analyse solar energy, its applications, merits and demerits.
CO5: apply the principle of solar energy to solve problems.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	0	0	0	0
CO2	3	1	0	0	0	0	0
CO3	3	3	0	0	0	0	0
CO4	9	9	0	9	0	0	0
CO5	3	1	0	0	0	0	0
Weightage of the course	**19**	**14**	**0**	**9**	**0**	**0**	**0**

Unit I **(10 hrs)**

Solar energy

Energy – renewable energy sources and its advantages – non renewable energy sources and its advantages.

An introduction to solar energy and its prospects – solar radiation – measurement of solar radiation – applications of solar energy.

Solar water heating system

Solar water heating system – Conventional hot water system for domestic use and its classification – advantages – applications.

Unit II

Solar cooker **(10 hrs)**

Introduction – flat plate box type solar cooker with or without reflector – multi reflector type solar oven – parabolic disc concentrator type solar cooker – box type solar cooker – thermal analysis – merits and demerits.

Solar air heaters

Solar air heaters – classification – advantages & disadvantages.

Unit III

Solar desalination **(10 hrs)**

Introduction – basin type solar still – basics of solar still – material problems in solar still – wick type solar still – multiple wick type solar still – solar disinfection.

Solar photovoltaics

Introduction – Semiconductor principles – photovoltaic principles – a basic photovoltaic system for power generation – advantages and disadvantages of photovoltaic solar energy conversion – applications.

Text Book:

Study material will be provided

Reference Books:

1. 1. G.D. Rai - Solar energy utilization, Kanna Publishers, 1987
2. S.P.Sukhatme, J.K.Nayak - Solar energy, The Mc Graw Hill Company, Third Edition
3. G.N.Tiwari - Solar energy, CRC Press,2002
4. H.P.Garg, J.Prakash - Solar energy : Fundamentals and Applications, Tata McGraw Hill Company Limited, 2000
5. Websites

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER IV
DISCIPLINE SPECIFIC COURSE
GLPH4DSL – LAB - SCIENTIFIC SKILL DEVELOPMENT
(Any 10 Experiments)
(For those admitted in June 2017 and later)

Contact Hours per week : 2
Total number of Hours per semester : 30
No. of Credits : 2

Course Outcomes (CO):

On successful completion of the course, the learners should be able to
CO1: report life history of scientists and their inventions
CO2: analyze a scientific journal
CO3: solve problems in Physics
CO4: troubleshoot the electrical and electronic circuits
CO5: acquire the presentation skills in conferences

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	9	0	0	1
CO2	1	3	3	9	0	0	1
CO3	3	9	9	0	0	0	1
CO4	9	9	9	0	0	0	1
CO5	9	9	9	9	0	0	1
Weightage of the course	**23**	**30**	**30**	**27**	**0**	**0**	**5**
Weighted percentage of Course contribution to POs	**2.88**	**3.66**	**6.62**	**6.85**	**0**	**0**	**3.09**

List of experiments

1. Interview with Scientist
2. Role play
3. Famous quotes of scientist
4. Presentation on science topics
5. Review of a scientific article
6. Solving the problems (like National Graduate Physics Examinations (NGPE) and other competitive exams question paper)
7. Trouble shooting problems – Digital Electronics
8. Solving the problems for competitive exams
9. Latest inventions using chart or model
10. Dynamic model display
11. Demo of the experiment

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER V
MAJOR COURSE
GLPH51 - CLASSICAL MECHANICS
(For those admitted in June 2017 and later)

Contact hours per week : 06
Total number of hours per semester : 90
Total number of Credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1: recall the basic concepts in Classical Mechanics
CO2: describe conservation laws, generalised coordinates, Lagrangian, Hamiltonian formulations, motion under central force and special theory of relativity
CO3: apply generalised coordinates, Lagrangian and Hamiltonian formulations, Kepler's laws, relativistic generalizations to solve problems
CO4: investigate Kepler's problem, two body problem, special theory of relativity and Lorentz transformations
CO5: explore the shape of the orbits or path of a moving particle

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	1	0	0	0
CO2	3	3	1	1	0	0	0
CO3	9	9	3	1	0	0	0
CO4	3	9	3	1	0	0	0
CO5	3	9	3	1	0	0	0
Weightage of the course	**19**	**31**	**11**	**5**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**2.38**	**3.79**	**2.43**	**1.27**	**0**	**0**	**0**

Unit – I
Basic Concepts and Lagrangian Formulation (18hrs)

Classical Mechanics and other Theories – Conservation Principle (Laws) - Mechanics of a Particle – Conservation of Linear Momentum – Conservation of Angular Momentum –

Conservation of Energy – Mechanics of a System of Particle - Conservation of Linear Momentum – Conservation Theorem for Angular Momentum - Conservation of Energy – Constrained Motion, Constraints, Degrees of Freedom.

Unit – II

Variational Principle and Lagrangian Formulation (18hrs)

Generalised Co-ordinates – Generalised Notations – Limitations of Newton's Laws – Hamilton's Variational Principle -Deduction of Lagrange's Equations by Differential Method (D'Alembert's Principle) - Non- Conservative Forces : Dissipative system: Rayleigh's Dissipation Function – Applications of Lagrange's Equations of motion – Linear Harmonic Oscillator – Simple Pendulum – Dumb Bell – Particle Moving on the surface of Earth - Compound Pendulum – Atwood's Machine.

Unit – III

Hamiltonian Formulation (18hrs)

Phase space and the motion of the System - Hamiltonian – Hamilton's Canonical equations of motion – physical significance of H – Deduction of Canonical Equations from a variational principle - Applications of Hamilton's equations of motion: Simple Pendulum - Compound Pendulum - Linear Harmonic Oscillator - Particle in central field of force.

Unit – IV

Motion Under Central Force : Two body problem (18hrs)

Equivalent one body problem – General features of central force motion – Equivalent one dimensional problem: General Features of the Orbits – Stability of orbits and conditions for closure - Motion under Inverse square Force: Kepler's problem.

Unit –V

Special Relativity in Classical Mechanics (18 hrs)

Basic postulates of Special Theory of Relativity -Galilean Transformation is inadequate - New transformation needed - Postulates of special theory of relativity- Lorentz Transformation – The relativistic law of addition of velocities - Kinematic effects of Lorentz transformation - Relativistic generalisation of Newton's Laws - World velocity or four velocity - Four Force and four Momentum - Relativistic Kinetic Energy- Relativistic Mass- Mass-Kinetic Energy Relations.

Text Books:

S.L. Gupta, V. Kumar, H.V. Sharma – Classical Mechanics (Pragati: Prakashan Publications Twenty- Fourth Edition, 2010).

Unit I - Chapter 1

Sections 1.1, 1.2, 1.3-1 to 1.3-3, 1.4, 1.4-1 to 1.4-3, 1.5

Page No : 3 to 16,

Unit II - Chapter 1

Sections 1.6 to1.8,

Chapter 2

Sections 2.3, 2.5 (upto case I) , 2.6-1, 2.9, 2.9-1, 2.9-2, 2.9-5, 2.9-6, 2.9-9, 2.9-10

Page No : 16 to 24,33, 34, 36 to41, 52 to 54, 57 and 58.

Unit III - Chapter 3

Sections 3.2 – 3.5, 3.7, 3.9, 3.9-1, 3.9-2, 3.9-4,3.9-6

Page No : 100 to 103, 104, 105, 108,109, 111 to114

Unit IV - Chapter 4

Sections: 4.1 to 4.5

Page No : 200 to 220.

Unit V - Chapter 7

Sections 7.1-7.3

Page No : 307 to 322.

Reference Books:

Herbert Goldstein - Classical Mechanics -Narosa Publishing House – New Delhi Third Edition, 2002.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER V
ELECTIVE COURSE
GLPH5E1 - DIGITAL ELECTRONICS
(For those admitted in June 2017 and later)

Contact Hours per Week : 05
Total number of Hours per Semester : 75
Total number of Credits : 05

Course Outcomes:

On successful completion of the course, the learners should be able to

CO1: state basic principles of number systems, codes and digital systems
CO2: explain the working of digital circuits for arithmetic/logical operations, memory, counters and converters
CO3: apply digital principles to solve problems and design circuits
CO4: use gates and flip flops for the construction of different kinds of digital circuits
CO5: analyze various types of gates, flip flops, registers, counters, D/A and A/D converters

CO-PO Mapping table (Course Articulation Matrix)

Pos / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	0	0	0
CO2	3	3	3	3	0	0	0
CO3	3	9	3	3	0	0	3
CO4	1	9	3	3	0	0	3
CO5	1	9	3	3	0	0	3
Weightage of the course	**11**	**33**	**15**	**15**	**0**	**0**	**9**
Weighted percentage of Course contribution to POs	**1.88**	**4.03**	**3.31**	**3.81**	**0**	**0**	**5.56**

Unit – I

Number Systems and Codes **(15hrs)**

Binary numbers – Binary to Decimal Conversion – Decimal to Binary Conversion – Octal numbers – Hexadecimal numbers – The ASCII code – The Excess 3-code – The Gray Code

Arithmetic Circuits **(15hrs)**

Binary Addition – Binary Subtraction – Unsigned Binary Numbers – Sign Magnitude Numbers – 2's complement representation – 2's complement arithmetic – Arithmetic building blocks – The adder – Subtractor.

Unit – II

Digital Logic **(15hrs)**

Binary Number System – The Basic Gates – Boolean Algebra – NOR Gates – NAND Gates

Combinational Logic Circuits

Boolean laws and theorem-Sum –of- Products method-Truth table to Karnaugh map-Pairs ,quads and octals - Karnaugh simplification-Don't care conditions-Product-of-sum methods-Product-0f –Sums simplification

Unit – III

Flip-Flops **(15hrs)**

RS Flip-Flops (NOR-GateLatch) – Gated Flip-Flops – Edge triggered RS flip-flops – Edge triggered D flip flop – Edge triggered JK flip-flops –JK Master slave flip flops.

Registers

Registers – Types of Registers – (Serial in – Serial Out) – (Serial in – parallel out) – (parallel in – serial out) – (parallel in – parallel out) – Ring counters.

Unit – IV

Counters **(15hrs)**

Counters – Asynchronous counters: 3-bit binary ripple counter – Decoding Gates – Synchronous counters: Mod-8 parallel binary counter – Changing the modulus – Decade counters.

Unit – V

D / A Conversion and A / D Conversion **(15hrs)**

Variable – Resistor Networks – Binary Ladders – 4-bit D / A Converter – D / A Accuracy and Resolution – A / D Converter – 2-bit Simultaneous conversion – A / D converter (Counter method) – A / D accuracy and Resolution.

Text Book:

Donald P.Leach & Albert Paul Malvino - Digital Principles and Applications
TATA McGraw – Hill Publishing Company
Limited, New Delhi,
Fifth Edition
Sixth Reprint 2004

Unit – I	Chapter – 5 (Except Section 5.9) (Page no 182-206) Chapter - 6 (Page no 218-246)
Unit – II	Chapters – 2 Sections 2.1 to 2.5 (Page no 45-71) Chapter 3 (Page no 94-124)
Unit – III	Chapter – 8 (Except Section 8.6, 8.8) (Page no 281-299, 300-302) Chapter – 9 (Page no 311-335)
Unit – IV	Chapter – 10 Section 10.1 to 10.5 (Page no 341-371)
Unit – V	Chapter – 11 Section 11.1 to 11.6, 11.10 (Page no 398-425, 436)

Reference Book

M. Morris Mano – Digital Logic and Computer Design, tenth edition (2006) Prentice-Hall of India Private Limited New Delhi

Thomas L.Floyd - Digital fundamentals, 11th edition (2015)

Millman Halkias - Integrated Electronics, second edition (2016)

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER V
ELECTIVE COURSE
GLPH5E2 - ATOMIC AND NUCLEAR PHYSICS
(For those admitted in June 2017 and later)

Contact hours per week : 05
Total number of hours per semester : 75
Total number of Credits : 05

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: evoke various nuclear models, periodic table, the nuclear reaction and nuclear forces
CO2: comprehend the atomic spectra, coupling of electrons, atomic nucleus, particle detectors and nuclear decay
CO3: solve the problems in atomic and nuclear physics
CO4: analyze various atomic and nuclear structures/models/spectra, types of coupling, radioactive decay and devices like detectors and accelerator
CO5: explain the important phenomena in atomic nucleus

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	0	0	1	0	0	1
CO2	3	3	0	1	0	0	1
CO3	3	3	9	1	0	0	1
CO4	3	3	0	1	0	0	1
CO5	3	3	9	1	0	0	1
Weightage of the course	**15**	**12**	**18**	**5**	**0**	**0**	**5**
Weighted percentage of Course contribution to POs	**1.88**	**1.47**	**3.97**	**1.27**	**0**	**0**	**3.09**

Unit – I **(15hrs)**

Atomic Structure:

Atomic models – The Thomson model – Alpha particle scattering – The Rutherford scattering formula – Nuclear dimensions – Electron orbits – Failure of classical Physics .

Bohr Model of the Atom:

Atomic Spectra – The Bohr Atom - Energy Levels and Spectra – Atomic Excitation – The Franck-Hertz Experiment – The Correspondence Principle – Nuclear Motion and Reduced Mass – Hydrogenic Atoms.

Unit – II **(15hrs)**

Many-Electron Atoms:

Electron Spin – Spin-Orbit Coupling – The Exclusion Principle (Only Statement) – Electron Configuration – The Periodic Table – Hund's Rule – Total Angular Momentum – LS Coupling – jj Coupling.

Atomic Spectra:

Origin of spectral lines – Selection rules – One electron spectra –Two electron spectra – X-ray spectra .

Unit – III

Nuclear Structure **(15hrs)**

The Atomic Nucleus:

Atomic Masses – Nuclear Electrons – The Neutron – Stable Nuclei – Nuclear Sizes – Binding Energy

Nuclear Forces and Models:

Meson Theory of Nuclear Forces – The Liquid Drop Model – The Shell Model

Unit – IV

Particle Detectors and Accelerators **(15hrs)**

Ionisation Chamber – Geiger-Muller Counter – Wilson-Cloud Chamber- Bubble Chamber – Nuclear Emulsion Technique– Cyclotron – Synchrocyclotron- Betatron – Synchrotrons – The Proton synchrontron.

Unit – V

Radioactivity and Nuclear Reactions **(15hrs)**

Radioactivity:

Statistics of Radioactive Decay – Radioactive series – Alpha Decay – Beta Decay – The Neutrino - Positron Emission and Electron Capture – Inverse Beta Decay – Gamma Decay.

Nuclear Reactions:

Centre of Mass Co-ordinate System – Cross Section – Mean Free Path – Compound Nucleus - Excited States – The Coulomb Barrier – Nuclear Fission – The Chain Reaction – Transuranic Elements – Thermonuclear Energy.

Text Book:

1. Arthur Beiser – Perspectives of Modern Physics

   Tata McGraw Hill – International Edition - 1997

   Unit I - Chapter 5

   Sections 5.1 – 5.7(Pg.103-123)

   Chapter 6

   Sections 6.1 – 6.8(Pg.124-146)

   Unit II - Chapter 10

   Sections 10.1 – 10.9(Pg.223-230,232-250)

   Chapter 11

   Sections 11.1 – 11.5(Pg.251-265)

   Unit III - Chapter 21

   Sections 21.1 – 21.6(Pg.489-504)

   Chapter 22

   Sections 22.4 – 22.6(Pg.511-520)

   Unit V - Chapter 23

   Sections 23.1 – 23.3, 23.6 – 23.10(Pg.523-532,541-548)

   Chapter 24

   Sections 24.1 – 24.10(Pg.549-570)

2. R. Murugeshan and Kiruthiga Sivaprasad – Modern Physics
   17^{th} Revised Edition - 2014
   S. Chand and Company Ltd.,
   New Delhi.

   Unit – IV - Chapter 29

   Sections 29.3, 29.6, 29.7,29.9, 29.11 (Pg.418-419,421-425, 426-427)

   Chapter 30

   Sections 30.4-30.8 (Pg.436-445)

Reference Book:

Irving Kaplan - Nuclear Physics - Addison Wesley Publishing Company- second edition-2002

1. D.C.Tayal - Nuclear Physics – Himalaya Publishing House – fifth edition – 2011
2. J.B.Rajam – Atomic Physics – S.Chand & co Publishing – seventh edition-1966

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.

DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER V
ELECTIVE COURSE
GLPH5E3 – FIBRE OPTICS
(For those admitted in June 2017 and later)

Contact hours per week : 05
Total number of hours per semester : 75
Total number of Credits : 05

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: list the basic concepts and importance of fibre optics
CO2: explain the requirements of fibre optic techniques.
CO3: classify the fabrication techniques and differentiate the functions of wave guides
CO4: elucidate the required light sources for dispersion in optical fibres
CO5: discuss about the transmission through optical fibres

CO-PO Mapping table (Course Articulation Matrix)

Pos / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	0	0	0
CO2	3	3	3	3	0	0	0
CO3	3	9	3	3	0	0	3
CO4	1	9	3	3	0	0	3
CO5	1	9	3	3	0	0	3
Weightage of the course	**11**	**33**	**15**	**15**	**0**	**0**	**9**
Weighted percentage of Course contribution to POs	**1.88**	**4.03**	**3.31**	**3.81**	**0**	**0**	**5.56**

UNIT I **(15 Hrs)**

Refractive index and velocity of light:

Introduction – importance – generation of telephone system and optical fibers - Propagation of light in different media – propagation of light in optical fibre-basic structure and optical path of an optical fibre – acceptance angle and acceptance cone – Numerical aperture

(NA) (General)- modes of propagation – Meridional and skew rays – Number of modes and cut off parameters of fibres – Single mode propagation – Comparison of step and graded index fibres – Applications of fibres. Classification of Optical fibres: Fibres – classification – stepped index fibre – Stepped index monomode fibre - Disadvantage of monomode fibre – Graded index multimode fibre – Plastic fibres – Mechanism of refractive index variation – Fibre strength - Mechanical strength measurement of fibres.

UNIT II **(15 Hrs)**

Fibre fabrication:

Classification of fibre fabrication techniques – External chemical vapour deposition (External CVD) – Axial vapour deposition (AVD) – Internal chemical vapour deposition – Multi-element Glasses – Phasil system – Comparison of various fabrication processes – Fibre drawing and coating – Double Crucible method - "Rod-in-tube"method.

UNIT III **(15 Hrs)**

Optical fibre as a cylindrical waveguide:

Optical fibre vs Cylindrical wave guide – Wave equations in step index fibres. Fibre losses: Attenuation in optic fibres – Material or impurity losses – Rayleigh scattering loss – Absorption loss – Leaky modes – Bending losses – Radiation induced losses – Inherent defect losses – Inverse square law losses – Transmission losses – Temperature dependence of fibre losses – Core and cladding losses.

UNIT IV **(15 Hrs)**

Dispersion in Optical fibres:

Electrical vs Optical bandwidth – Bandwidth-Length product – Inter-modal dispersion – Mixing of modes – Material Chromatic dispersion – Waveguide dispersion – Dispersion Power Penalty – Total dispersion delay – Maximum transmission rate.

UNIT V **(15 Hrs)**

Light Sources for Optical fibres:

Introduction – LED(light emitting diode) – Processes involved, Structure, materials and output power characteristics of LED - Fibre-LED coupling – Bandwidth, spectral emission of LEDs – Laser–Operation, types, spatial emission pattern, current vs output characteristics and modulation response of a Laser – Single frequency Laser – Suppression of modes in a Laser – Laser Chirp.

Text Book :

Subir Kumar Sarkar	-	Optical Fibres and Fibre Optic Communication Systems
		S .Chand & Company Ltd.,
		First Edition, 1997
Unit I	-	Chapter:1 Sections 1.1 -1.4 Pg: (1-3)
		Chapter:2 Sections 2.1 – 2.12 Pg: (4-16)

Chapter:3 Sections 3.1 – 3.6, 3.8 – 3.10 Pg:(22-27),(33-35)

Unit II - Chapter:4 Sections 4.1 -4.10 Pg: (39-50)

Unit III - Chapter:6 Sections 6.1, 6.2 Pg:(65-72)

Unit IV - Chapter:8 Sections 8.1 – 8.10 Pg: (96-106)

Reference Books:

Donard J.Sterling, JR., - Technician Guide to Fibre Optics
Vikas Publishing House,
III Edition, 2002

Ajoy Ghatak & K. Thygarajan - Introduction to Fibre Optics,
Cambridge University press, First edition 1998,
Reprinted 2000.

Gerd Keiser - Optical fiber communications,
McGraw-Hill, Inc. Second Edition, 1991

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER V
ELECTIVE COURSE
GLPH5E4 – ENERGY PHYSICS
(For those admitted in June 2017 and later)

Contact hours per week : 05
Total number of hours per semester : 75
Total number of Credits : 05

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: list the basics of energy sources
CO2: describe the applications of different energy sources
CO3: distinguish solar photovoltaic and solar distillation processes
CO4: analyse solar energy, wind energy and geothermal energy
CO5: appraise the advantages and disadvantages of energy sources

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	0	0	1	0	0	1
CO2	3	3	0	1	0	0	1
CO3	3	3	9	1	0	0	1
CO4	3	3	0	1	0	0	1
CO5	3	3	9	1	0	0	1
Weightage of the course	**15**	**12**	**18**	**5**	**0**	**0**	**5**
Weighted percentage of Course contribution to POs	**1.88**	**1.47**	**3.97**	**1.27**	**0**	**0**	**3.09**

UNIT I **(15 Hrs)**

An Introduction to Energy Sources: Energy consumption as a measure of prosperity – World energy futures – Energy Sources and their availability: Introduction, Commercial or Conventional Energy Sources – Renewable Energy Sources. Solar radiation and its

measurement: Introduction – Solar Constant – Solar radiation at the Earth's Surface – Solar Radiation Geometry – Solar radiation measurements – Solar radiation data.

UNIT II **(15 Hrs)**

Solar Energy Collectors: Introduction – Physical principles of the conversion of Solar radiation into heat – Flat plate collectors – Concentrating Collector: Focussing type – Advantages and disadvantages of Concentrating collectors over flat plate type collectors.

UNIT III **(15 Hrs)**

Solar Energy Storage: Introduction – Solar energy storage systems - Solar pond: Introduction, Principle of Operation and description of Non-convective solar pond, Extraction of thermal energy, Applications of Solar Ponds

Applications of solar energy: Introduction - Solar water heating – Space heating – Solar thermal electric conversion – Solar electric power generation: Solar photo voltaic – Agriculture and Industrial process heat – Solar distillation – Solar green houses (Introduction and advantages)

UNIT IV **(15 Hrs)**

Wind Energy: Introduction – Basic principles of Wind Energy conversion: The nature of the wind – Basic components of a WECS (Wind Energy Conversion System) – Advantages of Disadvantages of WECS – Energy from Biomass: Introduction – Biomass conversion technologies – Photosynthesis – Biogas generation – Factors affecting Biodigestion or Generation of gas.

UNIT V **(15 Hrs)**

Geo thermal Energy: Introduction – Estimates of Geo thermal power – Nature of Geothermal fields – Geothermal sources – Advantages and Disadvantages of Geothermal Energy over other energy forms – Applications of Geothermal energy.

Energy from oceans: Introduction – Ocean Thermal Electric conversion(OTEC): Introduction, Methods of ocean thermal electric power generation, Open cycle OTEC system, The closed or Anderon OTEC cycle, Heat Exchanger, Bio-fouling, Site-Selection, Energy utilisation, Hybrid Cycle, Conclusions.

Text Book:

G.D.Rai	-	Non-Conventional Sources of Energy Khanna Publishers, Delhi Fourth Edition, 13th Reprint 2004
Unit I	-	Chapter 1 Section 1.1 – 1.4.2, 1.5 Pg: 1-11, 35-37 Chapter 2 Section 2.1 – 2.6 Pg: 47-65
Unit II	-	Chapter 3 Section 3.1 – 3.3, 3.7,3.8 Pg : 73-86,102-112
Unit III	-	Chapter 4 Pg : 124-145 Chapter 5 Section 5.1 – 5.3, 5.5 – 5.8, 5.12 Pg: 146-162, 168-197, 208-220

Unit IV - Chapter 6 Section 6.1, 6.2, 6.5, 6.7 Pg: 227-245, 256-260,262
Chapter 7 Section 7.1 – 7.5 Pg : 313-337

Unit V - Chapter 8 Section 8.1 – 8.4, 8.12, 8.13 Pg : 439-445, 477-481
Chapter 9 Section 9.1-9.2.10
Pg : 495-510

Reference Book:

1. G.D.Rai - Solar Energy Utilization
Khanna Publications,
Fifth Edition Fourth Reprint, 2001

2. S.P.Sukatme - Solar Energy
Tata McGraw Hill Publishing Company,
IX Edition, 2003

3.Garg and Prakash,
H.P.Garg - Solar Energy: Fundamentals and Applications
Tata McGraw Hill Education, first revised edition,2000

4. M.P.Agarwal - Solar Energy, S.Chand & Co, I Edition, 1985

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER V
MAJOR COURSE
GLPH5L - LAB III
(Any 20 Experiments)
(For those admitted in June 2017 and later)

Contact hours per week : 06
Total number of hours per semester : 90
Total number of Credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1: explain the principles of the experiments
CO2: construct and analyse electronic and non-electronic circuits
CO3: determine the physical parameters through various experimental techniques
CO4: analyse the data and draw conclusions manually and graphically
CO5: do experiments with laboratory ethics

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	0	0	3	0	0	1
CO2	9	3	9	3	0	0	1
CO3	9	9	9	3	0	0	1
CO4	9	9	9	3	0	0	1
CO5	0	0	0	0	0	3	1
Weightage of the course	**30**	**21**	**27**	**12**	**0**	**3**	**5**
Weighted percentage of Course contribution to POs	**3.75**	**2.56**	**5.96**	**3.05**	**0**	**3.3**	**3.09**

List of Experiments:

1. Integrator, Differentiator using discrete components
2. AND, OR, NOT, EX-OR gates using discrete components.
3. AND,OR,NOT,EX-OR,NOR gates using IC 7400
4. AND,OR,NOT,EX-OR,NAND gates using IC 7402
5. Verification of De Morgan's theorem
6. Half Adder and Full Adder
7. Half Subtractor and Full Subtractor
8. Realisation of Boolean Expressions
9. Clippers
10. Clampers
11. Integrator, Differentiator using OP - AMP
12. Laser experiment – Determination of Particle Size
13. Laser experiment – Determination of Radius of the Circular Aperture
14. Laser experiment – Determination of width of the rectangular Aperture
15. LCR Series Resonance Circuit
16. LCR Parallel Resonance Circuit
17. AC frequency by Sonometer
18. Boltzmann constant
19. Owen's Bridge
20. Comparison of emf using BG
21. Comparison of Capacitance – DeSauty's Bridge
22. LR Circuit
23. Rydberg Constant – Hydrogen Spectrum
24. Photocell – Verifying laws of photo electric emission
25. Solar cell / Fuel cell characteristics

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER VI
MAJOR COURSE
GLPH61 - SOLID STATE PHYSICS
(For those admitted in June 2017 and later)

Contact hours per week : 06
Total number of hours per semester : 90
Total number of Credits : 05

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: recall interatomic forces, unit cells, different types of bondings, semiconductors and super conductors
CO2: discuss about the different structures based on packing factor, current conduction, generation and recombination of charge carriers
CO3: explain the crystal system, structures, properties of semiconductors and super conductors
CO4: analyze various lattice and electrical parameters of different types of conductors.
CO5: apply the principles of solid state physics to solve problems

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	3	0	1	0	0	0
CO2	3	9	9	1	0	0	0
CO3	3	9	9	1	0	0	0
CO4	9	9	9	1	0	0	0
CO5	9	9	9	1	0	0	0
Weightage of the course	**25**	**39**	**36**	**5**	**0**	**0**	**0**
Weighted percentage of Course contribution to Pos	**3.13**	**4.76**	**7.95**	**1.27**	**0**	**0**	**0**

Unit – I

Inter atomic forces and Bonding in Solids: (18hrs)

Introduction – Forces between atoms – Cohesion of Atoms and Cohesive Energy – Calculation of Cohesive Energy – Bonding in solids – Ionic bonding – Bond Energy of NaCl Molecule – Calculation of Lattice Energy of Ionic Crystals – Calculation of Madelung Constant of Ionic Crystals – Properties of ionic solids – Examples of ionic solids – Covalent bond – Properties of covalent compounds.

Unit – II

Crystal Physics - I: (18hrs)

Metallic bond – Properties of metallic crystals-Introduction – Lattice points and space lattice – The basis and crystal structure – Unit cells and lattice parameters – Unit cell versus primitive cell – Crystal systems – Crystal Symmetry (Symmetry Elements in Crystals) – The Twenty Three Symmetry Elements in a Cubic Crystal –The Bravais space lattices –Metallic crystal structures[simple cubic structure(sc),body centered cubic structure(bcc),face centered cubic structure(fcc)] – Other Cubic Structures.

Unit – III

Crystal Physics - II: (18hrs)

Directions, planes and Miller indices – Important features of Miller indices of crystal planes – Important planes and directions in a cubic crystal – Distribution of atoms in the atomic planes of a simple cubic crystal – Separation between lattice planes in a cubic crystal – Imperfections in crystals (upto Production of Point defects)- Hall effect – Advantages of semiconductor devices.

Unit – IV

Physics of Semiconductors: (18hrs)

Introduction – The band structure of semiconductors – Semiconductors – Intrinsic semiconductors – Conductivity and temperature – Electrical conductivity – Impurity semiconductors or extrinsic semiconductors – Mechanism of current conduction in semiconductors – Generation and recombination.

Unit – V

Super Conductivity: (18hrs)

Historical introduction – A survey of superconductivity – An account of the mechanism of superconductors – Effects of magnetic field – A.C.Resistivity – Critical currents – Flux exclusion: The Meissner effect – Thermal properties – The energy gap – Isotopic effect – Mechanical effects – Type I and type II superconductors – BCS theory – Quantum tunnelling(Qualitative only) – Josephson's tunnelling..

Text Book:

S.O. Pillai - Solid State Physics
New age international (p) limited,publishers
Sixth Revised edition: 2010, Reprint 2012
Unit I - Chapter 3
Section –I to IX , XII to XIV,XVIII
Page No : 47 to 59, 64 to 68, and 71 to 72

Unit II - Chapter 3
Section –XIX ,XX
Chapter 4
Section - I to VIII, XIV,XV(i,ii,iii), XVII
Page No : 72,73, 87 to 97, 100 to 108, and 110 - 122

Unit III- Chapter 4
Section – XVIII to XXII , XXIV
Chapter 10
Section XIV,XV
Page No : 112 -123, 124 – 131, 575 TO 580.

Unit IV - Chapter 10
Section - I to V, VII,VIII,X,XI,
Page No : 521 to 529, 535 to 543, and 558 to 565,

Unit V - Chapter 8
Section - I to XI,XIII,XVIII,XIX(qualitative only),XX
Page No : 358 to 372, 373 to 375, and 387 - 393

Reference Book:

Charles Kittel - Introduction to Solid State Physics
John Wiley & Sons, Inc.,
VIII Edition, Reprint 2014

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER VI
MAJOR COURSE
GLPH62 - WAVE MECHANICS
(For those admitted in June 2017 and later)

Contact hours per week : 06
Total number of hours per semester : 90
Total number of Credits : 05

Course Outcomes:
On successful completion of the course, the learners should be able to

CO1: recall the fundamental concepts in wave mechanics
CO2: outline different theories and formalism of wave mechanics
CO3: solve the harmonic oscillator, rigid rotator, particle in a box, square potential barrier and alpha emission problems
CO4: discuss the one dimensional and three dimensional energy eigenvalue problems
CO5: analyze the energy eigenvalue problems such as square potential with rigid, finite walls, square potential barrier, rigid rotator and hydrogen atom

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	1	0	0	1
CO2	3	3	1	3	0	0	1
CO3	3	3	3	3	0	0	0
CO4	3	3	3	3	0	0	0
CO5	3	3	3	0	0	0	0
Weightage of the course	**13**	**12**	**10**	**10**	**0**	**0**	**2**
Weighted percentage of Course contribution to Pos	**1.63**	**1.47**	**2.21**	**2.54**	**0**	**0**	**1.23**

UNIT – I
ORIGIN OF THE QUANTUM THEORY (18 hrs)
Limitations of Classical Physics – Planck's Quantum Hypothesis – Einstein's Theory of Photoelectric Effect – Compton Effect – Quantum Theory of Specific Heat – Bohr Model of

Hydrogen Atom – Existence of Stationary States – Wilson-Sommerfeld Quantization Rule – Elliptic Orbits of Hydrogen Atom – The Harmonic Oscillator – The Rigid Rotator – Particle in a Box – The Correspondence Principle – The Stern-Gerlach Experiment – Inadequacy of Quantum theory.

UNIT – II

WAVE MECHANICAL CONCEPTS **(18 hrs)**

Wave nature of particles – The Uncertainty Principle – The Principle of Superposition – Wave Packet – Time-dependent Schrodinger Equation – Interpretation of the Wave Equation – Ehrenfest's Theorem – Time-independent Schrodinger Equation – Stationary States – Admissibility conditions on the Wave Function.

UNIT – III

GENERAL FORMALISM **(18hrs)**

Linear Vector Space – Linear Operator – Eigen Functions and Eigen Values – Hermitian Operator – Postulates of Quantum Mechanics – Simultaneous measurability of observables-General Uncertainty relation.

UNIT – IV

ONE DIMENSIONAL ENERGY EIGEN VALUE PROBLEMS **(18hrs)**

Square-well Potential with Rigid Walls – Square-well Potential with Finite Walls – Square Potential Barrier – Alpha Emission- Linear Harmonic Oscillator: Schrodinger Method.

UNIT–V

THREE DIMENSIONAL ENERGY EIGEN VALUE PROBLEMS **(18hrs)**

Particle Moving in a Spherically Symmetric Potential – System of Two Interacting Particles – Rigid Rotator – Hydrogen Atom- Three-Dimensional square well potential.

Text Books:

G. Aruldhas – Quantum Mechanics, Second Edition, Prentice-Hall of India Private Limited, 2012.

Unit I	-	Chapter 1
		Sections 1.1-1.15
		Pg. No: 1-23
Unit II	-	Chapter 2
		Section 2.1-2.10
		Pg. No: 24-55
Unit III	-	Chapter 3
		Sections 3.1 – 3.7

Pg. No: 58-74, 83-96

Unit IV	-	Chapter 4
		Section 4.1-4.4, 4.7
		Pg. No: 99-110, 114-119
Unit IV	-	Chapter 5
		Sections 5.1 – 5.4, 5.7
		Pg. No: 141-156, 160-162

Reference Books:

1. P. M Mathews and K. Venkatesan - A Text Book on Quantum Mechanics, Tata McGraw Hill Education Private Limited New Delhi, Second Edition, 2010.
2. Sathya Prakash - Advanced Quantum Mechanics, Kedar Nath Ram Nath Publishers, Meerut, Fifth Revised and enlarged Edition, 1999.
3. Leonard I. Schiff - Quantum Mechanics, McGraw Hill International Editions, Third Edition, 1968.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER VI
MAJOR COURSE
GLPH6L – LAB IV
(Any 20 Experiments)
(For those admitted in June 2017 and later)

Contact hours per week : 06
Total number of hours per semester : 90
Total number of Credits : 05

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: explain the principles of the experiments
CO2: construct and analyse electronic and non-electronic circuits
CO3: determine the physical parameters through various experimental techniques
CO4: analyse the data and interpret appropriate conclusions
CO5: do experiments with laboratory ethics

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	0	0	3	0	0	1
CO2	9	3	9	3	0	0	1
CO3	9	9	9	3	0	0	1
CO4	9	9	9	9	0	0	1
CO5	0	0	0	0	0	3	1
Weightage of the course	**30**	**21**	**27**	**18**	**0**	**3**	**5**
Weighted percentage of Course contribution to Pos	**3.75**	**2.56**	**5.96**	**4.57**	**0**	**3.3**	**3.09**

List of Experiments:

1. Computer programming – Theory of Relativity (Any 2 Pbm)
2. Computer programming - Linear Harmonic Oscillator
3. Computer Programming – Energy Level Calculation in Hydrogen Atom
4. Small Angled Prism
5. Prism – I – I'
6. Resolving power of a telescope
7. Dispersive power of a grating
8. Newton's rings
9. Air wedge
10. B – H curve (Hysteresis loop-I $\propto \theta$)
11. Comparison of Mutual Inductance using B.G
12. Absolute Capacitance Using B.G
13. High Resistance by Leakage
14. RS Flip Flop Using NOR Gate
15. D Flip Flop Using NOR Gate
16. Low pass filter using Discrete Components
17. High pass filter using Discrete Components
18. Band Pass Filters Using Discrete Components
19. Astable multivibrator using IC 555
20. Monostable multivibrator using Timer 555
21. Bistable multivibrator – JK FF
22. Counter – MOD 5, MOD 7
23. Register – Ring Counter
24. Decade counter

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER VI
MAJOR COURSE
GLPH6P – PROJECT WORK
(For those admitted in June 2017 and later)

Contact Hours per Week : 03
Total number of Hours per Semester : 45
Total number of Credits : 03

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: implement the basic principles of physics in exploring new avenues.
CO2: design and conduct scientific studies for specific purposes
CO3: use scientific reasoning to gather, evaluate and interpret data
CO4: communicate the result of the study in oral and written form
CO5: solve physics problems using qualitative and quantitative reasoning including sophisticated mathematical techniques

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	0	3	3	1
CO2	3	9	9	9	3	3	1
CO3	9	9	9	9	3	3	1
CO4	0	0	9	9	3	3	1
CO5	3	3	9	9	3	3	1
Weightage of the course	**24**	**30**	**45**	**36**	**15**	**15**	**5**
Weighted percentage of Course contribution to Pos	**3**	**3.66**	**9.93**	**9.14**	**18.99**	**16.48**	**3.09**

Nature of Work:
Groupwise
Maximum Number of Students in a group – 4

The B.Sc physics students have to do project work during the third year and submit the project report at the end of the sixth semester. The project work will be evaluated as given below

- Project Report - 80 marks
- Viva Voce - 20 marks

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.

DEPARTMENT OF PHYSICS

B.Sc. PHYSICS

SEMESTER VI

ELECTIVE COURSE

GLPH6E1- THERMODYNAMICS

(For those admitted in June 2017 and later)

Contact hours per week : 05
Total number of hours per semester : 75
Total number of Credits : 05

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: define the properties of thermodynamic systems and the laws governing them
CO2: explain the energy equation, entropy changes, thermodynamic potentials and properties of substances
CO3: use the laws of thermodynamics to determine heat flow, change in entropy and properties of substances
CO4: analyse the properties of gases, phase transitions in closed and open systems
CO5: apply T-dS equations and thermodynamic relations to study the properties of specific systems

CO-PO Mapping table (Course Articulation Matrix)

Pos / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	0	0	0
CO2	3	3	3	3	0	0	0
CO3	1	9	3	3	0	0	0
CO4	1	3	3	3	0	0	0
CO5	1	9	3	3	0	0	0
Weightage of the course	**9**	**27**	**15**	**15**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**1.13**	**4.03**	**3.31**	**3.81**	**0**	**0**	**0**

Unit – I

Thermodynamic Systems and the first law **(15hrs)**

Scope of thermodynamics -Thermodynamic systems -State of a system -pressure-thermal equilibrium and temperature- The Zeroth law- thermodynamic equilibrium- The first law of thermodynamics – Some consequences of the first law - The energy equation – T and v independent – T and P independent - P and v independent.

Unit –II

Entropy and the second law of Thermodynamics **(15hrs)**

The second law of thermodynamics – Thermodynamic temperature- Entropy – calculation of entropy changes in reversible process - Temperature – entropy diagrams – entropy changes in irreversible processes – The principle of increase of entropy - Clausius and Kelvin – Plank statement of the second law

Unit - III

Combined I and II law **(15hrs)**

Combined I and II law – T and v independent – T and P independent – P and v independent – The T dS equations- properties of a pure substance – Properties of an ideal gas- Properties of a Vander Waals gas.

Unit – IV

Thermodynamic Potentials **(15hrs)**

The Helmoholtz function and the Gibbs function- Thermodynamic potentials- The Maxwell's relations – stable and unstable equilibrium – phase transitions – the Clausius-Clapeyron equation- The third law of thermodynamics.

Unit – V

Applications of Thermodynamics **(15hrs)**

Chemical Potential – Phase equilibrium and the phase rule- dependence of vapour pressure on total pressure – surface tension – vapour pressure of a liquid drop – the reversible voltaic cell

Text Book:

Francis W. Sears and Gerhard L. Salinger - Thermodynamics, Kinetic theory and Statistical thermodynamics
Narosa Publishing House
Third edition, Nineth Reprint 1998

Unit I :	Chapter 1	
	Sections 1.1-1.5, 1.8, 3.6, 4.1-4.4	(Pages: 2-7, 16-17, 72-73, 98-102)
Unit II :	Chapter 5	
	Sections 5.1-5.8	(Pages: 122-146)
Unit III:	Chapter 6	
	Sections 6.1-6.8	(Pages: 148-163)
Unit IV:	Chapter 7	
	Sections 7.1-7.7	(Pages: 178-203)

Unit V : Chapter 8
Sections 8.1-8.6 (Pages : 206-225)

Reference:

1. N.Subrahmanyam and Brijlal - Heat and Thermodynamics,
S.Chand and company Limited, edition 8, (2002)
2. M.N.Saha and B.N.Srivastava- A treatise on heat, 3rd edition, Published by The Indian Press

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
B.Sc. PHYSICS
SEMESTER VI
ELECTIVE COURSE
GLPH6E2 – BIO PHYSICS
(For those admitted in June 2017 and later)

Contact hours per week : 05
Total number of hours per semester : 75
Total number of Credits : 05

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: recall the separation techniques, principles of spectroscopy, crystallography and microscopy
CO2: describe the features of spectroscopy, crystallography, microscopy and separation techniques
CO3: analyse crystal structures, XRD data, NMR data
CO4: discuss various electron microscopy
CO5: apply NMR spectroscopy in chemistry, biochemistry and biophysics

CO-PO Mapping table (Course Articulation Matrix)

Pos / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	0	0	0
CO2	3	3	3	3	0	0	0
CO3	1	9	3	3	0	0	0
CO4	1	3	3	3	0	0	0
CO5	1	9	3	3	0	0	0
Weightage of the course	**9**	**27**	**15**	**15**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**1.13**	**4.03**	**3.31**	**3.81**	**0**	**0**	**0**

UNIT I **(15 Hrs)**

Separation Techniques

Introduction – Chromatography – Electrophoresis. Physico-Chemical Techniques to study Bio molecules: Introduction – Hydration of Macro Molecules – Role of Friction – Diffusion – Sedimentation – The ultra centrifuge – Viscosity – Rotational diffusion – Light scattering – Small Angle X-ray scattering.

UNIT II **(15 Hrs)**

Spectroscopy

Introduction – Ultra violet/Visible Spectroscopy – Circular Dichroism(CD) and Optical Rotatory Dispersion (ORD) – Fluorescence Spectroscopy – Infra Red Spectroscopy – Raman Spectroscopy – Electron spin Resonance. Light Microscopy: Introduction – Elementary Geometrical Optics – The limits of Resolution – Different types of Microscopy.

UNIT III **(15 Hrs)**

Electron Microscopy

Introduction – Electron Optics – The Transmission Electron Microscope(TEM) – The Scanning Electron Microscope(SEM) – Preparation of the specimen for electron microscopy – Image Reconstruction – Electron Diffraction – The Tunneling Electron Microscope – Atomic Force Microscope.

UNIT IV

X-ray Crystallography: **(15 Hrs)**

Introduction – Crystals and Symmetrics – Crystal systems – Point groups and Space groups – Growth of Crystals of Biological molecules – X-ray Diffraction – X-ray Data collection – Structure solution – Refinement of the structure – Note on the resolution of an X-ray structure.

UNIT V **(15 Hrs)**

NMR Spectroscopy:

Introduction – Basic Principles of NMR – NMR theory and experiment – Classical Description of NMR – NMR parameters – The nuclear overhauser Effect – NMR applications in chemistry – NMR applications in Biochemistry and Biophysics – NMR in medicine. Molecular modelling: Introduction – Generating the model – Optimizing the model.

Text Book :

Vasantha Pattabhi & N Gautham - Biophysics
Narosa Publishing House
First Reprint 2003
New Delhi Chennai Mumbai Kolkata

Unit I	-	Chapter 2 & 3 (Page No : 24 - 57)
Unit II	-	Chapter 4 & 5 (Page No : 58 - 85)
Unit III	-	Chapter 6 (Page No : 86 -94)
Unit IV	-	Chapter 7 (Page No: 95 - 111)
Unit V	-	Chapter 8&9 (Page No: 112 - 143)

Reference Book:

1. P. Narayanan – Essentials of Biophysics
New Age Internationals,second edition, India
Reprint 2005.

2.Vasantha Pattabhi, N.Goutham - Biophysics
Narosa Publisher, second edition,2009.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.

DEPARTMENT OF PHYSICS

SEMESTER VI

SELF EMPLOYMENT COURSE

GLSE66 – DOMESTIC ELECTRICAL APPLIANCES SERVICING

(For those admitted in June 2017 and later)

Contact hours per week : 02
Total number of Hours per Semester : 30
Total number of Credits : 02

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: define the basic electrical and electronic parameters
CO2: describe the basic household wiring, types of earthing, electrical devices and appliances
CO3: compare the types of transformer and batteries
CO4: list the possible defects in household appliances
CO5: analyse the colour coding of resistors and working of domestic electrical appliances

CO-PO Mapping table (Course Articulation Matrix)

Pos / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	3	0	0	0
CO2	3	1	0	3	0	0	0
CO3	3	3	0	3	0	0	0
CO4	9	1	0	0	0	0	3
CO5	3	9	0	0	0	0	3
Weightage of the course	**19**	**14**	**0**	**9**	**0**	**0**	**6**

Unit I **(10 Hrs)**

Basics of Electricals:

Voltage, current, power, energy and their units – Energy calculations

Basics of Electronics:

Resistor, Color coding of resistor, Diode, Regulator IC, Bridge Rectifier, Power supply Board. Phase – Neutral – Earth – Necessity of Earthing – Difference between Earth and Neutral- Methods of Earthing – Types of Earthing – Types of Fuses

Unit II **(10 Hrs)**

Transformer – Current Transformer – Potential Transformer – Types of wiring – Classification of Cell – Comparison of primary and secondary cell – Defects of Batteries – Care and maintenance of battery

Fluorescent lamp – Circuit diagram – Working – Defects and Servicing

Unit III **(10 Hrs)**

Capacitor start induction motor(Grinder) - Circuit diagram – Working – Defects and Servicing - Permanent Capacitor induction motor (Ceiling Fan) - Circuit diagram – Working – Defects and Servicing – Universal motor (Mixie) - Circuit diagram – Working – Defects and Servicing

Text Book:

Study material will be provided

Reference Book:

1.A.K.Sawhney - A Course in Electrical and Electronic measurements and Instrumentation, Education and technical Publishers, Reprint 1985, Fifh edition.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
SEMESTER VI
SELF EMPLOYMENT COURSE
GLSE66L – DOMESTIC ELECTRICAL APPLIANCES SERVICING - LAB
(ANY 12 EXPERIMENTS)
(For those admitted in June 2017 and later)

Contact hours per week : 02
Total number of Hours per Semester: 30
Total number of Credits : 02

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: identify the color codes of resistors
CO2: solder the electrical components
CO3: acquire the entrepreneurship skill
CO4: carry out the basic household wiring
CO5: service the household appliances

CO-PO Mapping table (Course Articulation Matrix)

Pos / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	3	0	0	0
CO2	3	1	0	3	0	0	0
CO3	3	3	0	3	0	0	0
CO4	9	1	0	0	0	0	3
CO5	3	9	0	0	0	0	3
Weightage of the course	**19**	**14**	**0**	**9**	**0**	**0**	**6**

List of Experiments:

1. Connect Voltmeter, Ammeter and take Load current
2. Connect Energy meter and calculate Energy
3. Color Coding of given Resistors

4. Soldering of given Components
5. Construct Bridge Rectifier and take the waveform from CRO
6. To wire switch box
7. To wire two lamps in series and parallel and test it
8. To wire staircase wiring and test it
9. To wire Dim and Bright circuit and test it
10. To connect and test the fluorescent lamp
11. To connect and run ceiling fan
12. To connect the single phase induction motor by using DOL starter
13. Practice in servicing mixies
14. Practice in servicing Grinders
15. Practice in servicing Iron boxes.

THE STANDARD FIREWORKS RAJARATNAM

COLLEGE FOR WOMEN (AUTONOMOUS)

(Reaccredited with 'A' Grade by NAAC and
College with Potential for Excellence by UGC)

SIVAKASI – 626 123

Affiliated to Madurai Kamaraj University, Madurai

REVISED

Programme Scheme, Scheme of Examination and Syllabi

(With effect from June 2017)

DEPARTMENT OF PHYSICS

PG PROGRAMME & CERTIFICATE PROGRAMME

Curriculum Design & Development Cell

CHAIRMAN OF THE BOARD	DEAN CDDC	DEAN ACADEMIC AFFAIRS	COE
	B. Dh. (B. DEEPA)	CDAU 15/07/19	E. Pangajam 25/7/19

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI – 626 123.
(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade by NAAC and College with Potential for Excellence by UGC)

DEPARTMENT OF PHYSICS

Vision and Mission of the Department

Vision:

- To stimulate the interest of the students in Physics and lay a strong foundation in the subjects, to motivate them towards research and render them competent and socially committed.

Mission:

- To design a relevant curriculum to suit the growing trends of technology.
- To train the students to apply laboratory skills.
- To develop the potentials of the students for independent thinking and creativity through project work.
- To promote collaborative research culture.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI – 626 123.

(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade by NAAC and College with Potential for Excellence by UGC)

DEPARTMENT OF PHYSICS

PG DEGREE PROGRAMME IN PHYSICS

GUIDELINES FOR OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

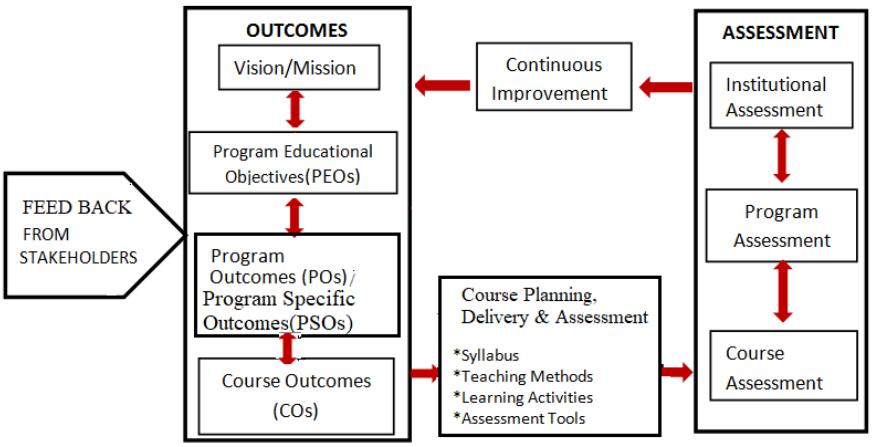
(For those admitted in June 2017 and later)

I. A. PREAMBLE

The institutional vision is to emerge as a premier institution offering need-based, value conscious and career-oriented quality education to empower rural women with communicative competency and employment potential. With the advent of Autonomy in the year 2005, Choice Based Credit System (CBCS) is followed and it offers much flexibility to innovate and design the contents of each programme and align it with the institutional mission. Quality assurance developments in higher education have encouraged us to move towards outcomes-based approach to teaching, learning and assessment. Programme specifications define the students in terms of what they can do at the end of a programme or a particular level of study. This is a change from the more traditional approach where teachers tended to define courses in terms of what is taught, rather than what the student can do at the end of the course or programme. More directed and coherent curriculum, "more relevant" Graduates to industry and other stakeholders and Continuous Quality Improvement (CQI) are the benefits of OBE.

A student-centered paradigm in higher education entails a shift from a more input-oriented curricular design based on the description of course content, to outcomes-based education in which the course content is developed in terms of learning outcomes. The implementation of **Outcome Based Education with CBCS** as per the UGC guidelines from the academic year 2019-2020 will definitely mark a paradigm shift from traditional education.

B. OUTCOME BASED EDUCATION (OBE) FRAMEWORK



C. PROGRAMME EDUCATIONAL OBJECTIVES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Programme Educational Objectives (PEOs):

PEOs are broad statements that describe the career and professional achievements that the programme is preparing the graduates to achieve within the first few years after graduation. PEOs should be consistent with the mission of the Institution. PEO's can be measured by a PO-PEO matrix. The PEO's should evolve through constant feedback from alumnae, students, industry, management etc,. It is mandatory that each PEO should be mapped to atleast one of the POs.

The Graduates will

PEO1: become competent professional in industry, consultancy, education, research and public administration.

PEO2: excel as Junior Research Fellow, research associates and analyze complex problems to reach substantiated conclusions.

PEO3: become tutors, tech or digital entrepreneur and undertake projects.

PEO4: interpret and analyze the experimental data in physics imbibed by ethical, moral and social values leading to highly cultured and civilized physicist.

Programme Outcomes (PO):

Programme Outcomes are narrower statements that describe what students are expected to know and be able to do upon the graduation. These relate to the skills, knowledge and behaviour that students acquire in their study through the programmes.

PO1: Disciplinary knowledge

Apply the knowledge of Arts, Science and Humanities to address fundamental and complex questions appropriate to their programmes.

PO2: Critical thinking, Problem solving and Analytical reasoning

Make use of appropriate knowledge and skills to identify, formulate, analyze and solve problems in order to reach substantiated conclusions.

PO3: Research related skills and scientific reasoning

Critically analyze research processes, products and practices with a view of strategic use of data in their field.

PO4: Communication skills and Digital literacy

Demonstrate skills in oral and written communication and make use of ICT in various learning ambience.

PO5: Team work and Leadership quality

Interact productively with people from diverse backgrounds as both leaders/mentors and team members with integrity and professionalism.

PO6: Multicultural competence with Moral and ethical awareness

Defend the society against gender and environmental issues with moral and ethical awareness.

PO7: Self-directed and Life-long learning

Formulate their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

Programme Specific Outcomes (PSO):

Programme Specific Outcomes denote what the students should be able to do at the time of graduation. They are programme specific. It is mandatory that each PO should be mapped to the respective PSO specified in the programme in order.

By the completion of the PG Physics programme, the learners will be able to

PSO1: apply graduate-level acquaintance in solving problems and proving the theories in various areas of physics like quantum mechanics, solid state physics, molecular spectroscopy, mathematical physics and nanophysics.

PSO2: possess scientific attitude, experimental skills, analyze data and interpret the results obtained in physics related problems.

PSO3: implement the physical concepts in a high quality research or creative capstone project under appropriate disciplinary or multi disciplinary context.

PSO4: present the recent trends in physics effectively in seminars, conferences using ICT tools.

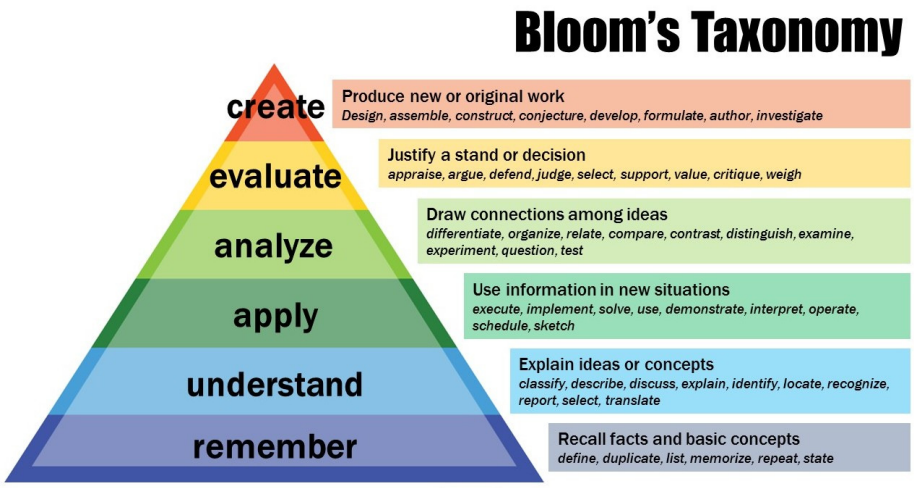
PSO5: plan and carry out group discussions, respond to the views of team members and perform complicated projects successfully.

PSO6: follow scientific ethics in all stages of scientific practices such as data collection, transcription, validation of results through replication and publication.

PSO7: realize the impact of science on society and engage in lifelong learning and professional development through self study or higher studies in the diverse fields like material science, electronics, energy devices, eco friendly materials etc.

BLOOM'S TAXONOMY:

Bloom's Taxonomy was created in 1956 by an educational psychologist Dr. Benjamin Bloom in order to promote higher forms of thinking in education, such as analyzing and evaluating concepts, processes, procedures, and principles, rather than just remembering facts. It is most often used when designing educational, training, and learning processes.



The K-levels mentioned in the diagram are usually denoted as [k1] to [k6] respectively from the bottom.

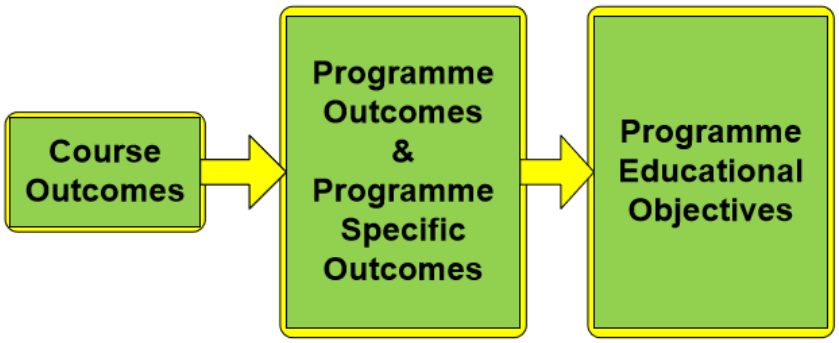
Course Outcomes (CO):

Course Outcomes are narrower statements that describe what students are expected to know and be able to do at the end of each course. These relate to the skills, knowledge, and behaviour that students acquire in their study through the course. Each course comprises five COs and the keywords used to define COs are based on Bloom's Taxonomy[k1] to [k6].

On successful completion of the course, the learners should be able to

CO1: [k1] / [k2]
CO2: [k3]
CO3: [k4]
CO4: [k5]
CO5: [k6]

D. CO-PO &PO-PEO relationship:



E. CO – PO MAPPING OF COURSES:

After CO statements are developed by the course in-charge, COs will be mapped with any possible POs based on the relationship exist between them. A CO must be mapped to

atleast one PO. The PO's which are not related to any of the COs in a particular course may be left blank. All the courses together must cover all the POs. The CO-PO matrix for a course is as shown below.

The correlation between COs and PO can be defined by three levels using the Letter Grades H, M, L which denotes respectively High (H), Medium (M), Low (L) and '-' for no correlation.

The concept of Six Sigma is used for calculating weighted percentage of contribution of each course in attainment of respective POs. As per Six Sigma Tool- Cause and Effect Matrix, the weightage of H, M and L are 9, 3 and 1 respectively.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1							
CO2							
CO3							
CO4							
CO5							
Weightage of the course							
Weighted percentage of Course contribution to POs							

The levels of contribution are denoted by Grades and weightages H-High (9), M-Medium (3), L-Low (1)

Weighted percentage of Contribution of the Course in attainment of PO1= Weightage of the course / Total weightage of all courses contributing PO1 computed based on correlation between COs and POs X 100

Programme Articulation Matrix (PAM):

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Total Weightage of all courses contributing to POs								

PO-PEO Mapping Matrix:

POs \ PEOs	PEO1	PEO2	PEO3	PEO4
PO1	X	X	X	
PO2	X	X		
PO3	X	X		
PO4	X		X	
PO5	X		X	X
PO6			X	X
PO7		X		

(Mark X to map a PO to a PEO)

F. MEASUREMENT OF ATTAINMENT OF DESIRED GOALS:

Course Outcome (CO) is measured through the performance of students by the various assessment tools adopted for that particular course. Each evaluation tool is mapped to a particular verb in Bloom's Taxonomy and further each verb is mapped to a particular CO. Once the Course Outcome is measured, the PO can be measured using a CO-PO matrix.

Measurement of PO attainment shall be done by direct and indirect methods. Direct assessment method and indirect assessment method are considered for 80% and 20% weightages respectively. Target levels of attainment shall be fixed by the Course teacher and Heads of the respective departments.

Direct assessments (rubric based) - Conventional assessment tools such as Term Test, Quiz, Seminar, Assignment and End Semester Examination.

Indirect assessments – Course Survey, Graduate Exit Survey, Feedback from Alumnae, Employer and Parents.

G. ASSESSMENT PROCESS:

Assessment is one or more processes carried out by the institution that identify, collect and prepare data to evaluate the achievement of course outcomes and programme outcomes.

Assessment Process for CO Attainment:

For the evaluation and assessment of CO's and PO's, rubrics are used.

(i) **CO Assessment Rubrics:**

Course Outcome is evaluated based on the performance of students in the Continuous Internal Assessments and in End Semester Examination of a course. Internal assessment contributes 25% and End Semester assessment contributes 75% to the total attainment of a CO.

(ii) **CO Assessment Tools:**

The description of Assessment tools used for the evaluation of COs and POs is given below.

Mode of Assessment	Assessment Tool	Description	Evaluation of Course Outcomes	Related POs
Direct (Weightage 80%)	**Theory Courses- Internal Assessment (Weightage 25%)**			
	Theory-Term Test	Three written examinations are conducted and average of best two is considered	The questions in the three Term Tests, Quiz and Assignment are framed in such a way that they cover all the COs of respective course. The final attainment for each CO under direct assessment is calculated by taking average of the CO attainments from Term Tests, Assignment and Quiz.	PO1 to PO7
	Assignment	One Assignment is given per course		
	Quiz/Seminar	One Quiz/Seminar is conducted for each course		
	Theory Courses- External Assessment(Weightage 75%)			
	End Semester Examination	Examination at the end of the course of 3-hour duration	It covers the entire syllabus of the course. It would generally satisfy all course outcomes for a particular course. The COs are evaluated based on the set attainment levels.	PO1 to PO7
	Practical Courses - Internal Assessment (Weightage 40%)			
	Observation	Day to day evaluation	Lab exercises are planned to cover all COs and CO attainment is calculated.	PO1 to PO7
	Model Practical Examination	Model Exam is conducted for each lab course.		
	Practical Courses - External Assessment (Weightage 60%)			
	End Semester Practical Examination	Examination at the end of the course of 3-hour duration	The final attainment for each CO under direct assessment is calculated by taking average of the CO attainments in Observation, Model Practicals and End Semester Practical Examination	PO1 to PO7
Indirect (Weightage 20%)	Course Survey	This survey gives the opinion of the students on attainment of Course Outcomes	At the end of each course an exit survey is collected from the students and Considered for the CO attainment under Indirect assessment	PO1 to PO7

(iii) **CO Attainment:**

Direct CO Attainment:

Course outcomes of all courses are assessed and the CO wise marks obtained by all the students are recorded for all the assessment tools mentioned above. The respective CO attainment level is evaluated based on set attainment rubrics.

Attainment Levels of COs

Assessment Methods	Attainment Levels	
Internal Assessment	Level 1	60% of students scoring more than average marks or set target marks in internal assessment tools
	Level 2	70% of students scoring more than average marks or set target marks in internal assessment tools
	Level 3	75% of students scoring more than average marks or set target marks in internal assessment tools
End Semester Examination	Level 1	60% of students scoring more than average marks or set target marks in End Semester Examination
	Level 2	70% of students scoring more than average marks or set target marks in End Semester Examination
	Level 3	75% of students scoring more than average marks or set target marks in End Semester Examination

Target setting for Assessment method:

For setting up the target of internal assessment tools, the average of last three tests must be taken into consideration and it should be kept as target. If the average marks are not available then current average can also be used as target.

For setting up the target of End Semester Examination, the average of the last year examination shall be set as target. If the average marks are not available then current average can also be used as target.

Formula for Attainment for each CO:

Attainment = Percentage of students who have scored more than the target marks

$$\% \text{ of Attainment} = \frac{\text{Number of students who scored more than the target}}{\text{Total number of students}} * 100$$

- Internal Attainment is the average of attainments obtained using various internal assessment tools.
- For Theory Courses,
  Direct CO Attainment =25% of internal attainment + 75% of End Semester attainment
- For Practical Courses,
  Direct CO Attainment =40% of internal attainment + 60% of End Semester attainment

Indirect CO Attainment:

At the end of each course, an exit survey is collected from the students and it gives the opinion of the students on attainment of Course Outcomes. A questionnaire is designed to reflect the views of the students about the attainment of course outcomes.

Overall CO Attainment = 80% of Direct CO Attainment + 20% of Indirect CO Attainment

In each course, the level of attainment of each CO is compared with the predefined targets, if the target is not reached, the course teacher takes necessary steps for the improvement to reach the target.

If the average attainment of a particular course for two consecutive years is greater than 80% of the maximum attainment value (i.e. 80% of 3 = 2.4), then for that particular course the current rubrics for attainment must be changed to analyze continuous improvement.

II. ASSESSMENT PROCESS FOR OVERALL PO ATTAINMENT

With the help of CO against PO mapping, the PO attainment is calculated. PO assessment is done by giving 80% weightage to direct assessment and 20% weightage to indirect assessment. Direct assessment is based on CO attainment, where 75% weightage is given to attainment through End Semester examination and 25% weightage is given to attainment through internal assessments. Indirect assessment is done through Graduate exit survey.

PO Assessment Tools

Mode of Assessment	Assessment Tool	Description
Direct Attainment (Weightage 80%)	CO Assessment	This is computed from the calculated CO Attainment value for each Course
Indirect Attainment (Weightage 20%)	Graduate Exit survey	At the end of the programme, Graduate Exit Survey is collected from the graduates and it gives the opinion of the graduates on attainment of Programme Outcomes

Direct Attainment of POs for all Courses

At the end of the each programme, the direct PO assessment is done from the CO attainment of all courses. The direct PO attainment for a particular course is determined from the attainment values obtained for each course outcome related to that PO and the CO-PO mapping values. For the evaluation and assessment of CO's and PO's, the same set of rubrics is used.

Programme Articulation Matrix (PAM):

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Average Direct PO Attainment								
Direct PO Attainment in %								

Indirect Attainment of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Graduate Exit survey							
Indirect PO Attainment							

Indirect PO Attainment = 20% of PO Attainment from Graduate Exit survey

Attainments of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Direct Attainment (Weightage 80%)							
Indirect Attainment (Weightage 20%)							
Overall PO Attainment							

Overall PO Attainment = 80% of Direct PO Attainment + 20% of Indirect PO Attainment

III. ASSESSMENT PROCESS FOR PROGRAMME EDUCATIONAL OBJECTIVES

The curriculum is designed so that all courses contribute to the achievement of PEOs. The marks secured by the students in these courses indicate the level of achievement of the PEOs. In addition, Alumnae survey, Placements of students and progression to higher studies also contribute to the attainment of PEOs.

Type of Assessment	Assessment Tool	Assessment criteria	Data collection frequency	Responsible entity	Indicators for Attainment of PEO
Direct Weightage 70%	PO Assessment	This is computed from the calculated PO Attainment values for each Course			PEO-1 PEO-2 PEO-3 PEO-4
Indirect Weightage 30%	Alumnae Survey Weightage 10%	Once in a year, Alumnae Survey is collected from the alumnae and it gives the opinion of the alumnae on attainment of Programme Outcomes and their achievements			PEO-1 PEO-2 PEO-3 PEO-4
	Placement Record Weightage 10%	Number of students Placed	Once in a year	Placement cell	PEO-1 PEO-2 PEO-3 PEO-4
	Higher Education Weightage 10%	Number of students opted for higher education	Once in a year	Department	PEO-1 PEO-2 PEO-3 PEO-4

The attainment of the PEOs

Direct Evaluation of Programme Outcomes (POs) of the concerned PEO

POs	PEO1	PEO2	PEO3	PEO4
PO1				
PO2				
PO3				
PO4				
PO5				
PO6				
PO7				
Average Direct PEO Attainment in %				
Total Direct PEO Attainment				

Indirect Attainment of PEOs

PEOs	PEO1	PEO2	PEO3	PEO4
Alumnae Survey				
Average PEO Attainment from Alumnae Survey				

$$\%\ \text{of Indirect Attainment from placement} = \frac{\text{Number of students who have got placement}}{\text{Total number of students}} * 100$$

$$\%\ \text{of Indirect Attainment from higher studies} = \frac{\text{Number of students who pursue higher studies}}{\text{Total number of students}} * 100$$

Indirect PEO Attainment = 10% attainment of Alumnae survey + 10% Attainment from placement+ 10 % Attainment from higher studies

Overall PEO Attainment = 70% of Direct PEO Attainment+ Indirect PEO Attainment
Expected Level of Attainment for each of the Programme Educational Objectives

PEO	Level of Attainment
Value >=70%	Excellent
Value > = 60 and value < 70	Very good
Value > = 50 and value < 60	Good
Value > = 40 and value < 50	Satisfactory
Value < 40	Not Satisfactory

Level of PEO attainment

Graduation Batch	Overall PEO Attainment	Whether Expected level of PEO is achieved?

Process of Redefining the PEOs:

The college has always been involving the key stake holders in collecting information and suggestions with regard to curriculum development and curriculum revision. Based on the information collected the objectives of the programme are defined, refined and are inscribed in the form of PEO's. The level of attainment of PEO's defined earlier will be analyzed and will identify the need for redefining PEOs. Based on identified changes in terms of curriculum, regulations and PEOs, the administrative system like BOS, Academic Council and Governing Body involve appropriate actions.

IV. Eligibility

As per the G.O (ID) No. 75, for admission to M.Sc Physics, a candidate must have passed the 3 years degree course in Physics (B.Sc Physics) (under the 10+2+3 pattern) recognized by the university as equivalent there to.

V. Duration of the Programme:

The duration of the programme is two academic years. Each Academic Year consists of two semesters. The duration of a semester is 90 working days.

VI. Attendance:

The Rules regarding the attendance for regular classes for the candidates to appear for the End Semester examinations are framed as given below:

a) Each student must put in a minimum attendance of 68 days (75% of 90 days per semester) so as to become eligible to appear for the End Semester examinations.

Shortage of attendance:

b) Those students with an attendance of 67 days and less but 59 days (65%) and above can be permitted to appear for the End Semester examinations provided, they get the condonation certificate from the Principal stating the proper reasons for the absence, within 5 days after the last working day of the concerned class. The Certificate may be obtained from the office on payment of penalty as per Madurai Kamaraj University norms.

c) In case of attendance with 58 days and less but 45 days (50%) and above, the students cannot appear for the End Semester examinations of that semester but can appear for the next End Semester examinations by obtaining special permission from the Principal providing necessary documents supporting the reasons for absence on payment of penalty as per Madurai Kamaraj University norms.

d) Students with an attendance of 44 days and less should repeat the whole semester.

VII. Evaluation Procedure:

Evaluation of each theory course will be 25% for CIA and 75% for End Semester examinations. Evaluation of each Practical Course will be 40% for CIA and 60% for End Semester Examinations. Project will be evaluated for 100% in the End Semester Examination. A mark statement will be issued to every student at the end of every semester.

VIII. Passing Minimum:

For a pass in each course a student should secure a minimum of 45% marks in the End Semester examinations and a minimum of 50% marks in aggregate (i.e. marks of CIA and End Semester examinations put together).The same rule is applicable for Dissertation/Project Report and Viva – Voce.

Minimum credits to be earned for M.Sc. Physics Programme is 90 credits.

IX. Eligibility condition for getting the Degree:

A Candidate undergoing the M.Sc degree Programme in Physics will be eligible for the award of degree in Physics, if she completes the entire Programme and pass all the examinations prescribed for the Programme.

As per UGC guidelines, a student who is not able to complete the Programme within two years, may be allowed for 2 years period beyond the two years duration to clear the backlog to be qualified for the degree.

X. Classification of Successful Candidates:

The successful candidates will be classified as per the details given in the table below:

CGPA	Grade	Classification of Final Result
9.50000 – 10.00000	O+	First Class
9.00000 – 9.49999	O	
8.50000 – 8.99999	D++	
8.00000 – 8.49999	D+	
7.50000 – 7.99999	D	
7.00000 – 7.49999	A++	
6.50000 – 6.99999	A+	
6.00000 – 6.49999	A	
5.50000 – 5.99999	B+	Second Class
5.00000 – 5.49999	B	
4.50000 – 4.99999	C+	Third Class
4.00000 – 4.49999	C	
0.00000 – 3.99999	U	Re-appear

XI. Award of Ranks:

Candidates who qualify themselves for the respective Degree Programme, passing all the examinations in the first attempt are eligible for ranking based on the CGPA gained in the Core courses.

For Each Major:-

$$\textbf{CUMULATIVE GRADE POINT AVERAGE [CGPA]} = \frac{\sum_i C_i G_i}{\sum_i C_i}$$

CGPA=Sum of the multiplication of grade points by the respective credits of the course cleared in the entire Programme / Sum of the credits of all the courses cleared in the programme

'C_i' = Credits earned for course *i* in any semester

'G_i'= Grade point obtained for course *i* in any semester

'Σ_i'= Summation of all courses cleared in a semester in the case of GPA and all courses cleared in all semesters in the case of CGPA.

XII. Other Provisions:

1. In the Mark Statement, 'AA' will be marked against the courses for which the candidate was absent for the examination.
2. If a candidate is found indulging in malpractice, she will be expelled from the examination hall right away and debarred from appearing in all examinations of that particular semester. She can be allowed to take up examination only in the consecutive semester.
3. The courses she has already appeared during that semester will not be considered.
4. A student can appear for any number of arrear courses.
5. Repeat Examinations will be conducted for the final semester papers within a month after the publication of final semester result.
6. Revaluation is permitted.

XIII. Transitory Provisions:

Students from other institutions will be granted year exemption alone and she has to appear and pass all the courses of all semesters under CBCS pattern in order to get the consolidated Statement of Marks/Grade.

Those students who have discontinued in the middle of the Programme may be admitted in the respective semester if they want to rejoin and complete the Programme, provided they had not got their transfer certificate.

The Standard Fireworks Rajaratnam College for Women, Sivakasi
M.Sc. Physics – Allotment of Hours and Credits
(For those who joined in June 2017 and later)

Subjects	**I Semester**	**II Semester**	**III Semester**	**IV Semester**	**Total Credits**
Core courses:					
Core Paper I	6 **(5)**	6 **(5)**	6 **(5)**	6 **(5)**	
Core Paper II	6 **(4)**	6 **(4)**	6 **(4)**	6 **(5)**	
Core Paper III	6 **(4)**	6 **(4)**	6 **(4)**	6 **(4)**	
Lab	6 **(4)**	6 **(4)**	6 **(4)**	-	
Project and Viva Voce	-	-	-	6 **(5)**	
Total	24(**17**)	24(**17**)	24(**17**)	24 **(19)**	**70**
Electives	6 **(5)**	6(**5**)	6(**5**)	6 **(5)**	**20**
Total	30 **(22)**	30 **(22)**	30 **(22)**	30 **(24)**	**90**

The Standard Fireworks Rajaratnam College for Women, Sivakasi (Autonomous)
Department of Physics
PG Programme
(For those who joined in June 2017 and later)

Semester	Course Code	Course Title	Teaching / Practical Hours per week	Credits	Duration of Exam. (hrs.)	Marks Allotted		
						Internal	External	Total
	Core Courses							
I	HLPH11	Mathematical Physics – I	6	5	3	25	75	100
	HLPH12	Classical and Statistical Mechanics	6	4	3	25	75	100
	HLPH13	Linear Integrated Circuits	6	4	3	25	75	100
	HLPH1L	Lab – I	6	4	5	40	60	100
	HLPH1E	Elective I	6	5	3	25	75	100
II	HLPH21	Quantum Mechanics – I	6	5	3	25	75	100
	HLPH22	Mathematical Physics - II	6	4	3	25	75	100
	HLPH23	Electromagnetic Theory	6	4	3	25	75	100
	HLPH2L	Lab – II	6	4	5	40	60	100
	HL2E	Elective II	6	5	3	25	75	100
III	HLPH31	Solid State Physics -I	6	5	3	25	75	100
	HLPH32	Quantum Mechanics – II	6	4	3	25	75	100
	HLPH33	Computer Oriented Numerical Methods	6	4	3	25	75	100
	HLPH3L	Lab – III	6	4	5	40	60	100
	HLPH3E	Elective III	6	5	3	25	75	100
IV	HLPH41	Solid State Physics -II	6	5	3	25	75	100
	HLPH42	Nuclear Physics	6	5	3	25	75	100
	HLPH43	Molecular Spectroscopy	6	4	3	25	75	100
	HLPH4P	Project and Viva Voce	6	5	-	-	100	100
	HLPH4E	Elective IV	6	5	3	25	75	100

Elective Courses								
I	HLPH1E1	Microprocessor	6	5	3	25	75	100
	HLPH1E2	Digital Logic Design	6	5	3	25	75	100
II	HLPH2E1	Applied Physics	6	5	3	25	75	100
	HLPH2E2	Microcontroller	6	5	3	25	75	100
III	HLPH3E1	CSIR UGC - NET Preparatory course - Physics	6	5	2	25	75	100
	HLPH3E2	Recent Trends in Physics	6	5	3	25	75	100
IV	HLPH4E1	Nano Physics	6	5	3	25	75	100
	HLPH4E2	Medical Physics	6	5	3	25	75	100

M.Sc Physics

Programme Articulation Matrix (PAM) - Weights

Course Code	Course title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
HLPH11	**Mathematical Physics-I**	31	22	13	13	0	0	5
HLPH12	**Classical and Statistical Mechanics**	19	30	27	11	0	0	5
HLPH13	**Linear Integrated Circuits**	19	15	21	3	0	0	5
HLPH1L	**Lab-I**	30	21	27	12	0	9	5
HLPH1E	**Elective I**	31	45	15	15	0	0	0
HLPH21	**Quantum Mechanics-I**	25	27	30	5	0	0	3
HLPH22	**Mathematical Physics-II**	31	25	19	11	0	0	5
HLPH23	**Electromagnetic Theory**	33	15	15	15	0	0	0
HLPH2L	**Lab-II**	30	21	27	12	0	9	5
HL2E	**Elective II**	25	16	12	9	0	0	0
HLPH31	**Solid State Physics - I**	33	27	18	0	0	0	5
HLPH32	**Quantum Mechanics - II**	25	30	30	5	0	0	3
HLPH33	**Computer Oriented Numerical Methods**	25	22	22	17	0	0	0
HLPH3L	**Lab-III**	15	45	15	15	0	9	5
HLPH3E	**Elective III**	31	36	36	0	0	0	5
HLPH41	**Solid State Physics -II**	29	24	9	0	0	0	5
HLPH42	**Nuclear Physics**	25	22	21	11	0	0	1
HLPH43	**Molecular Spectroscopy**	21	33	22	15	0	0	4
HLPH4P	**Project and Viva Voce**	11	22	18	27	15	9	5
HLPH4E	**Elective IV**	31	25	25	22	0	0	0
	Total	**520**	**523**	**422**	**218**	**15**	**36**	**66**

M.Sc Physics

Programme Articulation Matrix (PAM) - Weighted Percentage

Course Code	Course title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
HLPH11	**Mathematical Physics-I**	5.96	4.21	3.08	5.96	0	0	7.58
HLPH12	**Classical and Statistical Mechanics**	3.65	5.74	6.4	5.05	0	0	7.58
HLPH13	**Linear Integrated Circuits**	3.65	2.87	4.98	1.38	0	0	7.58
HLPH1L	**Lab-I**	5.77	4.02	6.4	5.5	0	25	7.58
HLPH1E	**Elective I**	5.96	8.6	3.55	6.88	0	0	0
HLPH21	**Quantum Mechanics-I**	4.81	5.16	7.11	2.29	0	0	4.55
HLPH22	**Mathematical Physics-II**	5.96	4.78	4.5	5.05	0	0	7.58
HLPH23	**Electromagnetic Theory**	6.35	2.87	3.55	6.88	0	0	0
HLPH2L	**Lab-II**	5.77	4.02	6.4	5.5	0	25	7.58
HL2E	**Elective II**	4.81	3.06	2.84	4.13	0	0	0
HLPH31	**Solid State Physics - I**	6.35	5.16	4.27	0	0	0	7.58
HLPH32	**Quantum Mechanics - II**	4.81	5.74	7.11	2.29	0	0	4.55
HLPH33	**Computer Oriented Numerical Methods**	4.81	4.21	5.21	7.8	0	0	0
HLPH3L	**Lab-III**	2.88	8.6	3.55	6.88	0	25	7.58
HLPH3E	**Elective III**	5.96	6.88	8.53	0	0	0	7.58
HLPH41	**Solid State Physics -II**	5.58	4.59	2.13	0	0	0	7.58
HLPH42	**Nuclear Physics**	4.81	4.21	4.98	5.05	0	0	1.52
HLPH43	**Molecular Spectroscopy**	4.04	6.31	5.21	6.88	0	0	6.06
HLPH4P	**Project and Viva Voce**	2.12	4.21	4.27	12.39	100	25	7.58
HLPH4E	**Elective IV**	5.96	4.78	5.92	10.09	0	0	0
	Total	**100.01**	**100.02**	**99.99**	**100**	**100**	**100**	**100.06**

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER – I
CORE COURSE
HLPH11 - MATHEMATICAL PHYSICS – I
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to
CO1: define matrices, vectors, theorems, differential equations, Beta function, Gamma function, Bessel and Legendre functions.
CO2: discuss about vectors, matrices, differential equations and special functions
CO3: solve differential equations using special functions
CO4: apply the generating function to obtain the recurrence relations for special functions
CO5: analyze the orthogonal property and recurrence relations of special functions

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	1	0	0	1
CO2	3	1	0	3	0	0	1
CO3	9	3	1	3	0	0	1
CO4	9	9	3	3	0	0	1
CO5	9	9	9	3	0	0	1
Weightage of the course	**31**	**22**	**13**	**13**	**0**	**0**	**5**
Weighted percentage of Course contribution to POs	**5.96**	**4.21**	**3.08**	**5.96**	**0**	**0**	**7.58**

Unit I:
Vector Analysis: (18hrs)
Line, surface and volume integrals – Gauss Divergence Theorem – Deductions from Gauss Divergence Theorem – Stoke's Theorem – Deductions from Stoke's theorem.

Matrix Algebra:

Solution of Linear equation – Linear Transformation – Orthogonal and Unitary Transformations – Similarity Tranformation – Eigen Values, Eigen Vectors; Charateristic equation of a Matrix – Cayley-Hamilton Theorem – Diagonalization of Matrices.

Unit II:

Differential Equations: **(18hrs)**

Introduction – Order and Degree of a Differential Equation – Solution of First Order Differential Equation by the Method of Separation of Variables – Linear Differential Equation of First Order and its Solution – Solution of Second Order Differential Equations with Constant Coefficients.

Unit III:

Special Functions: **(18hrs)**

Definitions – Symmetry property of beta function – Evaluation of Beta Function – Transformation of Beta Function – Evaluation of Gamma Function – Tranformation of Gamma Function – Relation between beta and gamma functions - Hermite functions, Laguerre functions(Generating Function , recurrence relations, Orthogonality relation, Rodrigue's Formula).

Unit IV:

Bessel Functions: **(18hrs)**

Bessel's differential equation : Bessel functions of first and second kind - Differential equation reducible to Bessel's equation – Recurrence formulae for $J_n(x)$ – Generating function for $J_n(x)$

Unit V:

Legendre Function: **(18hrs)**

Legendre differential equations and Legendre functions- Generating function of Legendre polynomials- Rodrigue's formula for Legendre polynomials – orthogonal properties of Legendre polynomial - Recurrence formulae for Legendre polynomials

Text Books:

Satya Prakash	-	Mathematical Physics with Classical Mechanics, Sultan Chand & Sons, New Delhi, 6th Revised Edition 2012.
Unit I	-	Chapter 1: Section : 1.3, 1.7 – 1.10 (Page no. 34 – 36, 53 - 74)
		Chapter 2: Section : 2.27 – 2.35 (Page no. 181 – 214)
Unit II	-	Chapter 7: Section : 7.1 – 7.5 (Page no. 482 – 499)
Unit III	-	Chapter 4: Section : 4.1 – 4.7 (Page no. 316 – 320)
		Chapter 7: Section 7.35 – 7.44 (Page no. 583 – 598)
Unit IV	-	Chapter 7: Section : 7.22, 7.24, 7.26, 7.27 (Page no. 549 – 565)
Unit V	-	Chapter 7: Section : 7.12 – 7.16 (Page no. 514 – 536)

Reference Books:

1. Pipes & Harvill - Applied Mathematics for Engineers and Physicists Mc Graw-Hill International Book Company 3rd Edition,1971
2. Butkov - Mathematical Methods for Physicists-1st edition, Addison Wesley Publishing company,1973
3. George B. Arfken & Hans J. Weber - Mathematical Methods for Physicists - 6th Edition. Published by Elsevier 2005

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI

DEPARTMENT OF PHYSICS

M.Sc. PHYSICS

SEMESTER – I

CORE COURSE

HLPH12- CLASSICAL AND STATISTICAL MECHANICS

(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 04

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: define fundamental concepts of both classical and statistical mechanics
CO2: discuss the equations of Lagrangian, Hamiltonian, canonical and different ensembles of statistical mechanics
CO3: solve simple problems in Lagrangian formulation, canonical transformations, Poisson's bracket and statistical mechanics
CO4: analyze various functions in classical, statistical and quantum statistical mechanics
CO5: appraise the requisites of classical and statistical mechanics

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	1	0	0	1
CO2	3	3	0	1	0	0	1
CO3	3	9	9	3	0	0	1
CO4	3	9	9	3	0	0	1
CO5	9	9	9	3	0	0	1
Weightage of the course	**19**	**30**	**27**	**11**	**0**	**0**	**5**
Weighted percentage of Course contribution to POs	**3.65**	**5.74**	**6.4**	**5.05**	**0**	**0**	**7.58**

Unit I:

Basic Concepts of Lagrangian equation: (18hrs)

Constraints- D'Alembert's Principle and Lagrange's Equations- Velocity – Dependent Potentials and the Dissipation Function- Simple Applications of the Lagrangian Formulation- Hamilton's Principle- Derivation of Lagrange's Equations from Hamilton's Principle- Extension of Hamilton's Principle to Nonholonomic Systems.

Unit II :

Hamiltonian Methods : (18hrs)

Legendre Transformations and the Hamilton Equations of motion – Cyclic Coordinates and conservation theorems – Routh's Procedure – Hamilton's equations from a variational Principle – The Principle of Least action.

Unit III :

Canonical Transformations : (18hrs)

The equations of Canonical Transformations – Examples of Canonical Transformations - Poisson Brackets and other Canonical invariants - Equation of motion in the Poisson Bracket formulation. The Hamilton-Jacobi Equation for Hamilton's Principle Function-Hamilton –Jacobi equation for Hamilton's characteristic function.

Unit IV :

Methods of Statistical Mechanics : (18hrs)

Phase space –More about phase space, Ensemble and Ensemble average- Ensembles-Uses of ensembles-Density of Distribution in phase space - Liouville's Theorem – Connection between Statistical and Thermo dynamical Quantities-Micro canonical ensemble – Gibbs canonical ensemble-Grand canonical ensemble-Equipartition Theorem from canonical distribution - Thermodynamic properties of diatomic molecules – Transition from classical statistical mechanics to quantum statistical mechanics-indistinguishability and quantum statistics - Exchange symmetry of wave functions - Grand canonical ensemble and quantum statistics.

Unit V:

Quantum Statistical Mechanics: (18hrs)

Energy and pressure of the Bose Einstein gas- Gas degeneracy – Bose Einstein Condensation – Thermal properties of Bose Einstein gas – Liquid Helium - Energy and pressure of the Fermi dirac gas – Thermodynamic functions of degenerate Fermi dirac gas-Compressibility of Fermi gas-Electron gas – Free electron model and electronic emission-fluctuation in energy- pressure-volume-Enthalpy-Probability of one dimensional Random walk- Brownian movement.

Text Books :

1. Herbert Goldstein - Classical Mechanics -
   Narosa Publishing House – New Delhi –
   II Edition
   First Printing 1985,

   Unit I - Chapter 1(Page no11- 29);Sections 1.3, 1,4,1.5, 1.6
   Chapter 2 (Page no 35- 37 & 43- 51)
   Sections 2.1,2,3, 2.4

   Unit II - Chapter 8: Sections 8.1(Page no 339-343),
   Sections 8.2 (Page no347-352),
   Sections 8.3, 8.5, 8.6 (Page no 362-371)

   Unit III - Chapter 9: Sections 9.1, 9.2, 9.4, 9.5
   (Page no 378-390, 397-416)
   Chapter 10: Section 10.1, 10.3
   (Page no 438-442, 445-449)

2. Gupta & Kumar	-	Statistical Mechanics Pragati Prakashan, Meerut Twenty First Edition 2006
Unit IV	-	Chapter 1:Sections : 1.1 – 1.5, 1.7, 1.14 (Page no 71-79, 82-86, 90-92) Chapter 3:Sections : 3.0 – 3.2 – 3, 3.4,3.6 (Page no 124- 156, 161-167, 169-175) Chapter 5:Sections : 5.2– 5.4 (Page no189-192) Chapter 6:Section : 6.11(Page no 226-227)
Unit V	-	Chapter 8:Sections : 8.0 – 8.4 (Page no 242- 260) Chapter 9:Sections : 9.0 – 9.4 (Page no 261 - 273) Chapter 12:Sections : 12.0 -12.6 (Page no 303-309)

Reference Book :

Agarwal and Eisner	–	Statistical Mechanics Wiley Eastern Limited, New Age International Limited, Third Reprint 1994

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI

DEPARTMENT OF PHYSICS

M.Sc. PHYSICS

SEMESTER – I

CORE COURSE

HLPH13 – Linear Integrated Circuits

(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 04

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: list the various steps in fabrication of semiconductors, basic information of op-amp, comparator, timer and phase locked loops

CO2: explain the characteristics of op-amp and operation of 555 timer

CO3: use op-amp for different applications and construct active and passive components

CO4: analyze waveform generators, detectors, oscillators, op-amp, filters, multivibrators and fabrication technology of ICs.

CO5: discuss the working of op-amp, 555 timer and phase locked loop with necessary diagrams

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	3	3	0	0	0	1
CO2	3	3	3	0	0	0	1
CO3	3	3	9	1	0	0	1
CO4	9	3	3	1	0	0	1
CO5	3	3	3	1	0	0	1
Weightage of the course	**19**	**15**	**21**	**3**	**0**	**0**	**5**
Weighted percentage of Course contribution to POs	**3.65**	**2.87**	**4.98**	**1.38**	**0**	**0**	**7.58**

Unit I:

Integrated circuit fabrication: (18hrs)

Introduction-Classification-Fundamentals of Monolithic IC Technology-Basic Planar Processes-Silicon Wafer Preparation-Epitaxial Growth-Oxidation-Photolithography-

Diffusion-Ion Implatation-Isolation Techniques-Metallization-Assembly Processing and Packaging-Fabrication of a Typical Circuit-Active and Passive Components for IC's-Monolithic Transistors-Monolithic Diodes-Integrated Resistors-Integrated Capacitor-Integrated Inductors- Fabrication of FET's-JFET Fabrication-MOSFET Fabrication-Complementary MOSFET (CMOS) Fabrication-Thin and Thick Film Technology-Deposition of thin film-Thick Film Technology-Surface Mount Technology (SMT)

Unit II:

Operational Amplifier: (18hrs)

Introduction - Basic information of Op-Amp-The ideal operational amplifier-Open loop operation of Op-Amp- Open Loop Operation of Op-Amp-Feedback in ideal Op-Amp-The Inverting Amplifier-The Non Inverting Amplifier-Differential Amplifier-Common Mode Rejection Ratio-Circuit for Improving CMRR-Input Resistance- -Motorola MC1530 Op-Amp-741 Op-Amp.

Unit III:

Operational amplifier applications: (18hrs)

Introduction-Basic Op-Amp Applications -Instrumentation Amplifier-AC Amplifier-V to I and I to V Converter-Op Amp Circuits using diodes- Sample and Hold Circuit-Log and Antilog Amplifiers-Integrator-Electronic Analog computation-Monolithic power amplifiers-Operational Transconductance Amplifier

Unit IV: (18hrs)

Comparators and Waveform Generators:

Introduction-Comparator-Applications of Comparator-Regenerative Comparator (Schmitt Trigger) - Sine wave Generators

Active Filters:

RC Active Filters-First Order Low Pass Filter-Second Order Active Filter-Higher Order Low Pass Filter-High Pass Active Filter-Band Pass Filter-Band Reject Filter

Unit V: (18hrs)

555 Timer:

Introduction-Description of Fundamental diagram-Monostable Operation-Applications in Monostable Mode- Astable operation-Applications in Astable Mode-Schmitt Trigger.

Phase-Locked Loops:

Basic Principles-Phase Detector /Comparator-Analog Phase Detector-Digital Phase Detector-Voltage Controlled Oscillator(VCO)-Low Pass Filter-PLL Applications-Frequency Multipilication/Division-Frequency Translation-FM Demodulation-Frequency Shift Keying(FSK) Demodulator

Introduction-Basic Principles-Phase Detector Comparator-Voltage Controlled Oscillator (VCO)-Low Pass Filter-Monolithic Phase-Locked Loop-PLL Applications

Text Books:

Linear Integrated Circuits- D.ROY CHOUDHURY
SHAIL B.JAIN
New Age International (P) Limited, Publishers
Reprint 2005.

Unit 1 - Chapter 1
Section (1.1-1.2, 1.4-1.9) (p.no:1-2, 4-40)

Unit 2 - Chapter 2
Section (2.1-2.3.7) (2.4.4, 2.5.1-2.5.2) (p.no:44-61, 71-83, 93-98)

Unit 3 - Chapter 4
Section (4.1-4.8, 4.13-4.14) (p.no:15 4-182, 208-217)

Unit 4 - Chapter 5
Section (5.1-5.3, 5.7) (p.no:231-240, 250-253, 289-311)
Chapter 7
Section (7.2-7.20) (p.no: 289-311)

Unit 5 - Chapter 8
Section (8.1-8.5) (p.no:335-353)
Chapter 9
Section (9.2-9.5, 9.7) (p.no:355-367,373-377)

Reference Book:

Jacob Millman and Christos C.Halkias – Integrated Electronics,
(Analog and digital circuits and systems)
Tata McGraw-Hill Publishing Company Ltd,
New Delhi, 1991, 29th reprint 2003.

Ramakant A. Gayakward - Op-Amps & Linear integrated Circuits,
Prentice Hall PTR, 2000, 4th Edition.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER I
CORE COURSE
HLPH1L - LAB – I
(Any 12 Experiments)
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 04

Course Outcomes (CO):
On successful completion of the course, the learners should be able to
CO1: recall the basic principles required for carrying out experiments.
CO2: construct electronic and non-electronic circuits.
CO3: perform experiment and collect data.
CO4: analyze the data both manually and graphically.
CO5: do the experiments by following the laboratory ethics.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	0	0	3	0	0	1
CO2	9	3	9	3	0	0	1
CO3	9	9	9	3	0	3	1
CO4	9	9	9	3	0	3	1
CO5	0	0	0	0	0	3	1
Weightage of the course	**30**	**21**	**27**	**12**	**0**	**9**	**5**
Weighted percentage of Course contribution to POs	**5.77**	**4.02**	**6.4**	**5.5**	**0**	**25**	**7.58**

List of Experiments

1. Young's Modulus of a plate - Hyperbolic fringes.
2. Study of Susceptibility measurements of liquids – Quincke's method.
3. Ultrasonic Studies of Liquids.
4. Electrical Conductivity – Four Probe Conductivity (Energy Gap Calculation).
5. Hall Effect.
6. Dielectric Studies of Liquids.
7. Determination of numerical aperture and bending loss using Fiber Optics kit.
8. Mutual inductance between two coils for various distances by Carey Foster method.
9. Photodiode Characteristics.
10. Construction of Saw tooth Wave generator.
11. Inverting and Non- inverting amplifier using Op-amp.
12. Emitter Follower.
13. Study of active low pass filter using Op-amp.
14. Study of active high pass filter using Op-amp.
15. Clipper circuit using Op-amp.
16. Astable multivibrator using Op-amp.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER I
ELECTIVE COURSE
HLPH1E1 - MICROPROCESSOR
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to
CO1: analyse the architecture and instruction set of the microprocessor Intel 8085
CO2: explain programming techniques with additional instructions
CO3: describe the counters and time delay
CO4: perform data and code conversions
CO5: interface data converters

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	9	3	3	0	0	0
CO2	3	9	3	3	0	0	0
CO3	9	9	3	3	0	0	0
CO4	9	9	3	3	0	0	0
CO5	9	9	3	3	0	0	0
Weightage of the course	**31**	**45**	**15**	**15**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**5.96**	**8.6**	**3.55**	**6.88**	**0**	**0**	**0**

Unit I :
Microprocessor Architecture and Memory Interfacing: (18hrs)

The 8085 MPU – Example of an 8085 based Microcomputer – Memory Interfacing – The SDK-85 Memory System – How does an 8085 based Single Board Microcomputer work. Introduction to 8085 assembly language Programming: the 8085 Programming Model – Instruction Classification – Instruction format – how to write ,assemble and execute a simple program – Overview of the Instruction set. Introduction to 8085 Instructions : Data transfer operations – arithmetic operations – Logic operations – Branch operations – writing assembly language programs – Debugging a program.

Unit II :

Programming techniques with additional instructions : (18hrs)

Programming techniques: Looping , counting and indexing – Additional data transfer and 16 bit arithmetic instructions – Arithmetic operations related to memory – Logic operations – Rotate and Compare – Dynamic debugging.

Unit III :

Counters and time delays : (18hrs)

Counters and time delays – Illustrative programs – Hexadecimal Counters – Zero to nine counter – Generating pulse waveform – Debugging counters and time delay programs. Stack and subroutines : Stack – subroutine – Conditional call and return instructions – advanced subroutine concepts.

Unit IV :

Code conversion, BCD arithmetic and 16 bit data operations : (18hrs)

BCD to binary conversion – Binary to BCD conversion – BCD to seven segment LED code conversion – Binary to ASCII and ASCII to binary code conversion-BCD addition – BCD subtraction – Introduction to advanced instructions and applications – Multiplication – Subtraction with carry . Interrupts : The 8085 interrupts – 8085 vectored interrupts – Restart as software instructions.

Unit V :

Interfacing Data converters: (18hrs)

Digital to Analog (D/A) converters: Basic concepts- Digital Converters to Analog (D/A) Converters -Analog to Digital (A/D)converters .General purpose programmable peripheral devices: the 8255A programmable peripheral interface.-Mode 0-Mode 1

Text Book :

Ramesh S. Gaonkar	-	Microprocessor Architecture, Programming and Application with 8085, III Edition (Penram International Publishing , India,1997)
UNIT I	-	Sec. 3.1 to 3.5; (Page No 66 to 97) Sec.5.1 to 5.5 (Page No 140 to 156) Sec.6.1 to 6.6. (Page No 160 to 198)
UNIT II	-	Sec. 7.1 to 7.6 (Page No 210 to 242)
UNIT III	-	Sec. 8.1 to 8.5 (Page No 256 to 271) Sec.9.1 to 9.4 (Page No 276 to 297)
UNIT IV	-	Sec. 10.1 to 10.9 (Page No 304 to 325) Sec. 12.1 to 12.3 (Page No 358 to 376)
UNIT V	-	Sec. 13.1 to 13.2(Page No 386 to 405) Sec.15.1 (Page No 446 to 462)

Reference Book:

B.Ram.	-	Fundamentals of Microprocessors and Microcomputers Fourth Revised and Enlarged Edition Dhanpat Rai & Sons publications(New Delhi) Reprint1996

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER - I
ELECTIVE COURSE
HLPH1E2 - DIGITAL LOGIC DESIGN
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to
CO1: simplify the Boolean functions and to construct circuits
CO2: explain the working of digital circuits (combinational and sequential) with diagram
CO3: design combinational and sequential circuits using gates and flip flops
CO4: analyze combinational and sequential circuits using gates and flip flops
CO5: apply the design procedure to solve problems

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	9	3	3	0	0	0
CO2	3	9	3	3	0	0	0
CO3	9	9	3	3	0	0	0
CO4	9	9	3	3	0	0	0
CO5	9	9	3	3	0	0	0
Weightage of the course	**31**	**45**	**15**	**15**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**5.96**	**8.6**	**3.55**	**6.88**	**0**	**0**	**0**

Unit I :
Simplification of Boolean Functions: (18 hrs)
The Map Method – Two-and Three-Variable Maps – Four-Variable Map – Five- and Six-Variable Maps – Product of Sums Simplification – NAND and NOR Implementation – Other Two-Level Implementations – Don't-Care Conditions.

Unit II :

Combinational Logic : (18 hrs)

Introduction – Design Procedure – Adders – Subtractors – Code Conversion – Analysis Procedure – Multilevel NAND Circuits – Multilevel NOR Circuits – Exclusive-OR and Equivalence Functions.

Unit III :

Combinational Logic with MSI and LSI: (18 hrs)

Introduction – Binary Parallel Adder – Carry propagation-Decimal Adder – BCD adder-Magnitude Comparator – Decoders –Demultiplexers-Encoders- Multiplexers – Read-Only Memory(ROM) – Programmable Logic Array(PLA).

Unit IV :

Sequential Logic: (18 hrs)

Introduction – Flip-Flops – Triggering of Flip-Flops – Analysis of Clocked Sequential Circuits – State Reduction and Assignment – Flip-Flop Excitation Tables – Design Procedure – Design of Counters – Design with State Equations

Unit V :

Registers, Counters and the Memory Unit: (18 hrs)

Introduction – Registers –Register with parallel load-Sequential logic implementation-Shift Registers – Serial transfer-Bidirectional Shift register with parallel load-Serial addition-Ripple Counters –Binary Ripple counter-BCD Ripple counter-Synchronous Counters – Binary counter-Binary Up-Down counter-BCD counter-Timing Sequences -Johnson Counter.

Text Book :

M. Morris Mano – Digital Logic and Computer Design
Prentice-Hall of India Private Limited
New Delhi – 2003

Unit I	–	Chapter 3 – Sections 3.1 – 3.8 Page No : 72 to 102
Unit II	–	Chapter 4 Page No : 116 to 149
Unit III	_	Chapter 5 – Sections 5.1 – 5.8 Page No : 154 to 195
Unit IV	–	Chapter 6 Page No : 202 to 251
Unit V	–	Chapter 7 – Sections 7.1 – 7.6 Page No : 256 to 289

Reference Book:

S Salivahanan & S Arivazhagan - Digital Circuits and Design
Vikas Publishing House Pvt Ltd.
2nd Edition 2003
4th Reprint 2004

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI

DEPARTMENT OF PHYSICS

M.Sc. PHYSICS

SEMESTER – II

CORE COURSE

HLPH21 - QUANTUM MECHANICS - I

(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 04

Course outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: state the properties of Schrodinger formulation and matrix formulation of quantum mechanics.

CO2: explain Schrodinger wave equation, eigen functions, eigen values of energy and momentum, Hermite polynomial, Laguerre polynomials and equations of motion.

CO3: apply Schrodinger wave equation to exactly solvable systems of bound state, collision problems and matrix theory to linear harmonic oscillator problem.

CO4: interpret the significance of Ehrenfest theorem, eigen values, eigen functions, operators and delta functions.

CO5: analyse discrete energy levels and wave functions of bound state, Hilbert space of state vectors, commutator brackets and equations of motion using matrix formulation of quantum theory

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	1	0	0	0
CO2	3	0	3	1	0	0	0
CO3	9	9	9	1	0	0	1
CO4	3	9	9	1	0	0	1
CO5	9	9	9	1	0	0	1
Weightage of the course	**25**	**27**	**30**	**5**	**0**	**0**	**3**
Weighted percentage of Course contribution to POs	**4.81**	**5.16**	**7.11**	**2.29**	**0**	**0**	**4.55**

Unit I :

The Schrödinger Wave Equation : (18hrs)

Development of the Wave Equation: Travelling harmonic waves-need for a wave equation- The one dimensional wave equation-Extension to three dimensions-Inclusion of forces-Interpretation of the wave function: Statistical interpretation- Normalisation of –

Probability current density- Expectation value- Ehrenfest's theorem-Energy eigen functions: Separation of the wave equation- Significance of the separation constant E- Boundary conditions at great distances- Continuity conditions- Boundary conditions for infinite potential energy- Energy eigen values in one dimension- Discrete energy levels- continuous energy eigenvalues- Discrete and continuous eigenvalues in three dimensions.

Unit II :

Eigenfunctions and Eigenvalues: (18hrs)

Interpretative postulates and energy eigenfunctions: Dynamical variables as operators- Exapansion in eigen functions- The total-energy operator- Normalisation in a box- Orthonormality of energy eigenfunctions- Reality of energy eigen values- Exapansion in energy eigenfunctions- The closure property- Probability function and expectation value- General solution of the Schrodinger equation-Momentum Eigenfunctions: Form of the eigen functions- Box normalization- The Dirac delta function- A representation of the delta function- Normalisation in terms of the delta function- Some properties of delta function – Closure- Expansion in momentum eigenfunctions- Probability function and expectation value-Motion of a free wavepacket in one Dimension: The minimum uncertainty product- Form of the minimum packet- Momentum expansion coefficients- Change with time of a minimum packet.

Unit III :

Exactly solvable systems:-I (18hrs)

One dimensional Square well potential : Perfectly rigid walls- Finite Potential step – Energy levels- Parity-Bound states: Linear harmonic oscillator: Asymptotic behaviour- Energy levels- Zero-point energy- Hermite polynomials- Harmonic-oscillator wave function- correspondence with classical theory- Oscillating wave packet.

Unit IV:

Exactly solvable systems:-II (18hrs)

The Hydrogen atom: Reduced mass- Asymptotic behaviour- Energy levels- Laguerre polynomials- Hydrogen-atom wave function- Degeneracy- Separation in parabolic coordinates- energy levels- Wave functions – Collision Theory: One dimensional Square potential barrier: Asymptotic behaviour- Normalisation- Scattering coefficients- Scattering of a wave packet.

Unit V :

Matrix Formulation of Quantum Mechanics: (18 hrs)

Transformation Theory: Hilbert Space – Dirac's bra and ket notation – projection Operators- Physical meaning of matrix elements- Equations of Motion: Schrödinger picture – Heisenberg picture – Interaction picture - Energy representation- Classical lagrangian and Hamiltonian equations of motion- Poisson Brackets- Quantisation of a classical system- Motion of a particle in an electromagnetic field- Evaluation of commutator brackets-Velocity and acceleration of a charged particle– Matrix theory of Harmonic Oscillator : Energy representation- Raising and lowering operators - Matrices for a, x and p –Coordinate representation.

Text Books :

Leonard I. Schiff	-	Quantum Mechanics McGraw Hill International Editions Third Edition, 1968
Unit I	-	Chapter 2: Section 6,7,8 (pg. no. 19-37)
Unit II	-	Chapter 3: Section 10,11,12 (pg.no. 46-64)
Unit III	-	Chapter 2 : Section 9(pg.no.37-43) Chapter 4 : Section 13 (66-76)
Unit IV	-	Chapter 4 : Section 16 (88-98) Chapter 5 : Section 17 (pg.no.101-105)
Unit V	-	Chapter 6 : Section 23,24,25(Pg.no. 163 – 178,180-185)

Reference Books:

1. P.M Mathews and K.Venkatesan	-	A Text Book on Quantum Mechanics Tata McGraw Hill Education Private Limited New Delhi Second Edition 2010
2. John L.Powell & Crasemann	-	Quantum Mechanics Narosa Publishing House, Ninth Reprint 1998
3. Sathya Prakash	-	Advanced Quantum Mechanics Kedar Nath Ram Nath Publishers, Meerut Fifth Revised and enlarged Edition 1999

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER – II
CORE COURSE
HLPH22 - MATHEMATICAL PHYSICS – II
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to
CO1: define tensors, Fourier transforms, Laplace transforms, complex variables, Dirac Delta function, green function and types of groups.
CO2: explain the types of tensor, properties of Fourier, Laplace transforms, Dirac delta function, reducible and irreducible representations.
CO3: solve problems in Fourier, Laplace transforms, tensors, Dirac delta, green functions and complex variables.
CO4: construct the analytic functions of complex variable and the character table for point group.
CO5: analyze Fourier transform, Laplace transform, complex variables, Dirac delta, green functions and character table for point group.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	1	0	0	1
CO2	3	3	3	1	0	0	1
CO3	9	3	3	3	0	0	1
CO4	9	9	3	3	0	0	1
CO5	9	9	9	3	0	0	1
Weightage of the course	**31**	**25**	**19**	**11**	**0**	**0**	**5**
Weighted percentage of Course contribution to POs	**5.96**	**4.78**	**4.5**	**5.05**	**0**	**0**	**7.58**

Unit I:

Tensors: **(18hrs)**

Introduction – n-dimensional space- coordinate transformations- Contravariant and covaraiant vectors – Tensors of higher ranks - Algebra of tensors – Symmetric and antisymmetric tensors – Invariant tensors- conjugate tensors – Line element:metric tensors - Fundamental tensor – raising and lowering of indices: associated tensors

Unit II :

Integral transforms: **(18hrs)**

Introduction – Fourier's Transform – Properties of Fourier's Transform - Fourier Transform of a Derivative – Fourier sine and cosine Transforms of Derivative's - Fourier Transform of Functions of two or three variables – Finite Fourier Transform – Simple Applications of Fourier Transforms- Laplace Transform – Properties of Laplace Transform - Laplace Transform of the Derivative of a function - Laplace Transform of Intergral - Laplace Transform of Periodic Function - Laplace Transform of Some Special Function

Unit III:

Complex variables: **(18 hrs)**

Complex numbers-Algebraic operation - complex conjugates-Modulus and argument of Complex number-Graphical representation on Argand diagram and Trigonometric form-Analytic function-Cauchy-Riemann Differential equation-Laplace's equation; Harmonic function-Cauchy's Integral theorem-Cauchy's integral formula-Derivatives of an analytic function-Morera's theorem- Liouville's theorem-Taylor's series-Laurent's series-singularities of an analytics function-Residues and their evaluation-Cauchy residue theorem-Evaluation of definite integral

Unit IV:

Dirac Delta and Greens Function: **(18hrs)**

Dirac Delta function-Properties of delta function- Fourier transform of delta function – Laplace transorm of delta function -Derivative of delta function-Completeness condition in terms of Dirac Delta function-Three dimensional delta function – Green's Function: An Introduction – Green's Function for 1D case – General Proof of Symmetry Property of Green's Function – Eigen Function

Unit V:

Group Theory: **(18hrs)**

Introduction – Symmetry elements and Symmetry operations – Group postulates and types of group – Multiplication tables – Subgroup and Classes – Matrices – Matrix representations of Symmetry operations – Reducible and Irreducible representations – Orthogonality theorem – Properties of Irreducible representations – Construction of Character Tables for point group.

Text Books:

1 Satya Prakash - Mathematical Physics with Classical Mechanics, Sultan Chand & Sons, New Delhi, 6th Revised Edition 2012.

Unit I - Chapter -3 Sections: 3.1 – 3.18 (Page No: 231 – 263).

Unit II - Chapter 10 : Section : 10.1 – 10.14 (Page No. 820 – 865)

Unit III - Chapter - 6:Sections: 6.1 – 6.5, 6.9-6.11 ,6.14, 6.16- 6.25 Page No: (352 – 357 ,361-372,376-381,384-431)

Unit IV - Chapter 11: Section: 11.1 – 11.11 (Page No. 902 – 921)

2 K. V Raman Group Theory and its Applications to Chemistry, Tata Mac Graw-Hill Publishing Company Limited, New Delhi, 1994

Unit V - Chapter 1 : Section : 1.1 -1.4 (Page No. 1 – 12)
Chapter 3: Section :3.2 – 3.4 (Page No. 43 – 57)
Chapter 4 : Section : 4.1 – 4.4 (Page No. 59 – 65)

Reference Books:

1. Pipes & Harvill - Applied Mathematics for Engineers and Physicists Mc Graw-Hill International Book Company 3rd Edition,1971
2. Butkov Addison - Mathematical Methods for Physicists-1st edition, Wesley Publishing company,1973
3. George B. Arfken & Hans J. Weber - Mathematical Methods for Physicists 6th Edition. Published by Elsevier 2005

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI

DEPARTMENT OF PHYSICS

M.Sc. PHYSICS

SEMESTER – II

CORE COURSE

HLPH23 - Electromagnetic Theory

(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 04

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: recall the basic concepts and different laws of electrostatic fields, magnetic fields, propagation of waves and Maxwell's equations.

CO2: describe static electric and magnetic fields, their behavior in different media, associated laws, boundary conditions and electromagnetic potentials.

CO3: apply different techniques of vector calculus to solve problems related to electromagnetic field.

CO4: analyze the propagation of electromagnetic waves in different media and their interfaces.

CO5: apply Maxwell's equations for electromagnetic wave propagation in different transmission lines and media.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	0	0	0
CO2	3	3	3	3	0	0	0
CO3	9	3	3	3	0	0	0
CO4	9	3	3	3	0	0	0
CO5	9	3	3	3	0	0	0
Weightage of the course	**33**	**15**	**15**	**15**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**6.35**	**2.87**	**3.55**	**6.88**	**0**	**0**	**0**

Unit I

Electrostatic Fields I : **(18hrs)**

Coulomb's law – The Electric Field Intensity – The Electric potential - The Electric field inside and outside macroscopic bodies – Gauss's law – The equations of Poisson and Laplace – Conductors – Calculation of electric field produced by a simple charge distribution – The electric dipole – The linear electric quadrupole – Electric multipoles – The electric field outside an arbitrary charge distribution – The average electric field intensity inside a sphere containing an arbitrary charge distribution - The potential energy of a charge distribution – Energy density in an electric field – Forces on conductors.

Electrostatic Fields II :

Electric polarization – Electric field at an exterior point

Electrostatic Fields III :

Continuity of V, D_n, E_t at the interface between two different media – The uniqueness theorem – Solution of Laplace's equation in rectangular coordinates – Solution of Poisson's equation for V- Solution of Poisson's equation for E.

Unit II

Magnetic Fields I: **(18hrs)**

Magnetic forces – The magnetic induction B – The Biot – Savart law – The force on a point charge moving in a magnetic field – The divergence of the magnetic induction B – The vector potential A – The curl of the magnetic Induction B – Ampere's circuital law – The magnetic dipole.

Magnetic Fields II :

The Faraday induction law – The induced electric field intensity E in terms of the vector potential A – Induced electromotance in a moving system – Inductance and induced electromotance – Energy stored in a magnetic field.

Unit III

Maxwell's Equations : **(18hrs)**

The conservation of electric charge – The potentials V and A – The Lorentz condition – The divergence of E and the non-homogenous wave equation for V - The non-homogenous wave equation for A - The curl of B-Maxwell's Equations – Duality – Lorentz's Lemma – The non-homogenous wave equations for E and B.

Unit IV **(18hrs)**

Propagation of Electromagnetic waves I :

Plane electromagnetic waves in free space – The E and H vectors in homogenous, isotropic, linear and stationary media – Propagation of plane electromagnetic waves in non-conductors - Propagation of plane electromagnetic waves in conducting media - Propagation of plane electromagnetic waves in good conductors - Propagation of plane electromagnetic waves in low – pressure ionized gases.

Unit V **(18hrs)**

Propagation of Electromagnetic waves II :

The laws of Reflection and Snell's Law of Refraction – Fresnel's Equations – Reflection and Refraction at the Interface Between Two Nonmagnetic Nonconductors – Total Reflection at an Interface Between Two nonmagnetic Nonconductors .

Propagation of Electro magnetic waves III :

Propagation in a straight line – TE and TM waves-TEM waves – Boundary conditions at the surface of metallic wave guides - The coaxial line – The hollow rectangular wave guide.

Text Book:

Paul Lorrain and Dale R. Corson - Electromagnetic Fields and Waves
CBS Publishers & Distributors (New Delhi)
II Edition, First Indian Edition 1986, Reprint 2003

Unit I - Chapter 2(Pg 40-81)
Chapter 3 : Section 3.1, 3.2(Pg 91-97)
Chapter 4 :Section 4.1,4.2,4.4,4.6, 4.7(Pg138-144,156-163,176-180)

Unit II - Chapter 7 (Pg292-323)
Chapter 8 : Section 8.1 to 8.5(Pg332-356)
Unit III - Chapter 10 (Pg 422-453)
Unit IV - Chapter 11 (Pg 459-495)
Unit V - Chapter 12: Section 12.1-12.4(Pg 504-526)
Chapter 13: Section 13.1- 13.3.1 (Pg 557-578)

Reference books :

1. John R. Reitz – Foundation of Electromagnetic theory
Frederick J.Milford Narosa publishing house–
Robert W.Christy III Edition -Twelfth Reprint, 1998

2. David J. Griffiths – Introduction to Electrodynamics –
Pearson Education –
III Edition Fourth Indian Reprint, 2004

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER II
CORE COURSE
HLPH2L - Lab –II
(Any 12 Experiments)
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 04

Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1: state the principles of the experiments.
CO2: perform electronic and non-electronic experiments
CO3: calculate the physical parameters
CO4: analyse the data and draw conclusions manually and graphically
CO5: do experiments with laboratory ethics

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	0	0	3	0	0	1
CO2	9	3	9	3	0	0	1
CO3	9	9	9	3	0	3	1
CO4	9	9	9	3	0	3	1
CO5	0	0	0	0	0	3	1
Weightage of the course	**30**	**21**	**27**	**12**	**0**	**9**	**5**
Weighted percentage of Course contribution to POs	**5.77**	**4.02**	**6.4**	**5.5**	**0**	**25**	**7.58**

List of Experiments:

1. Wavelength of Spectral lines using Hartmann's Interpolation Method (Arc spectrum)
2. Young's Modulus of a plate using Elliptic fringes.
3. Edser Butler fringes.
4. Wavelength of sodium light and separation between D_1 and D_2 lines of sodium light using Michelson's interferometer.
5. Ultrasonic Studies of Solids.
6. Dielectric Studies of Solids.
7. Thermal Expansion of solid using Interference method.
8. Susceptibility of solid using Guoy Balance.
9. Amplitude Modulation.
10. Characteristics studies on UJT .
11. Relaxation Oscillator using UJT.
12. Waveform Generation and Hysteresis studies using Schmitt Trigger.
13. Solving Simultaneous equations using Op Amp.
14. Solving Differential equations using Op Amp.
15. Oscillator using Op Amp
16. Sample and Hold circuit using Op-amp.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN
SIVAKASI
DEPARTMENT OF PHYSICS
SEMESTER – II
ELECTIVE COURSE
HLPH2E1 - APPLIED PHYSICS
(For those admitted in June 2017 and later)

Contact Hours per Week : 06
Total no. of hours per Semester : 90
Total no. of Credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1: list various optical and medical instruments, various types of communication
CO2: describe the working of optical and medical instruments, fibre optics and various communication systems
CO3: solve problems related to fibre optics and communication system
CO4: compare various telescopes, scanning methods, classification of holograms, types of optical fibre and power budget calculation
CO5: appraise the application of optical phenomenon and medical instrument in their relevant field

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	1	0	0	0
CO2	3	3	3	1	0	0	0
CO3	3	3	3	1	0	0	0
CO4	9	9	3	3	0	0	0
CO5	9	1	3	3	0	0	0
Weightage of the course	**25**	**16**	**12**	**9**	**0**	**0**	**0**

Unit – I
Optical Instruments **(18hrs)**

Camera-Camera lenses-Size of an object- The simple magnifier-Telescopes-refracting astronomical telescope-reflecting telescope - Newton's telescope-other reflecting telescope-constant deviation spectrometer

Holography

Introduction – Principle of Holgraphy-Recording of the Hologram-Reconstruction of the image-Holograms-important Properties of Hologram-Classification of Holograms-Applications-Medical applications of holography

Unit – II **(18hrs)**

Fibre Optics

Introduction-Optical fibre-Necessity of cladding-Optical fibre system-optical fibre cable-Total internal reflection-Propagation of light through an optical fibre-Critical angle of propagation-Acceptance angle- Numerical aperture-types of rays-Classification of optical fibres-The three types of fibres-single mode setp index fibre-multimode step index fibre-Graded index fibre-Materials-All glass fibre-all plastic fibres-PCS fibres-Fabrication-Applications-Illumination and image transmission-Optical communications- medical applications-military applications

Unit – III

Satellite Communications **(18hrs)**

Kepler's First Law, Second Law, Third Law – Orbits, Geostationary orbit – Power Systems – Attitude control – Satellite station keeping – Antenna look angles – Limits of visibility – Frequency plans and Polarization – Transponders – Uplink Power Budget calculations – Downlink Power Budget calculations – Overall Link budget calculations

Unit – IV **(18 hrs)**

Facsimile and Television

Facsimile transmission – Scanning – Cylindrical scanning – Electronic CCD scanning – The scanning spot – Facsimile receiver – Photographic recording – Transmission of Facsimile telegraph signals – Digital fax transmission – Television - Television camera – Television displays - Interlacing and vertical synchronization frequency

Unit – V

Medical Instrumentation **(18 hrs)**

Electrocardiography –Origin of cardiac action potential-ECG Lead configurations-ECG recording set up– Types of ECG recorders – Principles of Ultrasonic measurement-Basic modes of transmission – Ultrasonic imaging – Ultrasonic Diagnosis - Magnetic Resonance Imaging(MRI)-Magnetic resonance phenomenon-Magnetic resonance spectroscopy- Magnetic resonance imaging-Magnetic relaxation and MRI Parameters- MRI Instrumentation

Text Books:

Dr.N.Subrahmanyam, Brijlal - Dr.M.N.Avadhanulu	A Textbook of Optics, S.Chand & Company PVT.LTD. Twenty fifth Revised Edition 2012,Reprints 2015
Unit - I	Optical Instruments- Chapter 10: Sections 10.3-10.5, 10.15-10.17(Pg.No 210-214,227-231) Holography- Chapter 23: Sections (23.1-23.2.2, 23.6-23.10) (Pg.No 637-640,642-652)
Unit - II	Fibre Optics- Chapter 24: Sections (24.1-24.4.2, 24.6, 24.9-24.12.3, 24.14, 24.20-24.20.4) Pg.No.: 655-663,664,667-672,674-675,687-689
Dennis Roddy & John Coolen -	Electronic Communications,

Prentice-Hall of India Private Limited,
Fourth edition, 2003

Unit – III - Chapter 19: sections 19.1 to 19.16(Pg.No 711-741)

Unit – IV - Chapter 18: sections 18.1 to 18.3(Pg.No 660-680)

Unit – V - Study material to be provided.

M. Armugam - Biomedical Instrumentation
Anuradha Agencies, Second Edition 2002

John G. Webstar, Editor - Medical Instrumentation, John Wiley and Sons
Third edition 1999

Leslie Cromwell, Fred J. Weibell - Biomedical Instrumentation and Measurements
Erich A. Pfeiffer Pearson Education Private Limited
Second edition 2003

Wayne Tomasi - Advanced Electronic Communication systems ,
Prentice Hall of India Private Limited, Sixth Edition 2004

Study material will be provided for all five units

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN
SIVAKASI
DEPARTMENT OF PHYSICS
SEMESTER – II
ELECTIVE COURSE
HLPH2E2 - MICROCONTROLLER
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1: explain the architecture and instruction set of the microcontroller Intel 8051.
CO2: write the assembly language programming for the microcontroller Intel 8051.
CO3: list the features of 8051.
CO4: identify interrupts sources and interrupt vector addresses.
CO5: disseminate different programmable devices and methods to interface them.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	1	0	0	0
CO2	3	3	3	1	0	0	0
CO3	3	3	3	1	0	0	0
CO4	9	9	3	3	0	0	0
CO5	9	1	3	3	0	0	0
Weightage of the course	**25**	**16**	**12**	**9**	**0**	**0**	**0**

Unit I :
Introduction to 8051 microcontrollers: (18hrs)

Introduction- Intel's MCS -51 Series Microcontrollers –Intel 8051 architecture- Memory Organization –Internal RAM Structure- Power Control in 8051- Stack Operation.

Unit II :
8051 instruction set and programming: (18hrs)

Introduction- Addressing Modes of 8051- Instruction Set of 8051-Some Assembler Directives- Programming Examples using 8051 Instruction Set.

Unit III :
Hardware features of 8051: (18hrs)

8051 Timers - Timer SFRs - Timer Operating modes - Timer control and operation - Using timers as counters - Programming examples.

Unit IV :

8051 interrupts: **(18 hrs)**

Interrupts sources and interrupt vector addresses – Enabling and disabling of interrupts –Interrupt priorities and polling sequence- Timing of Interrupts- Programming examples- 8051 Serial Ports.

Unit V :

8051 interface examples: **(18 hrs)**

Interfacing 8255 with 8051 – Interfacing of Push Button Switches and LEDs- Interfacing of Seven _segment Displays -Interfacing ADC Chip – Interfacing DAC Chip – Interfacing stepper motor with 8051 - Microcontroller Application Example - Traffic light control.

Text Books :

N.Senthil Kumar - Microprocessors and Microcontrollers
M.Saravanan Oxford University Press 2010
S.Jeevananthan

Unit I - Chapter 9 : section 9.1-9.7 (pg. no. 303-312)
Unit II - Chapter 10: section 10.1-10.5 (pg. no.314-327)
Unit III - Chapter 11 : Section 11.4(pg.no.339-347)
Unit IV - Chapter 11 : Section 11.5 ,11.6(347-362)
Unit V - Chapter 12 : Section 12.1-12.5,12.7,12.11
(Pages 366-377,380- 383,393-397)

Reference Books:

1. Raj kamal - Microcontrollers, architecture, Programming, interfacing & system design - Pearson education,2005

2. A.P.Godse, D.A. Godse - Microprocessors & Microcontrollers
Technical Publications. 1st edition 2010

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER – III
CORE COURSE
HLPH31 - SOLID STATE PHYSICS - I
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1: recall elastic / thermal properties, parameters of different crystals / materials
CO2: discuss parameters of different crystals/elastic waves, heat capacity, electrical and thermal properties of different materials/models
CO3: interpret parameters of different types of crystals/elastic waves and models
CO4: examine elastic waves, thermal/electrical parameters of different crystals/ models/materials
and carrier concentrations.
CO5: derive parameters of inert gas/ionic/semiconductor crystals, elastic waves and different models

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	3	0	0	0	0	1
CO2	3	3	9	0	0	0	1
CO3	3	9	0	0	0	0	1
CO4	9	9	0	0	0	0	1
CO5	9	3	9	0	0	0	1
Weightage of the course	**33**	**27**	**18**	**0**	**0**	**0**	**5**
Weighted percentage of Course contribution to POs	**6.35**	**5.16**	**4.27**	**0**	**0**	**0**	**7.58**

Unit I :
Crystal Binding and elastic constants : (18hrs)

Crystals of inert gases: Vander walls – London Interaction, Repulsive Interaction Equilibrium Lattice Constants Cohesive energy – Ionic crystals: Electrostatic or Madelung energy – Evaluation of the Madelung constant – Analysis of elastic strains – Elastic

compliance and stiffness constants – Elastic Energy density – Elastic Stiffness constant of cubic crystals – Bulk modulus and compressibility.

Unit II :

Elastic constants and Crystal Vibrations: (18hrs)

Elastic waves in cubic crystals –Waves in [100] Direction – Waves in [110] Direction-Vibrations of crystals with Monatomic basis: First Brillouin zone–Group velocity– Long wavelength limit-Derivation of force constants from experiment – Two atoms per primitive basis.

UNIT III:

Thermal Properties: (18hrs)

Phonon heat capacity: Planck distribution– Normal mode enumeration–Density of states in one dimension–Density of sates in three dimensions–Debye model for density of states– Debye T^3 law– Einstein model of the density of states – General result for $D(\omega)$.

Unit IV :

Free Electron Fermi Gas : (18hrs)

Energy levels in one dimension – Effect of temperature on the Fermi – Dirac distribution – Free electron gas in three Dimensions**–** Heat capacity of the electron gas: Experimental heat capacity of metals- Heavy fermions– Electrical conductivity and Ohm's law.

Energy Bands:

Nearly free electron model: Origin of the energy gap- Magnitude of the energy gap– Bloch functions- Kronig – Penney model – Wave equation of electron in a periodic potential: Restatement of the Bloch theorem- Crystal momentum of an electron – Solution of the central equation–Kronig–Penney model in reciprocal space.

Unit V :

Semiconductor Crystals : (18hrs)

Band gap – Equations of motion: Physical derivation of $\hbar$k -Holes- Effective mass– Physical interpretation of the effective mass– Effective masses in semiconductors– Silicon and Germanium – Intrinsic carrier concentration: Intrinsic mobility – Impurity conductivity: Donor states–Acceptor states.

Text Book :

Charles Kittel	-	Introduction to Solid State Physics, VIII Edition, Reprint 2014
Unit I	-	Chapter 3 (Page no 47-66, 73-80)
Unit II	-	Chapter 3 (Page no 80-88)
		Chapter 4 (Page no 89-99)
Unit III	-	Chapter 5 (Page no 105-119)
Unit IV	-	Chapter 6 (Page no 131-148)
		Chapter 7 (Page no 161-176)
Unit V	-	Chapter 8 (Page no 185-213)

(Only the titles mentioned in the Syllabus)

Reference Book:

1. S.O. Pillai - Solid State Physics
New Age International (P) Limited Publishers, New Delhi
Revised Sixth Edition, 2005

2. S.L. Kakani, C.Hemrajani - Solid State Physics
Fourth Edition 2005
Sultan Chand & Sons

3. J.P. Srivastava - Elements of Solid State Physics
Prentice Hall of India Private Limited
2nd Edition
7th Printing July 2008

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc., SEMESTER III
CORE COURSE
HLPH32 - QUANTUM MECHANICS - II
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 04

Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1: state various approximation methods for bound state, time dependent perturbation problems and scattering problems.
CO2: describe various approximation methods of perturbation problems and scattering problems, emission and absorption of radiation, angular momentum and relativistic theories.
CO3: apply the appropriate approximation methods to find solutions of variety of eigen value problems of stationary and time dependent perturbation problems and scattering problems.
CO4: interpret eigen values of angular momentum, Schrodinger and Dirac relativistic equations.
CO5: analyse the asymptotic behavior of wave function in various collision problems, dirac matrices and spin orbit interaction.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	1	0	0	0
CO2	3	9	3	1	0	0	0
CO3	9	3	9	1	0	0	1
CO4	3	9	9	1	0	0	1
CO5	9	9	9	1	0	0	1
Weightage of the course	**25**	**30**	**30**	**5**	**0**	**0**	**3**
Weighted percentage of Course contribution to POs	**4.81**	**5.74**	**7.11**	**2.29**	**0**	**0**	**4.55**

Unit I :

Approximation methods for Bound states: **(18hrs)**

Stationary Perturbation Theory**:** Nondegenerate case- First order perturbation- Second order perturbation- Perturbation of an oscillator- Degenerate case- removal of degeneracy in second order- Zeeman effect without electron spin- First-order Stark effect in hydrogen- Perturbed energy levels- Occurrence of permanent electric dipole moments.

The Variation method: Expectation value of the energy- Application to excited states- Ground state of Helium – Electron interaction energy- Variation of the parameter Z- Vander Walls interaction –Perturbation calculation-variation calculation-The WKB Approximation.

Unit II :

Methods for Time -Dependent Problems **(18hrs)**

Time-dependent Perturbation Theory**-** Interaction picture – First order perturbation – Harmonic Perturbation -Transition Probability – Ionisation of Hydrogen atom- Density of final states- Ionisation probability- Second order perturbation- Adiabatic approximation- Choices of phases- Connection with perturbation theory- Discontinuous changes with H- Sudden approximation- Disturbance of an oscillator.

Absorption and induced emission: Use of perturbation theory- Transition probability- Interpretation in terms of absorption and emission- Electric dipole transitions- Forbidden transitions.

Spontaneous emission: Classical radiation field- Asymptotic form- Radiated energy- Dipole radiation- Angular momentum-Dipole case- Conversion from classical to quantum theory.

Unit III :

Rotation, Angular Momentum and Unitary groups: **(18hrs)**

Proper rotation group- Geometrical isomorphism- infinitesimal rotations- Spin of a vector particle- Commutation relations for the generators- Choice of a representation- Values of m, f(j) & λm-.Angular momentum matrices- Connection with spherical harmonics- Spin angular momentum-The eigen values of the total angular momentum.

Unit IV :

Scattering by a spherically symmetric potential : **(18hrs)**

Asymptotic behaviour- differential cross-section- Total elastic cross-section- Phase shifts- Calculation of phase shifts- Ramsauer- Townsend effect-Scattering by a perfectly rigid sphere- Scattering by a square well potential – Generalised optical theorem-Optical theorem- Green's functions and propagator-Free particle Green's function- Application to scattering-Born approximation-Validity of Born approximation- The Eikonal approximation.

Unit V :

Relativistic wave Equations: **(18hrs)**

The Schrodinger relativistic equation: Free particle- electromagnetic potentials- Separation of the equation- Energy levels in a coulomb field-Dirac's Relativistic Equation – Free-particle equation- Matrices for alpha & beta- Free particle solutions- charge and current densities – Electromagnetic potentials-Dirac's Equation for a central field: Spin angular momentum- Spin orbit energy- separation of the equation- The Hydrogen atom- Classification of energy levels-Negative energy states .

Text Books :

1. Leonard I. Schiff - Quantum Mechanics
McGraw Hill International Editions
Third Edition 1968

Unit I	-	Chapter 8: Section:31,32,34(Pg.no.245-263,268-279)
Unit II	-	Chapter 8: Section 35(Pg.no.279-295) Chapter 11 Section 44(Pg.no.400-406) Section 45(Pg.no.406-414)
Unit III	-	Chapter 7 Section 27(Pg.no.194-204) Section 28(Pg.no.213-214)
Unit IV	-	Chapter 5 Section 19(Pg.no.116-127) Section 20(Pg.no.135-138) Chapter 9 Section 36(Pg.no.300-302,307-309) Section 38(Pg.no.324-327,339-343)
Unit V	-	Chapter 13 Section 51,52,53 (Pg.no.466-488)

Reference Books:

1. P.M Mathews and K.Venkatesan - A Text Book On Quantum Mechanics
Tata McGraw Hill Education Private Limited, New Delhi
Second Edition 2010
2. John L.Powell & Crasemann- Quantum Mechanics
Narosa Publishing House
Ninth Reprint 1998
3. Sathya Prakash - Advanced Quantum Mechanics
Kedar Nath Ram Nath Publishers, Meerut
Fifth Revised and enlarged Edition 1999

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER – III
CORE COURSE
HLPH33 – Computer Oriented Numerical Methods
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 04

Course Outcomes (CO):
On successful completion of the course, the learners should be able to
CO1: list the features of C++, numerical methods of solving various types of equations, 8085 MPU architecture, 8085 MPU features, memory, I/O devices.
CO2: explain the features of C++ with syntax and examples,numerical methods,solution for different type of equations, 8085 MPU architecture/features,memory,I/Odevices.
CO3: apply appropriate numerical techniques to solve different types of equations.
CO4: solve problems using algorithms/C++/8085 microprocessor.
CO5: analyse C++, numerical methods and 8085 features.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	1	0	0	0
CO2	3	3	3	3	0	0	0
CO3	9	0	9	1	0	0	0
CO4	3	9	9	3	0	0	0
CO5	9	9	9	9	0	0	0
Weightage of the course	**25**	**22**	**22**	**17**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**4.81**	**4.21**	**5.21**	**7.8**	**0**	**0**	**0**

Unit I : (18hrs)
Tokens, Expressions and Control Structure:
Introduction – Tokens - Keywords – Identifiers and Constants – Basic Data Types – User-Defined Data Types – Derived Data Types – Symbolic Constants – Declaration of Variables – Dynamic Initialization of Variables.

Functions in C++:

Introduction – The Main Function – Function Prototyping – Call by Reference – Return by Reference – Inline Functions – Default Arguments – const Arguments – Recursion – Function Overloading – Math Library Functions.

Unit II : **(18hrs)**

Classes and Objects:

Introduction – Defining Member Functions – A C++ Programme with class – Making anOutside Function Inline – Nesting of Member Function – Private Member Functions – Arrays within a Class – Memory Allocation for Objects – Static Data Members – Static Member Functions – Arrays Of Objects – Objects as Function Arguments – Friendly Functions – Refining Objects – Constant Member Functions – Pointers to Members – Local Classes

Unit III: **(18hrs)**

Iterative Methods :

Introduction – Beginning an iterative method – The method of successive bisection – Newton-Raphson iterative method – Programs in C++ for Successive bisection method and Newton-Raphson method only.

Solution of Simultaneous Algebraic Equations

Introduction - The Gauss elimination method – Pivoting – Program in C++ for Gauss elimination method only.

Least Squares Approximation of Functions:

Introduction – Linear regression – Algorithm for linear regression - Polynomial regression – Fitting exponential function only – Programmes in C++ for straight line fit and exponential fit only .

Unit IV : **(18hrs)**

Differentiation and Integration:

Introduction – Formulae for numerical differentiation – Numerical integration - Trapezoidal rule, Simpson's rule. Introduction – Taylor series method – Runge-Kutta methods – Runge-Kutta fourth order formula – Predictor-corrector. Program in C++ for Trapezoidal rule and Simpson's rule and Runge-Kutta method (IV order) only.

Unit V : **(18hrs)**

Introduction to 8085 Assembly Language Programming:

The 8085 programming model – Instruction Classification – Instruction, Data Format and Storage - To write, Assemble and Execute a simple program – Overview of the 8085 Instruction Set – Writing and Hand Assembling a Program.

Microprocessor Architecture and 8085 Microprocessor Architecture:

Microprocessor Architecture and its Operations – Memory – Input and Output (I/O) Devices. The 8085 MPU 96.

Text Book:

1. E.BalaguruSamy - Object Oriented Programming with C++ Tata McGraw Hill Education Pvt. Ltd. Fifth Edition

Unit I - Chapter 3: Sections 3.1 –3.6, 3.8, 3.9, 3.11, 3.12, 3.20-3.25 (Pg. No.30-37, 38-42, 55-64)
Chapter 4: Sections 4.1-4.10, 4.12 (Pg. No. 71-86)

Unit II - Chapter 5: Sections 5.1, 5.3-5.19 (Pg. No. 90, 92-124)

2. V.Rajaraman - Computer Oriented Numerical Methods
PHI Learning Private Limited, New Delhi.
Forty First Printing (Third Edition) - January 2011.

Unit III - Chapter 3: Sections 3.1-3.3, 3.5 (Pg. No. 35-41, 44-48)
Chapter 4: Sections 4.1 – 4.3 (Pg. No. 74-84)
Chapter 6: Sections 6.1-6.5 (6.5.1 only) (Pg.No.117-128)

Unit IV - Chapter 8: Sections 8.1 – 8.4 (Pg. No. 142-150)
Chapter 9: Sections 9.1, 9.3-9.6 (Pg. No. 164-180).

3. Ramesh Gaonkar - Microprocessor Architecture, Programming and Applications with the 8085, Penram International Publishing (India) Private Limited, (Fifth Edition), March 2011.

Unit V - Chapter 2: Sections 2.1 – 2.6 (Pg. No. 32-52)
Chapter 3: Sections 3.1 – 3.3 (Pg. No. 58-81)
Chapter 4: Section 4.1 (Pg. No. 96 – 109)

Reference Book:

M.K.Jain, S.R.K.Iyengar and R.K.Jain - Numerical Methods for Scientific and Engineering Computation – V Ed. New Age International Publishers

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER III
CORE COURSE
HLPH3L - LAB – III
(Any 12 experiments)
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 04

Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1: write programs for numerical methods, microprocessor and draw circuit diagrams for data processing circuits.
CO2: implement the programs and construct the circuits.
CO3: record observation in a systematic way
CO4: analyze the collected data and report the results
CO5: interpret the results following laboratory ethics

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	9	3	3	0	0	1
CO2	3	9	3	3	0	0	1
CO3	3	9	3	3	0	3	1
CO4	3	9	3	3	0	3	1
CO5	3	9	3	3	0	3	1
Weightage of the course	**15**	**45**	**15**	**15**	**0**	**9**	**5**
Weighted percentage of Course contribution to POs	**2.88**	**8.6**	**3.55**	**6.88**	**0**	**25**	**7.58**

List of experiments

1. Numerical Integration-**2 problems**
2. Numerical differentiation -**2 problems**
3. Solving Simultaneous Equations- **2 problems**
4. Curve Fitting -**2 problems**
5. Ascending and descending order using µp
6. Multiplication and division using µp
7. Character Display using µp
8. Rolling display using µp
9. Interfacing experiments using µp -**2 problems**
10. Implementation of Boolean Expression using Multiplexer
11. Implementation of Boolean Expression using De Multiplexer
12. Encoder
13. Decoder.
14. Ultraviolet spectral analysis -**2 samples**
15. Infrared spectral analysis -**2 samples**

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER – III
ELECTIVE COURSE
HLPH3E1– CSIR UGC-NET Preparatory course - Physics
(For those admitted in June 2017 and later)

Contact hours per week : 06
Total number of hours per semester : 90
Number of credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to
CO1: solve problems using mathematical concepts.
CO2: apply classical, quantum and thermodynamical concepts to solve problems
CO3: solve problems on electromagnetic waves
CO4: apply various concepts of atomic, nuclear and molecular physics to solve problems
CO5: apply different laws to solve problems in electronics

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	0	0	0	1
CO2	3	9	9	0	0	0	1
CO3	9	9	9	0	0	0	1
CO4	9	9	9	0	0	0	1
CO5	9	9	9	0	0	0	1
Weightage of the course	**31**	**36**	**36**	**0**	**0**	**0**	**5**
Weighted percentage of Course contribution to POs	**5.96**	**6.88**	**8.53**	**0**	**0**	**0**	**7.58**

UNIT I **(18 hrs)**
Mathematical Methods of Physics:
Dimensional analysis; Vector algebra and vector calculus; Linear algebra, matrices, Cayley Hamilton theorem, eigenvalue problems; Linear differential equations; Special functions (Hermite, Bessel, Laguerre and Legendre); Fourier series, Fourier and Laplace transforms; Elements of complex analysis: Laurent series-poles, residues and evaluation of integrals; Elementary ideas about tensors; Introductory group theory, SU(2), O(3); Elements

of computational techniques: roots of functions, interpolation, extrapolation, integration by trapezoid and Simpson's rule, solution of first order differential equations using Runge-Kutta method; Finite difference methods; Elementary probability theory, random variables, binomial, Poisson and normal distributions. Analytic functions: Taylor series, central limit theorem.

UNIT II **(18 hrs)**

Classical, Quantum and Statistical Mechanics:

Variational principle, Lagrangian and Hamiltonian formalisms and equations of motion; Poisson brackets and canonical transformations; Symmetry, invariance and conservation laws, cyclic coordinates; Periodic motion, small oscillations and normal modes; Special theory of relativity, Lorentz transformations, relativistic kinematics and mass–energy equivalence. Commutators and Heisenberg's uncertainty principle; Matrix representation; Dirac's bra and ket notation; Schrodinger equation (time-dependent and time-independent); Eigenvalue problems such as particle-in-a-box, harmonic oscillator, etc.; Tunneling through a barrier; Time-independent perturbation theory and applications; Variational method; WKB approximation; Time dependent perturbation theory and Fermi's Golden Rule; Selection rules; Semi-classical theory of radiation; Elementary theory of scattering, phase shifts, partial waves, Born approximation; Identical particles, Pauli's exclusion principle, spin-statistics connection; Relativistic quantum mechanics: Klein Gordon and Dirac equations.Laws of thermodynamics and their consequences; Maxwell relations; Classical and quantum statistics, ideal Fermi and Bose gases; Principle of detailed balance; Blackbody radiation and Planck's distribution law; Bose-Einstein condensation; Random walk and Brownian motion.

UNIT III: **(18 hrs)**

Electromagnetic Theory

Electrostatics: Gauss' Law and its applications; Laplace and Poisson equations, boundary value problems; Magnetostatics: Biot-Savart law, Ampere's theorem, electromagnetic induction; Maxwell's equations in free space and linear isotropic media; boundary conditions on fields at interfaces; Scalar and vector potentials; Gauge invariance; Electromagnetic waves in free space, dielectrics, and conductors; Reflection and refraction, polarization, Fresnel's Law, interference, coherence, and diffraction; Dispersion relations in plasma; Lorentz invariance of Maxwell's equations; Transmission lines and wave guides; Dynamics of charged particles in static and uniform electromagnetic fields; Radiation from moving charges, dipoles and retarded potential.

UNIT IV: **(18 hrs)**

Atomic, Nuclear & Molecular Physics

Spectrum of Hydrogen, helium and alkali atoms; Relativistic corrections for energy levels of hydrogen; Hyperfine structure and isotopic shift; width of spectral lines; LS & JJ coupling; Zeeman, Paschen Back & Stark effect; X-ray spectroscopy; Electron spin resonance, Nuclear magnetic resonance, chemical shift; Rotational, vibrational, electronic, and Raman spectra of diatomic molecules; Frank – Condon principle and selection rules; Spontaneous and stimulated emission, Einstein A & B coefficients; Lasers, optical pumping,

population inversion, rate equation; Modes of resonators and coherence length. Deuteron problem; Evidence of shell structure, single- particle shell model, its validity and limitations; Rotational spectra; Elementary particles (quarks, baryons, mesons, leptons); Spin and parity assignments, isospin, strangeness; Gell-Mann-Nishijima formula; C, P, and T invariance and applications of symmetry arguments to particle reactions, parity non-conservation in weak interaction; Relativistic kinematics.

UNIT V: (18 hrs)

Electronics and Experimental methods:

Optoelectronic devices, including solar cells, photodetectors, and LEDs; High-frequency devices, including generators and detectors; Operational amplifiers and their applications; Digital techniques and applications (registers, counters, comparators and similar circuits);A/D and D/A converters; Microprocessor and microcontroller basics; Precision and accuracy, error analysis, propagation of errors, least squares fitting.

Reference Books

Unit – I

1. S. Sathya Prakash, Mathematical Physics with Classical Mechanics, Chand & Sons, New Delhi, 5th Revised Edition, 2006.

Unit – II

1. Leonard I. Schiff, Quantum Mechanics, McGraw Hill International Edition, 3rd Edition, 1968.
2. S. Sathya Prakash, Mathematical Physics with Classical mechanics, Chand & Sons, New Delhi, 5th Revised edition, 2006.

Unit – III

1. John R. Reitz, Frederick J. Milford, Robert W. Christy, Foundation of Electromagnetic Theory, Narosa Publishing House, 3rd Edition, 12th Reprint, 1998.

Unit – IV

1. Arthur Beiser, Concepts of Modern Physics – 5th Edition, International Edition.
2. T. G. Tayal, Nuclear Physics, Himalaya Publishing Company, 4th Edition.

Unit – V

1. Donald P. Leach & Albert Paul Malvino, Digital Principles and Applications, TATA McGraw – Hill Publishing Company, 4th Edition.

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER – III
ELECTIVE COURSE
HLPH3E2 - RECENT TRENDS IN PHYSICS
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to
CO1: list the basic concepts of simulation and applications of nanotechnology
CO2: describe various nano lithographic techniques, modeling, smart materials and self healing structures
CO3: classify system simulation and discrete system simulation, sensors
CO4: analyze the applications of nanotechnology in optics and electronics
CO5: solve problems using simulation

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	0	0	0	1
CO2	3	9	9	0	0	0	1
CO3	9	9	9	0	0	0	1
CO4	9	9	9	0	0	0	1
CO5	9	9	9	0	0	0	1
Weightage of the course	**31**	**36**	**36**	**0**	**0**	**0**	**5**
Weighted percentage of Course contribution to POs	**5.96**	**6.88**	**8.53**	**0**	**0**	**0**	**7.58**

Unit I:
System Simulation: (18hrs)

Simulation of a Pure Pursuit Problem- an example – A System and its Model – Simulation of an Inventory Problem – The basic Nature of Simulation– Simulation of Continuous Systems - A Chemical Reactor – Numerical integration vs. Continuous System Simulation – Selection of an Integration formula – Runge-Kutta integration formula.

Unit II:

Discrete System Simulation: **(18hrs)**

Simulation of a Servo System – Simulation of a Water Reservoir System – Analog vs. Digital Simulation – Fixed time-step vs. event-to-event model – On Simulating randomness – Generation of random numbers – Generation of non -uniformly distributed random numbers – Monte Carlo computation vs. Stochastic Simulation.

Unit III:

Nanotechnology: **(18hrs)**

Nano Definition - A Different kind of small size – Electrons – Atoms and Ions – Molecules – Metals – Bio systems – Molecular Recognition – Electrical Conduction and Ohm's law - Scanning Probe Instruments – Spectroscopy – Electrochemistry – Electron Microscopy -The Return of Scanning Probe Instruments – Nano scale Lithography – Dip Pen Nanolithography – E-Beam Lithography – Nano sphere Liftoff Lithography – Molecular Synthesis – Self Assembly – Nanoscale Crystal Growth – Polymerization – Nano bricks and Building Blocks – Nano CAD.

Unit IV:

Optics and Electronics: **(18hrs)**

Light Energy, its capture and Photo Voltaics – Light production – Light Transmission – Light Control and manipulation – Electronics – Carbon Nano tubes – Soft Molecule Electronics – Memories – Gates and Switches – Architectures - Smart materials – Sensors – Nano scale Biostructures – Energy capture, Transformation and Storage – Optics – Magnets – Fabrication - Electronics –Modeling –Self Healing structures - Recognition – Separation – Catalysts – Heterogeneous nanostructures and composites – Encapsulation – Consumer goods.

Unit V:

Sensors and Biomedical Applications: **(18hrs)**

Natural Nano scale sensors - Electromagnetic sensors – Biosensors – Electronic noses - Drugs – Drugs Delivery – Photodynamic Therapy - Molecular motors – Neuro Electronic Interfaces – Protein Engineering – Nano luminescent Tags.

Text Books :

1. Narsingh Deo - System Simulation with Digital Computer – Prentice-Hall of India Private Limited (New Delhi) – Seventeenth Printing

Unit I - Chapter 1: Sections : 1.1 – 1.5, (pages :1-10)
Chapter 2 : Sections : 2.1 – 2.4 (pages :15-25)

Unit II - Chapter 2 : Sections : 2.5 – 2.7 (pages :25-33)
Chapter 3 : Sections : 3.1 -3.5 (pages :40-57)

2. Mark Ratner & Daniel Ratner – Nanotechnology - Pearson Education (Singapore) Third Impression 2008

Unit III	-	Chapter 1 : (Page No: 5-9) Chapter 2 : (page No:11-16) Chapter 3 : (Page No: 20-33) Chapter 4: (page No:38-60)
Unit IV	-	Chapters : 9, 5 ,6(page No:121-139,63-81,83-95)
Unit V	-	Chapters : 7 , 8(page No:97-119)

Reference Book:

Charles P.Poole, Jr., & Frank J.Owens - Introduction to Nanotechnology
Wiley India P.Ltd, reprint 2010, NewDelhi

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER – IV
CORE COURSE
HLPH41 - Solid State Physics - II
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1:recall different parameters of different materials and different particles.
CO2:explain properties/parameters of metals, magnetic materials, different particles.
CO3:determine Fermi surfaces and metals, super conductivity and different magnetic materials and different particles.
CO4:analyze parameters of metals, super conductivity, magnetic materials, plasmons, polaritons and polarons.
CO5:describe orbits, energy bands of metals, survey of superconductor, parameters of magnetic materials/different particles.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	0	0	0	0	0	1
CO2	9	3	0	0	0	0	1
CO3	1	9	0	0	0	0	1
CO4	9	9	0	0	0	0	1
CO5	1	3	9	0	0	0	1
Weightage of the course	**29**	**24**	**9**	**0**	**0**	**0**	**5**
Weighted percentage of Course contribution to POs	**5.58**	**4.59**	**2.13**	**0**	**0**	**0**	**7.58**

Unit I :

Fermi Surfaces and Metals : (18hrs)

Reduced Zone scheme- Periodic Zone scheme – Construction of Fermi surface : Nearly free Electrons – Electron orbits, hole orbits and open orbits – Calculation of energy bands : Tight binding method of energy bands, Wigner- Seitz method – Experimental methods in Fermi surface studies: Quantization of orbits in a magnetic field, De Haas-van Alphen effect – External orbits.

Unit II :

Super Conductivity : (18hrs)

Experimental Survey : Occurrence of super conductivity -Destruction of superconductivity by magnetic fields – Meissner effect – Heat capacity – Energy gap.

Theoretical survey : Thermodynamics of the superconducting transition – London equation – Coherence length – BCS theory of superconductivity – BCS ground state – Flux quantization in a superconducting ring – Type II superconductors – Vortex state – Estimation of H_{C1}, H_{C2}. – Josephson superconductor tunneling – DC Josephson effect – AC Josephson effect.

Unit III :

Diamagnetism, Paramagnetism: (18hrs)

Langevin diamagnetism equation – Quantum theory of dimagnetism of mononuclear systems – Paramagnetism – Paramagnetic susceptibility of conduction electrons

Optical Processes and Excitons:

Optical reflectance: Kramers –Kronig relations-Excitons: Frenkel excitons, Weakly bound(Mott-Wannier) Excitons, Exciton condensation into electron-hole drops.

Unit IV :

Ferromagnetism and Antiferromagnetism : (18hrs)

Ferromagnetic order: Curie point and the exchange integral, Temperature dependence of the saturation magnetization, Saturation magnetization at absolute zero – Ferrimagnetic order: Curie temperature below the Neel temperature – Antiferromagnetic order – Susceptibility below the Need temperature - Antiferomagnetic magnons - Ferromagnetic domains: Origin of domains, Coercivity and hysteresis.

Unit V :

Plasmons, Polaritons and Polarons: (18hrs)

Dielectric function of the electron gas: Plasma Optics, Dispersion relation for electromagnetic waves, Transverse optical modes in a plasma, Transparency of alkali metals in the Ultraviolet, Longitudinal plasma oscillations – Plasmons -Electrostatic screening: Screened Coulomb potential – Pseudo potential component- Mott metal insulator trasition - Screening and phonons in metals –Polaritons: LST relation - Electron –phonon interaction, Polarons.

Text Book :

Charles Kittel - Introduction to Solid State Physics
VIII Edition
Reprint 2014
Wiley India Pvt. Limited, New Delhi

Unit I - Chapters 9
Pages: 220-237, 242-249

Unit II - Chapters 10
Pages : 257-268,270-282,283-292

Unit III - Chapters 11
Pages : 297-302,315-317

Chapters 15
Pages : 427-432,435- 444

Unit IV - Chapters 12
Pages : 321-330,336-339,340-348,351-354

Unit V - Chapters 14
Pages : 393-417,420-422

Only the titles mentioned in the syllabus

Reference Book:

1. S.O. Pillai - Solid State Physics
Revised Sixth Edition, 2005
New Age International (P) Limited Publishers, New Delhi

2. S.L. Kakani, C.Hemrajani - Solid State Physics
Fourth Edition 2005
Sultan Chand & Sons

3. J.P. Srivastava - Elements of Solid State Physics
2nd Edition
7th Printing July 2008
Prentice Hall of India Private Limited

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER – IV
CORE COURSE
HLPH42 - NUCLEAR PHYSICS
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):

CO1: list the properties of nuclear forces, nuclear models, nuclear reactions, fission, fusion and elementary particles
CO2: explain the different scatterings, nuclear models, types of nuclear reactions, types of fission, classification of elementary particles and quarks
CO3: outline the existence of non-central forces, predictions of the shell model, classical and partial wave analysis of reaction cross-sections, compound nucleus, controlled thermonuclear reactions
CO4: analyze Breit-Wigner Dispersion formula, Bohr and Wheeler's theory of nuclear fission, conservation laws of nuclear reactions and elementary particles
CO5: apply the conservation laws of elementary particles to solve simple problems

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	1	0	0	0
CO2	3	1	0	1	0	0	0
CO3	3	3	3	3	0	0	0
CO4	9	9	9	3	0	0	0
CO5	9	9	9	3	0	0	1
Weightage of the course	**25**	**22**	**21**	**11**	**0**	**0**	**1**
Weighted percentage of Course contribution to POs	**4.81**	**4.21**	**4.98**	**5.05**	**0**	**0**	**1.52**

Unit– I : (18hrs)

Nuclear Forces:

Introduction- Deuteron (Properties, No excited S-States, Excited States of the Deuteron) - Neutron-Proton Scattering at Low Energies (Phase shift Analysis, Scattering

length, Determination of phase shift, Spin dependence, Coherent scattering) - Shape Independent Effective Range Theory in n-p Scattering (Determination of scattering length and effective range) - Proton-Proton Scattering at Low Energies (phase shift analysis) - Neutron-Neutron Scattering (Similarity between (nn) and (pp) forces) - Non-central Forces (Experimental evidence for the existence of non-central forces, General form of this force, its properties), Saturation of Nuclear Forces (Exchange Forces, Isotopic Spin Formalism) – Relevant Problems from the Text Book.

Unit II: **(18hrs)**

Nuclear Models:

Introduction - Fermi gas model - Liquid drop model - Shell model [Evidence for the existence of Magic numbers, nuclear properties, Extreme Single Particle model (Square well potentials of infinite depth, Harmonic Oscillator Potential, Spin-Orbit Potential), Predictions of the Shell Model] - Collective Nuclear Model (Rotational States only) - Relevant Problems from the Text Book.

Unit III: **(18hrs)**

Nuclear Reactions:

Types of Nuclear Reactions - Conservation Laws - Nuclear Reaction Kinematics - Nuclear Cross-Section - Classical Analysis of Cross-Section - Partial wave Analysis of Reaction Cross-Section - Compound Nucleus - Resonance Cross- Sections: Breit Wigner Dispersion Formula (Resonance Cross-sections, Elastic Resonance Scattering, Low Energy Neutron Reactions) - Relevant Problems from the Text Book.

Unit IV: **(18hrs)**

Nuclear Fission and Fusion:

Nuclear Fission (Types of Fission, Fission Cross-sections, Distribution of Fission Products, Distribution of Fission Energy, Neutron Emission in Fission, Energy Distribution of Neutrons, Fissile and Fertile Materials, Spontaneous Fission, Fission isomer, Deformation of liquid drop: Bohr and Wheeler's Theory of Nuclear Fission) - Nuclear Fusion and Thermonuclear Reactions - Controlled Thermonuclear Reactions (Hydrogen bomb, Fusion Reactor, Different methods for the production of fusion reactions) - Relevant Problems from the Text Book.

Nuclear Fission Reactors:

The Need for Nuclear Power - Nuclear Chain Reaction (four factor formula) - The Critical Size of a Reactor –Relevant Problems from the Text Book.

Unit V: **(18hrs)**

Elementary Particles:

Introduction - Classification of Elementary Particles – Fundamental Interactions (Gravitational, Electromagnetic, strong, weak) - Conservation Laws (Conservation of Isospin, Conservation of Strangeness, Conservation of Hypercharge, Charge Conjugation- Space-inversion Invariance (parity)- Combined Inversion (CP)- Time Reversal- Combined Inversion of CPT) - Elementary Particle Symmetries- Quarks – Isospin of Quarks - Quark Wave functions of Pseudo Scalar Mesons - Quark Wave functions of Baryons - Relevant Problems from the Text Book.

Text Book:

D.C.Tayal - Nuclear Physics
Himalaya Publishing House Pvt. Ltd.
Fifth Revised & Enlarged Edition : 2008
Reprint : 2012

Unit I - Chapter – 8 Sections : 8.1-8.5, 8.7-8.9
(Pg. No. 301-318, 321-323, 328-332, 347-352)

Unit II - Chapter – 9 Sections : 9.1 – 9.5
(Pg. No. 355-369, 374-378, 382-385, 389-398)

Unit III - Chapter – 10 Sections : 10.1-10.3, 10.7-10.9, 10.15, 10.20
(Pg. No. 401-406, 415-422, 427-429, 433-438, 455-460)

Unit IV - Chapter – 13 Sections : 13.1-13.3
(Pg. No. 578 -590, 592-603)
- Chapter – 15 Sections : 15.1-15.3
(Pg. No. 626-633, 652-655)

Unit V - Chapter –18 : Sections 18.1-18.4, 18.18- 18.22
(Pg. No. 692-707, 741-752, 762-770)

Reference Books :

1. R.R. Roy and B.P. Nigam - Nuclear Physics (Theory and Experiment),
New Age International (P) Ltd Publishers,
First Edition - 1967
Reprint, 2011

2. Irving Kaplan - Nuclear Physics
Addison Wesley Publishing Company
Second Edition -1962

3. Satya Prakash - Nuclear Physics and Particle Physics
Sultan Chand & Sons
First Edition - 2005

4. V. Devanathan - Nuclear Physics
Narosa Publishing Company Pvt. Ltd.
Ist Edition - 2006

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER – IV
CORE COURSE
HLPH43 - MOLECULAR SPECTROSCOPY
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1: state the nature of interaction of various radiations on different types of molecules
CO2: obtain the energy expressions for interacting molecules using microwave, infrared, Raman, electronic and spin resonance spectroscopic method
CO3: estimate the interatomic distances of rotors, vibrating molecules and vibrating rotors
CO4: analyse the structure and intensity of rotational, vibrational, electronic spectra and spin resonance spectra of molecules
CO5: explain the experimental techniques involved in microwave, infrared, Raman and spin resonance spectroscopic methods

CO-PO Mapping table (Course Articulation Matrix)

Pos / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	0	3	0	0	0
CO2	3	9	3	3	0	0	1
CO3	3	9	9	3	0	0	1
CO4	9	9	9	3	0	0	1
CO5	3	3	1	3	0	0	1
Weightage of the course	**21**	**33**	**22**	**15**	**0**	**0**	**4**
Weighted percentage of Course contribution to POs	**4.04**	**6.31**	**5.21**	**6.88**	**0**	**0**	**6.06**

Unit I:
Microwave spectroscopy: (18hrs)

Rotation of molecules – Rotational spectra – Diatomic molecules – Polyatomic molecules – Techniques and instrumentation – Chemical analysis by microwave spectroscopy

Unit II:

Infrared spectroscopy: **(18hrs)**

The vibrating diatomic molecule – The diatomic vibrating rotator – The vibration rotation spectrum of carbon monoxide – Break down of the born – Oppenheimer approximation – The vibrations of poly atomic molecules – The influence of rotation on the spectra of polyatomic molecules – Analysis by Infrared techniques – Techniques & instrumentation.

Unit III:

Raman spectroscopy: **(18hrs)**

Introduction – Pure rotational Raman spectra –Vibrational Raman Spectra – Polarization of light and the Raman spectra – Structure determination from Raman and Infra-red Spectroscopy – Techniques and instrumentation – Near – Infra-red FT – Raman spectroscopy.

Unit IV:

Electronic spectra of molecules: **(18hrs)**

Born – Oppenheimer approximation – vibrational coarse structure – Intensity of Vibrational Electronic Spectra : Franck – Condon Principle – dissociation energy and dissociation products – Rotational Fine Structure of electronic vibration transition - Predissociation.

Unit V:

Spin-resonance Spectroscopy: **(18hrs)**

Spin and applied field: Nature of spinning particles, Interaction between Spin and a magnetic field – Population of energy levels – The Larmor Precession – relaxation times – Fourier transform spectroscopy in NMR – multiple pulse FT - NMR of hydrogen nuclei - Chemical shift – coupling constant – NMR of nuclei other than hydrogen – Techniques and Instrumentation - Electronic Spin Resonance Spectroscopy.

Text Books :

Colin N.Banwell and Elanie M.McCash – Fundamentals of Molecular Spectroscopy
Fourth Edition, Fourth Reprint 2017
-Tata McGraw Hill Publishing Company Limited

Unit I	-	Chapters 2: Sections : 1 – 6 (P 31-52)
Unit II	-	Chapter 3 : Sections : 1 – 8 (P 55-99)
Unit III	-	Chapter 4 : Sections : 1 – 7(P 100-126)
Unit IV	-	Chapter 6 : Sections : 1 (P 162-176)
Unit V	-	Chapter 7 : Sections : 1 – 5(P 199-256)

Reference Book :

1. G.Aruldas - Molecular Structure & Spectroscopy
Prentice-Hall of India
6th printing 2005

2. B.P.Staughan and S.Walker - Spectroscopy –Volume II,
London Chapman and Hall A
Halsted Press book, John Wiley and Sons Inc., 1976

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER - IV
CORE COURSE
HLPH4P - PROJECT AND VIVA VOCE
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to
CO1: identify and analyze the nature of the problems
CO2: interpret relevant data, manipulate them and find solution
CO3: develop the writing skills of project report in an ethical manner
CO4: present their findings in conferences
CO5: defend their dissertations in viva-voce

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	0	0	0	3	0	1
CO2	1	1	0	0	3	0	1
CO3	3	3	0	9	3	3	1
CO4	3	9	9	9	3	3	1
CO5	3	9	9	9	3	3	1
Weightage of the course	**11**	**22**	**18**	**27**	**15**	**9**	**5**
Weighted percentage of Course contribution to POs	**2.12**	**4.21**	**4.27**	**12.39**	**100**	**25**	**7.58**

Rules Regarding Project and Project Viva :

1. Students will be divided into groups. The maximum number of students per group is two.
2. The project work can be on
    - A research problem
    - An advanced study of a topic in their syllabus
    - Extensive study of an experiment
3. Each student shall submit one spiral bound copy of her project work for valuation.
4. The project report shall contain at least thirty to forty pages excluding bibliography and appendices.

The project work will be valued as

- Report present – 80
- Viva voce – 20

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER IV
ELECTIVE COURSE
HLPH4E1 – NANO PHYSICS
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: label the basics of microscopic techniques, features of individual nanoparticles, CNT and nanosensors.

CO2: explain the working of different microscopies, synthesis, structure and properties of nanoparticles, CNT and nanosensors.

CO3: discuss the microscopic techniques and applications of nanoclusters, metal and semiconductor nanoparticles, carbon nanotubes and nanosensor devices.

CO4: apply the techniques of microscopes in characterization of metal/semiconducting nanoparticles, CNT and nanoscale organization of nanosensors.

CO5: inspect electron/scanning probe microscopies, individual nanoparticle/ CNT and nano sensing devices.

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	0	0	0	0
CO2	9	3	3	1	0	0	0
CO3	3	3	3	3	0	0	0
CO4	9	9	9	9	0	0	0
CO5	9	9	9	9	0	0	0
Weightage of the course	**31**	**25**	**25**	**22**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**5.96**	**4.78**	**5.92**	**10.09**	**0**	**0**	**0**

Unit – I

Investigating and Manipulating Materials in the Nanoscale

Microscopies Techniques-I **(18hrs)**

Introduction – Electron Microscopies – Scanning Electron Microscopy – Transmission Electron Microscopy – Scanning Transmission Electron Microscopy (STEM) – Image Collection in Electron microscopes – Environmental Transmission Electron Microscopy (ETEM) – Electron Energy Loss Spectroscopy at the Nanometre Scale.

Unit – II

Microscopies Techniques-II **(18hrs)**

Scanning Probe Microscopies – Scanning Tunnelling Microscopy (STM)- Scanning Tunnelling Microscopy based Atomic Manipulations – Atomic Force Microscopy – Optical Microscopies for Nanoscience and Technology – Confocal Microscopy – Scanning Near field Optical Microscopy – Secondary Ion Mass Spectrometry.

Unit – III

Properties of Individual Nanoparticles **(18hrs)**

Metal Nanoclusters – Magic Numbers – Theoretical Modeling of Nanoparticles – Geometrical Structure – Electronic Structure – Semi conducting Nanoparticles Optical Properties – Photofragmentation – Coulombic Explosion – Methods of Synthesis – RF Plasma – Chemical Methods – Thermolysis – Pulsed Laser methods.

Unit – IV

Carbon Nanotubes **(18hrs)**

Fabrication – Structure – Electrical Properties – Vibrational Properties – Mechanical Properties – Applications of Carbon Nanotubes – Field Emission and Shielding – Computers – Fuel cells – Chemical Sensors Catalysis – Mechanical Reinforcement.

Unit – V

Nanosensors **(18hrs)**

Introduction – Sensor – Nanosensors – Nanoscale Organization for Sensors – Self assembly – Template Method – Characterization – Nanosensor Based on Optical properties – Nanosensors Based on Quantum Size Effects – Electrochemical Sensors – Sensors Based on Physical properties – Nanobiosensors – Sensors of the Future.

Text Book:

1. T.Pradeep – Nano The Essentials
   Tata McGraw Hill Education Private Limited., NewDelhi
   Fourth reprint 2010
   - Unit I - Chapter 2 – Sections: 2.1 – 2.2.7 (Page No : 15-43)
   - Unit II - Chapter 2 – Sections: 2.3-2.3.3, 2.4 –2.5.1, (Page No :43-51,54-61)
   - Unit V - Chapter12 -Sections:12.1-12.4.2, 12.5-12.11 (Page No :283-287,299)

2. Charles P.Poole, Jr., &
Frank J.Owens - Introduction to Nanotechnology
Wiley India P.Ltd, Reprint 2010, NewDelhi
Unit III - Chapter 4 – Sections: 4.2 -4.2.4, 4.3- 4.3.3, 4.5 – 4.6
(Page No :74-83, 90-94, 97-101)
Unit IV - Chapter 5 – Sections: 5.4-5.5.6 (Page No : 114-132)

Reference Books:

1. Nanotechnology by Richard Booker and Earl Baysen, Wiley Dreamtech India (P) Ltd (Edition 2005).
2. Nano crystalline Materials- Current Research and future directions – C. Suryanarayananan and C.C. Koch, Hyperfine Interactions Journal

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
SEMESTER IV
ELECTIVE COURSE
HLPH4E2 – MEDICAL PHYSICS
(For those admitted in June 2017 and later)

Contact hours per week : 06
Contact hours per semester : 90
Total number of credits : 05

Course Outcomes (CO):
On successful completion of the course, the learners should be able to

CO1: describe the physiological effects of ultrasound in therapy
CO2: apply the theory of light in medical applications
CO3: create an insight on various aspects of radiology
CO4: apply the physical principles of the instruments used in medical diagnosis & therapy
CO5: explain the physics behind radiation therapy

CO-PO Mapping table (Course Articulation Matrix)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	0	0	0	0
CO2	9	3	3	1	0	0	0
CO3	3	3	3	3	0	0	0
CO4	9	9	9	9	0	0	0
CO5	9	9	9	9	0	0	0
Weightage of the course	**31**	**25**	**25**	**22**	**0**	**0**	**0**
Weighted percentage of Course contribution to POs	**5.96**	**4.78**	**5.92**	**10.09**	**0**	**0**	**0**

Unit I: **(18 hrs)**

Sound in Medicine:

General properties of sound, The body as a drum (Percussion in Medicine),The stethoscope, Ultrasound pictures of the body, Ultrasound to measure motion, Physiological effects of ultrasound in therapy, The production of speech.

Physics of the ear and Hearing:

The outer ear, the middle ear, the inner ear, sensitivity of the ears, testing your hearing, deafness and hearing aids.

Unit II:

Light in Medicine: (18 hrs)

Measurement of light and its units, applications of visible light in medicine, applications of ultraviolet and infrared light in medicine, lasers in medicine, applications of microscopes in medicine

Unit III: (18 hrs)

Physics of diagnostic X-rays:

Production of X-ray beams, how x-ray are absorbed, making an x-ray image, radiation to patients from x-rays.

Unit IV: (18 hrs)

Physics of Nuclear Medicine (Radio isotopes in Medicine):

Review of basic characteristics and units radioactivity, sources of radioactivity for nuclear medicine, basic instrumentation and its clinical applications

Unit V: (18 hrs)

Physics of Radiation Therapy:

The dose units used in radiotherapy - the red and the gray, principles of radiation therapy, a short course in radiotherapy treatment planning, megavoltage therapy, short distance radio therapy or branchy therapy.

Text Book :

John R. Cameron and James G. Skofronick – Medical Physics ,
A Wiley –Interscience Publication,
John Wiley & Sons, New York (1978).

Unit I	–	Chapter 12 (Page No : 253 - 292)
	–	Chapter 13 (Page No : 294 - 310)
Unit II	_	Chapter 14 (Page No : 312 - 335)
Unit III	-	Chapter 16 (Page No : 386 - 420)
Unit IV	-	Chapter 17 (Page No : 438-451,455-468)
Unit V	-	Chapter 18(Page No : 486- 512)

Reference Book:

M. Arumugam, Biomedical Instrumentation, Anuradha Publishing Co., Kumbakonam, Tamilnadu, 2004

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.

DEPARTMENT OF PHYSICS

ADD ON COURSE- 1

GLPHEC1 - NANOTECHNOLOGY

(For those admitted in June 2017 and later)

Contact hours per week : 02
Total number of Hours per Semester : 30
Total number of Credits : 02

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: define the basics of nanomaterials and characterization techniques
CO2: discuss the synthesis, characterization and applications of carbon nanotubes/nanomaterials
CO3: describe the properties of carbon nanotubes and nanomaterials
CO4: analyze the significance of various microscopic and diffraction techniques
CO5: compare the different synthesis routes of nanomaterials

Unit-I

The Big world of Nano Materials (6 hrs)

History and scope – Clusters and Magic Numbers –Early applications of nanotechnology:Nano-gold – Nanosize and properties- classification of Nanostructured Materials – Fascinating Nanostructures.

Unit-II

Synthesis Routes (6 hrs)

Bottom-up approaches: Physical Vapour Deposition (PVD) – Chemical Vapour Deposition (CVD- Top-down approaches :Nanolithography – Consolidation of nanopowders: Shockwave consolidation, Hot isostatic pressing (HIP) and cold isostatic pressing (CIP), Spark plasma sintering.

Unit-III

Carbon Nanotubes: (6 hrs)

Carbon nanotubes – Description – Types of CNT – Properties of CNT – Defects of CNT – Synthesis – Natural sources – Structure – Applications of CNT

Unit-IV

Tools to Characterize Nanomaterials (6 hrs)

X-ray diffraction (XRD) – Scanning Electron Microscopy (SEM) – Transmission Electron Microscopy (TEM) – Atomic Force Microscopy (AFM)

Unit-V

Applications of Nanomaterials (6 hrs)

Nano-Electronics - Micro-and Nano-electromechanical systems (MEMS/NEMS) – Nanosensors – Carbon Nanotubes- Based sensors-Food and Agriculture industry - Cosmetics and consumer goods.

Text Book:

1. B.S.Murthy – Textbook of Nanoscience and Nanotechnology
University Press (India) Private Limited, Hyderabad
Reprint 2014
Unit I - Chapter 1 – (Page No : 1-7, 8-17)
Unit II - Chapter 3 – (Page No : 66-72 Sections: 3.1.1,3.1.2, Page No.983.2.5,Page No.100 -105,Section 3.3 -3.3.3)
Unit III - Chapter 3 – Sections: 3.1-3.3.3(Page No :66-105)
Unit IV - Chapter 5 – Sections: 5.1, 5.3, 5.3.1, 5.4, 5.5 (Page No :149-151, 152- 153, 155, 159- 161)
UnitV- Chapter 4 - Sections:4.1, (Page No : 107- 110)
Sections:4.2, 4.3, 4.3.1(Page No : 118- 122),
Sections:4.5, 4.6, 4.6.1- 4.6.4 (Page No : 134- 136)

Reference Books:

1. Introduction to Nanotechnology - Charles P.Poole, Jr., & Frank J.Owens, Wiley India P.Ltd, Reprint 2010, NewDelhi
2. Nanotechnology by Richard Booker and Earl Baysen, Wiley Dreamtech India (P) Ltd (Edition 2005).
3. Nano crystalline Materials- Current Research and future directions – C. Suryanarayananan and C.C. Koch, Hyperfine Interactions Journal (2000).

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, SIVAKASI.

DEPARTMENT OF PHYSICS

ADD ON COURSE - 2

GLPHEC2 – Physics for Competitive Examinations

(For those admitted in June 2017 and later)

Contact hours per week : 02
Contact hours per semester : 30
Total number of credits : 02

Course Outcomes (CO):

On successful completion of the course, the learners should be able to

CO1: define the basic laws of motion, gravitation, thermal, optics and electronics
CO2: describe the concepts of work, waves, atomic and nuclear physics
CO3: classify the different electronic devices and communication systems
CO4: solve problems in Physics
CO5: appraise the importance of recent trends in Physics

Unit I: **(6 hours)**

Motion and its Laws- Work, Energy and Power

Unit II: **(6 hours)**

Gravitation- Properties of Matter

Unit III: **(6 hours)**

Thermal Physics and Heat Transfer – Waves and Oscillations

Unit IV: **(6 hours)**

Optics – Atomic and Nuclear Physics

Unit V: **(6 hours)**

Electronic Devices- Communication Systems

Text Book:

Amit Kumar Verma - Objective Physics, Ramesh Publishing House, New Delhi, Seventh Edition, 2011

Unit I - Chapter 2: Page No. 13– 32 & Chapter 3 : Page No.33- 41.
Unit II - Chapter 5: Page No. 54- 64 & Chapter 6 : Page No. 65- 79.
Unit III- Chapter 7: Page No. 80- 90 & Chapter 8 : Page No. 91- 106.
Unit IV- Chapter 11: Page No. 150- 167 & Chapter 12 : Page No.169- 188.
Unit V - Chapter 14: Page No. 198- 214 & Chapter 15 : Page No.215- 229.