B.Sc. PHYSICS

CHOICE BASED CREDIT SYSTEM (CBCS)

Curriculum and Syllabus

Students admitted from 2020 onwards

Enable | Enlighten | Enrich
KARPAGAM
ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)

DEPARTMENT OF PHYSICS
KARPAGAM ACADEMY OF HIGHER EDUCATION
(Deemed to be University Established Under Section 3 of UGC Act, 1956)
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PREAMPLE

The B.Sc. Physics course is conducted with the following objectives:

- **To update the knowledge of the students in one of the most important basic sciences, namely PHYSICS.**
- **To update the knowledge of a person in the latest fields of science like Atomic and Nuclear Physics, Laser Physics, Materials Science, Nano Technology, Astrophysics etc.**
- **To motivate and support young talented researchers in their research activities.**
- **To prepare the students to fit into National Laboratories like CSIR laboratories and National Physical Laboratories etc., as working personnel. Also to make them to work in Universities and colleges as teachers.**
- **To enhance the knowledge of the structure and evolution of the Universe, fundamental properties of matter and energy through the support of leading edge research.**
- **To provide efficient and resourceful hands to help in inter-disciplinary areas where basic and advanced knowledge in physics is utilized.**

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)
(Established under Section 3 of UGC Act, 1956)
Eachanari Post, Coimbatore - 641 021, India
FACULTY OF ARTS, SCIENCE AND HUMANITIES
UNDER-GRADUATE PROGRAMMES
REGULAR MODE
REGULATIONS - 2020

The following Regulations are effective from the academic year 2020-2021 and are applicable to candidates admitted to Under Graduate Degree (UG) programmes in the Faculty of Arts, Science, and Humanities, Karpagam Academy of Higher Education (KAHE) from the academic year 2020-2021 onwards.

1 PROGRAMMES OFFERED, MODE OF STUDY AND ADMISSION REQUIREMENTS

1.1 U.G. Programmes Offered

A candidate may undergo a programme in any one of the under graduate programme approved by the KAHE as given below.

S. No.	DEGREE	DISCIPLINE
1	B. Sc.	Biochemistry
2	B. Sc.	Biotechnology
3	B. Sc.	Computer Science
4	B.Sc.	Mathematics
5	B.Sc.	Physics
6	B. Sc.	Chemistry
7	B. Sc.	Microbiology
8	B. Sc.	Information Technology
9	B. Sc.	Computer Technology
10	B.Sc.	Computer Science with Cognitive Systems
11	BCA	Computer Application
12	B.Sc.	Applied Science (Material Science)
13	B.Sc.	Applied Science (Foundary Science)
14	B. Com.	Commerce
15	B.Com (CA)	Commerce with Computer Applications
16	B. Com. (PA)	Commerce with Professional Accounting
17	B. Com. (BPS)	Commerce with Business Process Services
18	B.B.A.	Business Administration

1.2 Mode of Study

Full-Time

All programs are offered under Full-Time Regular mode. Candidates admitted under '**Full-Time'** should be present in the KAHE during the complete working hours for curricular, co-curricular and extra-curricular activities assigned to them.

1.3 Admission Requirements (Eligibility)

A candidate for admission to the first year of the UG Degree programme shall be required to have passed the Higher Secondary Examination (10 + 2) [Academic or Vocational] prescribed by the Government of Tamil Nadu Board or any similar examination of any other Board accepted by the KAHE as equivalent thereto.(Annexure I)

2. DURATION OF THE PROGRAMMES

2.1 The minimum and maximum period for the completion of the U.G. Programmes are given below:

Programme	Min. No. of Semesters	Max. No. of Semesters
B.Sc., B.Com, BCA, BBA	6	12

2.2 Each semester normally consists of 90 working days or 450 Instructional hours of study. Examination shall be conducted at the end of every semester for the respective courses.

3. CHOICE BASED CREDIT SYSTEM

3.1. All programmes are offered under Choice Based Credit System with a total credit of 140 for UG Programmes.

3.2. Credits

Credit means the weightage given to each course of study by the experts of the Board of Studies concerned. Total credits 140 as per UGC Guidelines for the UG programme (Three Years).

4. STRUCTURE OF THE PROGRAMME

4.1 Tamil or any one of the Indian / Foreign Languages *viz*, Malayalam, Hindi, French, Sanskrit are offered as an additional course for Science Programme. Four credits are awarded for each course and the examinations will be conducted at the end of the each semester.

For Arts programme, there are two additional courses (English III and IV) offered during the Second year - third and fourth semesters. Six credits are awarded for each course, and the examinations will be conducted at the end of the respective semester.

4.2. Core Course, Discipline Specific Elective, Generic Elective, Skill Enhancement Course, Project, Ability Enhancement Course are part of curricular structure.

4.2.1. Core Course

Core course consists of theory and practical for Department domains for which examinations shall be conducted at the end of each semester. The students have to study 12 Core Courses compulsorily.

4.2.2. Discipline Specific Electives (DSE)

DSE is offered in the fifth and sixth semesters of third year. The examination shall be conducted at the end of each semester. Final year students (V and VI Semesters) will

have to choose the elective courses in V semester and VI Semester from the list of elective courses given in the curriculum, in addition to the project work.

4.2.3. Generic Elective

Generic elective is an elective course chosen generally from an unrelated discipline/subject, with an intention to provide exposure in other areas of interest also to students.

The students have to choose two Generic Electives- one each in the First year (3 or 4 courses) and second year (3 or 4 courses) of the programme from the list of elective courses given in the curriculum.

Note: A particular elective course will be offered only if at least one third of the students in a class opt that course. If less, the elective selected has to be studied as a self-study course only.

4.2.4. Skill Enhancement Courses

Skill Enhancement Courses are offered in the third and fourth semesters of second year programme and in the fifth and sixth semesters of the third year programme. Second year students (III and IV Semesters) will have to choose atleast one elective course each in both III and IV Semesters from the list of elective courses given in the curriculum. Similarly final year students (V and VI Semesters) will have to choose atleast one elective course each in both V and VI Semesters from the list of elective courses given in the curriculum. The examination shall be conducted at the end of each semester.

Note: A particular elective course will be offered only if at least one third of the students in a class opt that course. If less, the elective selected has to be studied as a self-study course only.

4.2.5. Project Work

The project work shall start at the beginning of sixth semester and the Project Report has to be submitted at the end of the sixth semester. The project may be an individual or group task**.** HoD of the department concerned shall assign a project supervisor who in turn shall monitor the project work of the student(s). A project/ dissertation work may be given *in lieu* of a discipline-specific elective paper.

4.2.6. Ability Enhancement Course

Ability Enhancement Course-1

The course (English for Science Programme / Business Communication for Arts Programme) shall be offered during the first and second semester for which examinations shall be conducted at the end of the semester. And Business Communication for Arts Programme shall be offered during the first semester for which examinations shall be conducted at the end of the semester.

Ability Enhancement Compulsory Course-2

Students shall study the course Environmental Studies in the First / Second Semester

for which examinations shall be conducted at the end of the semester.

4.2.7. Internship

The student shall undergo 15 days internship in the end of II and IV semester.

5.0 Value Added Courses

Courses of varying durations but not less than 30 hours which are optional and offered outside the curriculum that add value and helping the students in getting placement. Students of all programmes are eligible to enroll for the value added course. The student can choose one Value-added course per semester from the list of Value-added courses available in KAHE. The examinations shall be conducted at the end of the value added course at the Department level and the student has to secure a minimum of 50% of marks to get a pass. The certificate for the value added course for the passed out students shall be issued duly signed by the HOD and Dean of the Faculty concerned.

6.0 Online Course

Student shall study at least one online course from SWAYAM / NPTEL / MOOC in any one of the first five semesters for which examination shall be conducted at the end of the course by the respective external agencies if any. The student can register to the courses which are approved by the Department. The student shall produce a Pass Certificate from the respective agencies before the end of the fifth semester. The credit(s) earned by the students will be considered as additional credit(s) over and above the credits minimum required to earn a particular degree.

7.0 Extension Activities

Every student is encouraged to participate in at least any one of the following Extension activities:

- NSS
- NCC
- Sports / Mass drill
- YRC
- Club activities
- Other Co-curricular and Extra curricular activities

The student's performance shall be examined by the staff in-charge of Extension Activities along with the faculty mentor and the Head of the respective department on the following parameters.

- 75 % weightage for active participation in Extension Activities in / out of the KAHE.
- 25 % weightage for Exemplary Awards / Honours / Prizes secured.

8.0 Marks for Co-curricular and Extra-curricular shall be sent to the CoE before the commencement of the Sixth End Semester Examinations.

The above activities shall be conducted outside the regular working hours of the KAHE.

5. MEDIUM OF INSTRUCTION

The medium of instruction and examinations for the courses under Language I – Tamil / Hindi / Malayalam / French / Sanskrit shall be in the language concerned. For all other courses, the medium of instruction and examination shall be in English.

6. MAXIMUM MARKS

Each of the theory and practical courses shall carry a maximum of 100 marks. Out of which 40 marks is awarded for Continuous Internal Assessment (CIA) and 60 marks for End Semester Examinations (ESE).

Evaluation: Evaluation in the courses comprises two parts, one is the Continuous Internal Assessment (CIA) and the other one is the End Semester Examination (ESE).

7. REQUIREMENTS TO APPEAR FOR THE END SEMESTER EXAMINATION

a. Ideally, every student is expected to attend all classes and secure 100% attendance. However, in order to allow for certain unavoidable circumstances, the student is expected to attend at least 75% of the classes and the conduct of the candidate has been satisfactory during the course.

b. A candidate who has secured attendance between 65% and 74% (both included), due to medical reasons (Hospitalization / Accident / Specific Illness) or due to participation in University / District / State / National / International level sports or due to participation in Seminar / Conference / Workshop / Training Programme / Voluntary Service / Extension activities or similar programmes with prior permission from the Registrar shall be given exemption from prescribed minimum attendance requirements and shall be permitted to appear for the examination on the recommendation of the Head of the Department concerned and Dean to condone the shortage of attendance. The Head of the Department has to verify and certify the genuineness of the case before recommending to the Dean concerned. However, the candidate has to pay the prescribed condonation fee to the KAHE.

c. However, a candidate who has secured attendance less than 64% in the current semester due to any reason shall not be permitted to appear for the current semester examinations. But he/she will be permitted to appear for his/her supplementary examinations, if any and he/she has to re-do the same semester with the approval of the "Students' Affairs Committee" and Registrar.

8. a. FACULTY MENTOR

To help students in planning their courses of study and for general advice on the academic programme, the HoD shall allot twenty students to a faculty who will function as faculty mentor throughout their period of study. Faculty mentor shall advise the students and monitor their behavior and academic performance. Problems if any shall be counseled by them periodically. The Faculty mentor is also responsible to inform the parents of their wards' progress. Faculty mentor shall display the cumulative attendance particulars of his / her ward students' periodically (once in 2 weeks) on the Notice Board to enable the students, know their attendance status and satisfy the **clause 7** of this regulation.

b. **ONLINE COURSE COORDINATOR**

To help students in planning their online courses and for general advice on online courses, the HOD shall nominate a coordinator for the online courses. The Online course coordinator shall identify the courses which students can select for their programme from the available online courses offered by the different agencies periodically and inform the same to the students. Further, the coordinators shall advice the students regarding the online courses and monitor their course.

9. CLASS COMMITTEE

Every class shall have a Class Committee consisting of the faculty members of the various courses of the class concerned, student representatives (Minimum 2 boys and 2 girls of various capabilities and Maximum of 6 members) and the concerned HoD / senior faculty as Chairperson. The objective of the Class Committee Meeting is all about the teaching – learning process. Class Committee shall be convened at least once in a month. The functions of the Class Committee shall include

- Analysing and solving problems experienced by students in the class room and in the laboratories.
- Analyzing the performance of the students of the class after each test and finding the ways and means to improve the performance.
- The Class Committee of a particular class of any department is normally constituted by the HoD / Chairperson of the Class Committee. However, if the students of different departments are mixed in a class, the Class Committee shall be constituted by the respective Dean of the Faculty.
- The class committee shall be constituted during the first week of each semester.
- The HoD / Chairperson of the Class committee is authorized to convene the meeting of the class committee.
- The respective Dean of the Faculty has the right to participate in any Class committee meeting.
- The Chairperson is required to prepare the minutes of every meeting, and submit the same to Dean concerned within two days after having convened the meeting. Serious issues if any shall be brought to the notice of the Registrar by the HoD / Chairperson immediately.

10. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline or department shall have a "Course Committee" comprising all the teachers handling the common course with one of them nominated as Course Coordinator. The nomination of the course coordinator shall be made by the respective Dean depending upon whether all the teachers handling the common course belong to a single department or to various other departments. The 'Course Committee' shall meet in order to arrive at a common scheme of evaluation for the tests to ensure a uniform evaluation of the tests. If feasible, the course committee shall prepare a common question paper for the Internal Assessment test(s).

11. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

11.1 **Attendance and assessment:** Every Faculty is required to maintain an **Attendance and Assessment Record (Log book)** which consists of attendance of students marked for each lecture / practical / project work class, the test marks and the record of class work (topic covered), separately for each course. This should be submitted to the HoD once in a fortnight for checking the syllabus coverage and the records of test marks and attendance. The HoD shall sign with date after due verification. The same shall be submitted to respective Dean once in a month. After the completion of the semester the HoD should keep this record in safe custody for five years. Because records of attendance and assessment shall be submitted for Inspection as and when required by the KAHE / any other approved body.

11.2 **Continuous Internal Assessment (CIA)**: The performance of students in each course will be continuously assessed by the respective faculty as per the guidelines given below:

Theory Courses

S. No.	Category	Maximum Marks
1.	Assignment*	5
2.	Attendance	5
3	Seminar	5
4.	Test – I (1 ½ units- Unit I and II)	8
5	Test – II (1 ½ units Unit II and III)	8
6	Test III (2 units Unit IV and V)	9
Continuous Internal Assessment : Total		40

* Two Assignments (Assignment I before Internal Test – I and assignment II before Internal Test – II).

Practical Courses

S. No.	Category	Maximum Marks
1.	Attendance	5
2.	Observation work	5
3.	Record work	5
4.	Model Examination	20
5.	*Viva – voce* [Comprehensive]*	5
Continuous Internal Assessment: Total		**40**

* Includes *Viva- voce* conducted during the model Exam practical.

Every practical Exercise / Experiment shall be evaluated based on the conduct of Exercise/ Experiment and records maintained.

11.3 Pattern of Test Question Paper

Portions for Internal Test – I : First 1 ½ Units(Unit I and II)

Portions for Internal Test – II : Second 1 ½ Units (Unit II and III)

Portions for Internal Test – III : Two units (Unit IV and V)

Instruction	Remarks
Maximum Marks	50 marks
Duration	2 Hours
Part – A	Objective type (20x1=20)
Part - B	Short Answer Type (3 x 2 = 6)
Part - C	3 Eight mark questions 'either – or' choice (3 x 8 = 24 Marks)

11.4 Attendance

Marks Distribution for Attendance

S. No.	Attendance (%)	Maximum Marks
1	91 and above	5.0
2	81 – 90	4.0
3	76 – 80	3.0
4	Less than 75	0

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12. ESE EXAMINATIONS

12.1 End Semester Examination (ESE): End Semester Examination will be held at the end of each semester for each course. The question paper is for a maximum 60 marks.

Pattern of ESE Question Paper:

Instruction	Remarks
Maximum Marks	60 marks for ESE.
Duration	3 hours (½ Hr for Part – A Online & 2 ½ Hours for Part – B and C
Part - A	20 Questions of 1 mark each (20 x 1 = 20 Marks) Question No. 1 to 20 Online Multiple Choice Questions
Part- B	5 Questions of 2 marks each(5 x 2 = 10 Marks) Covering all the five units of the syllabus Question No. 21 to 25
Part- C	5 six mark Questions of 6 marks each (5 x 6 = 30 Marks.) Question No. 26 to 30 will be 'either-or' type, covering all five units of the syllabus; i.e., Question No. 26: Unit - I, either 26 (a) or 26 (b), Question No. 27: Unit - II, either 27 (a) or 27 (b), Question No. 28: Unit - III, either 28 (a) or 28 (b), Question No. 29: Unit - IV, either 29 (a) or 29 (b), Question No. 30: Unit - V, either 30 (a) or 30 (b)

12.2 **Practical:** There shall be combined valuation. The pattern of distribution of marks shall be as given below.

Experiments	: 40 Marks
Record	: 10 Marks
Viva-voce	: 10 Marks
Total	**: 60 Marks**

Record Notebooks for Practical Examination

Candidate taking the practical examination should submit Bonafide Record Notebook prescribed for the practical examination; failing which the candidate will not be permitted to take the practical examination.

In case of failures in Practical Examination, the marks awarded for the Record at the time of first appearance of the Practical Examination shall remain the same at the subsequent appearance also by the candidate.

12.3. **Evaluation of Project Work**

12.3.1 The project work shall carry a maximum of 100 marks. (CIA - 40 and ESE – 60*)

*Combined valuation of Internal and External Examiners.

12.3.2 The project report prepared according to the approved guidelines and duly signed by the supervisor(s) shall be submitted to HoD.

12.3.3 The evaluation of the project will be based on the project report submitted and a *viva-voce* Examination by a team consisting of the supervisor, who will be the Internal Examiner and an External Examiner who shall be appointed by the COE. In case the guide is not available, the HoD shall act as an Internal Examiner for the same.

12.3.4 If a candidate fails to submit the project report on or before the specified date given by the Examination Section, the candidate is deemed to have failed in the Project Work and shall re-enroll for the same in a subsequent semester.

If a candidate fails in the respective viva-voce examinations he/she has to resubmit the Project Report within 30 days from the date of declaration of the results. For this purpose the same Internal and External examiner shall evaluate the resubmitted report.

12.3.5 Copy of the approved project report after the successful completion of *viva-voce* examinations shall be kept in the KAHE library.

13. PASSING REQUIREMENTS

13.1 Passing minimum: There is a passing minimum 20 marks out of 40 marks for CIA and the passing minimum is 30 marks out of 60 marks in ESE. The overall passing in each course is 50 out of 100 marks (Sum of the marks in CIA and ESE examination).

13.2 If a candidate fails to secure a pass in a particular course (either CIA or ESE or Both) as per clause 13.1, it is mandatory that the candidate has to register and reappear for the examination in that course during the subsequent semester when examination is conducted for the same till he / she receives a pass both in CIA and ESE (vide Clause 2.1).

13.3 Candidate failed in CIA will be permitted to improve CIA marks in the subsequent semesters by writing tests and by re-submitting Assignments.

13.4 CIA marks (if it is pass) obtained by the candidate in the first appearance shall be retained by the Office of the Controller of Examinations and considered valid for all subsequent attempts till the candidate secures a pass in ESE

13.5 Candidate who is absent in ESE in a Course / Practical / Project Work after having enrolled for the same shall be considered to have **failed** in that examination.

14. IMPROVEMENT OF MARKS IN THE COURSES ALREADY PASSED

Candidates desirous to improve the marks secured in a passed course in their first attempt shall reappear once (**only in ESE**) in the subsequent semester. **The improved marks shall**

be considered for classification but not for ranking. If there is no improvement there shall be no change in the marks awarded earlier.

15. AWARD OF LETTER GRADES

All assessments of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain number of points, will be awarded as per the range of total marks (out of 100) obtained by the candidate in each course as detailed below:

Letter grade	Marks Range	Grade Point	Description
O	91 - 100	10	OUTSTANDING
A+	81- 90	9	EXCELLENT
A	71-80	8	VERY GOOD
B+	66- 70	7	GOOD
B	61 – 65	6	ABOVE AVERAGE
C	55 - 60	5	AVERAGE
D	50 - 54	4	PASS
RA	<50	-	REAPPEARANCE
AAA	-	-	ABSENT

16. GRADE SHEET

After the declaration of the results, Grade Sheets will be issued to each student which will contain the following details:

i. The list of courses enrolled during the semester and the grade scored.

ii. The Grade Point Average (**GPA**) for the semester and

iii. The Cumulative Grade Point Average (**CGPA**) of all courses enrolled from first semester onwards.

iv. Remark on Extension Activities (only in the 6th Semester Grade Sheet)

GPA of a Semester and CGPA of a programme will be calculated as follows.

GPA of a Semester = Sum of the product of the GP by the corresponding credits of the courses offered in that Semester / Sum of the credits of the courses of that Semester

i.e. **GPA** of a Semester = $\frac{\sum_i CiGPi}{\sum_i Ci}$

CGPA of the entire programme = Sum of the product of the GPs by the corresponding credits of the courses offered for the entire programme / Sum of the credits of the courses of the entire programme

i.e. **CGPA** of the entire programme = $\frac{\sum_n \sum_i CniGPni}{\sum_n \sum_i Cni}$

where,

Ci is the credit fixed for the course 'i' in any semester

GPi is the grade point obtained for the course 'i' in any semester

'n' refers to the Semester in which such courses are credited.

Note: RA grade will be excluded for calculating **GPA** and **CGPA**.

17. REVALUATION

A candidate can apply for revaluation and retotalling of his / her semester examination answer script (**theory courses only**), within 2 weeks from the date of declaration of results, on payment of a prescribed fee. For the same, the prescribed application has to be sent to the Controller of Examinations through the HoD. **A candidate can apply for revaluation of answer scripts not exceeding 5 courses at a time.** The Controller of Examination will arrange for the revaluation and the results will be intimated to the candidate through the HoD concerned**.** Revaluation is not permitted for supplementary theory courses.

18. TRANSPARENCY AND GRIEVANCE COMMITTEE

Revaluation and Re-totaling is allowed on representation (clause 17). Student may get the Xerox copy of the answer script on payment of prescribed fee, if he / she wishes. The student may represent the grievance, if any, to the Grievance Committee, which consists of Dean of the Faculty, (if Dean is HoD, the Dean of another Faculty nominated by the KAHE), HoD of the Department concerned, the faculty of the course and Dean from other discipline nominated by the KAHE and the CoE. If the Committee feels that the grievance is genuine, the script may be sent for external valuation; the marks awarded by the External examiner will be final. The student has to pay the prescribed fee for the same.

19. ELIGIBILITY FOR THE AWARD OF THE DEGREE

A student shall be declared to be eligible for the conferment of the Degree if he / she has

- Successfully completed all the components prescribed under Parts I to Part IV in the CBCS pattern to earn the minimum required credits as specified in the curriculum corresponding to his / her programme within the stipulated period vide class 2.1.
- Not any disciplinary action pending against him / her.
- The award of the degree must be approved by the Board of Management.

20. CLASSIFICATION OF THE DEGREE AWARDED

20.1 Candidate who qualifies for the award of the Degree (vide clause 19) having passed the examination in all the courses in his / her first appearance, within the specified minimum number of semesters and securing a **CGPA not less than 8** shall be declared to have passed the examination in **First Class with Distinction.**

20.2 Candidate who qualifies for the award of the Degree (vide clause 19) having passed the examination in all the courses within the specified maximum number of semesters (vide clause 2.1), securing a **CGPA not less than 6.5** shall be declared to have passed the examination in **First Class**.

20.3 All other candidates (not covered in clauses 20.1 and 20.2) who qualify for the award of the degree (vide Clause 19) shall be declared to have passed the examination in **Second Class**.

21. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

21.1 Candidate, may for valid reasons and on prior application, be granted permission to withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination.

21.2 Such withdrawal shall be permitted only once during the entire period of study of the degree programme.

21.3 Withdrawal of application is valid only if it is made within 10 days prior to the commencement of the examination in that course or courses and recommended by the HoD / Dean concerned and approved by the Registrar.

21.3.1 Notwithstanding the requirement of mandatory TEN days notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.

21.4 Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction. This provision is not applicable to those who seek withdrawal during **VI semester**.

21.5 Withdrawal from the End semester examination is **NOT** applicable to arrears courses of previous semesters.

21.6 The candidate shall reappear for the withdrawn courses during the examination conducted in the subsequent semester.

22. PROVISION FOR AUTHORISED BREAK OF STUDY

22.1 **Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme.** However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons, and to rejoin the programme in a subsequent year, permission may be granted based on the merits of the case provided he / she applies to the Registrar, but not later than the last date for registering for the end semester examination of the semester in question, through the Head of the Department stating the reasons therefore and the probable date of rejoining the programme.

22.2 The candidate thus permitted to rejoin the Programme after the break shall be governed by the Curriculum and Regulations in force at the time of rejoining. Such candidates may have to do additional courses as per the Regulations in force at that period of time.

22.3 The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification. (Vide

Clause 20). However, additional break of study granted will be counted for the purpose of classification.

22.4 The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 2.1 irrespective of the period of break of study (vide clause 22.1) in order that he/she may be eligible for the award of the degree.

22.5 If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Break of Study' or 'Withdrawal' (Clause 21 and 22) is not applicable for this case.

23. RANKING

A candidate who qualifies for the UG Degree programme passing all the Examinations in the first attempt, within the minimum period prescribed for the programme of study from Semester I through Semester VI to the programme shall be eligible for ranking. Such ranking will be confined to 10% of the total number of candidates qualified in that particular programme of study subject to a maximum of 10 ranks.

24. SUPPLEMENTARY EXAMINATION

Supplementary Examination will be conducted only for the final semester students within ten days from the date of publication of results for students who have failed in one theory course only. Such students shall apply with prescribed fee to the Controller of Examinations within the stipulated time.

25. DISCIPLINE

25.1. If a student indulges in malpractice in any of the Internal / External Examination he / she shall be liable for punitive action as prescribed by the KAHE from time to time.

25.2. Every student is required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the KAHE. The erring students will be referred to the disciplinary committee constituted by the KAHE, to enquire into acts of indiscipline and recommend the disciplinary action to be taken.

26. REVISION OF REGULATION AND CURRICULUM

The KAHE may from time to time revise, amend or change the Regulations, Scheme of Examinations and syllabi if found necessary.

DEPARTMENT OF PHYSICS
FACULTY OF ARTS, SCIENCE AND HUMANITIES
UG PROGRAM (CBCS) – B.Sc. Physics
(2020–2021 Batch and onwards)

Course code	Name of the course	Category	Objectives and outcomes		Instruction hours / week			Credit(s)	Maximum Marks			P.No.
			PEOs	POs	L	T	P		CIA	ESE	Total	
									40	60	100	
SEMESTER – I												
20LSU101	Language – I	AEC	1	a, f	4	0	0	4	40	60	100	25
20ENU101	English-I	AEC	1	a, f	4	0	0	4	40	60	100	28
20PHU101	Mechanics	CC	3	b	4	0	0	4	40	60	100	30
20PHU102	Properties of Matter	CC	3	b	4	0	0	4	40	60	100	32
20PHU103	Mathematics –I	Allied	8	e	4	0	0	4	40	60	100	34
20PHU111	Mechanics Practical	CC	6	d	0	0	3	2	40	60	100	36
20PHU112	Properties of Matter Practical	CC	6	d	0	0	3	2	40	60	100	37
20PHU113	Mathematics Practical-I	Allied	7	e	0	0	4	2	40	60	100	39
Semester Total					**20**		**10**	**26**	**320**	**480**	**800**	
SEMESTER – II												
20LSU201	Language –II	AEC	1	a,f	4	0	0	4	40	60	100	40
20ENU201	English-II	AEC	1	a,f	4	0	0	4	40	60	100	43
20PHU201	Electricity and Magnetism	CC	4	b	6	0	0	5	40	60	100	45
20PHU202	Principles of Electronics	CC	9	b	5	0	0	4	40	60	100	47
20PHU203	Mathematics – II	Allied	8	e	4	0	0	4	40	60	100	50
20PHU211	Electricity and Magnetism Practical	CC	6	d	0	0	2	1	40	60	100	52
20PHU212	Principles of Electronics Practicals	CC	6	d	0	0	2	1	40	60	100	54
20AEC201	Environmental Studies	AEC	2	l	3	0	-	3	40	60	100	56
Semester Total					**26**		**04**	**26**	**320**	**480**	**800**	
SEMESTER – III												
20PHU301	Waves and optics	CC	3	b	4	0	0	4	40	60	100	59
20PHU302	Physics of Electronic Devices and Circuits	CC	4	b	4	0	0	4	40	60	100	61
20PHU303A	Renewable Energy and Energy harvesting	SEC	5	i	03	0	0	3	40	60	100	63
20PHU303B	Physics Workshop Skill	SEC	5	i								65
20PHU304	Chemistry –I	Allied	2	b	4	0	0	4	40	60	100	67
20PHU311	Wave and Optics Practical	CC	6	g	0	0	4	2	40	60	100	70
20PHU312	Physics of Electronic Devices and Circuits Practical	CC	6	h	0	0	4	2	40	60	100	72
20PHU313A	Renewable Energy and Energy harvesting Practical	SEC	6	g	0	0	3	1	40	60	100	74
20PHU313B	Physics Workshop Skill Practical	SEC										75
20PHU314	Chemistry Practical–I	Allied	6	g	-	0	4	2	40	60	100	76
	Semester total				**15**		**15**	**22**	**320**	**480**	**800**	
SEMESTER – 4												

20PHU401	Thermal Physics and Statistical Mechanics	CC	3	b	4	0	0	4	40	60	100	77
20PHU402	Atomic and Nuclear Physics	CC	4,9	d	4	0	0	4	40	60	100	80
20PHU403A	Basic Instrumentation Skill	SEC	5	i	3	0	0	3	40	60	100	82
20PHU403B	Radiation Safety	SEC	5	b								84
20PHU404	Chemistry –II	Allied	4	b	4	0	0	4	40	60	100	86
20PHU411	Thermal Physics and Statistical Mechanics – Practical	CC	6	g	0	0	04	2	40	60	100	88
20PHU412	Atomic and Nuclear Physics Practical	CC	6	g	0	0	04	2	40	60	100	90
20PHU413A	Basic Instrumentation Skill Practical	SEC	6	g	0	0	3	1	40	60	100	91
20PHU413B	Radiation Safety Practical	SEC										93
20PHU414	Chemistry Practical–II	Allied	6	g	0	0	04	2	40	60	100	95
	Semester total				**15**		**15**	**22**	**320**	**480**	**800**	
Internship												
SEMESTER – 5												
20PHU501	Mathematical Physics	CC	4	e	04	0	0	4	40	60	100	96
20PHU502	Electromagnetic Wave Propagation	CC	8, 9	b, e	4	0	0	4	40	60	100	98
20PHU503	Elements of Modern Physics	CC	3	b, e	04	0	0	4	40	60	100	100
20PHU504A	Microprocessor and Microcontroller	DSE	5	D	03	0	0	3	40	60	100	102
20PHU504B	Medical Physics	DSE	5	d								104
20PHU511	Mathematical Physics Practical	CC	6	g	0	0	4	2	40	60	100	107
20PHU512	Electromagnetic wave Propagation Practical	CC	6	g	0	0	04	2	40	60	100	109
20PHU513	Elements of Modern Physics Practical	CC	6	g	0	0	04	2	40	60	100	111
20PHU514A	Microprocessor and Microcontroller Practical	DSE	6	g	0	0	03	1	40	60	100	113
20PHU514B	Medical Physics Practical	DSE	6	g								115
	Semester total				**15**		**15**	**22**	**320**	**480**	**800**	
SEMESTER – 6												
20PHU601	Classical and Quantum Mechanics	CC	8	c	04	0	0	4	40	60	100	117
20PHU602	Solid State Physics	CC	4	c	4	0	0	4	40	60	100	119
20PHU603A	Nanomaterials and Applications	DSE	9	h	4	0	0	4	40	60	100	121
20PHU603B	Biological Physics											123
20PHU611	Classical and Quantum Mechanics Practical	CC	6	b	0	0	4	2	40	60	100	125
20PHU612	Solid State Physics Practical	CC	6	h	0	0	4	2	40	60	100	126
20PHU613A	Nanomaterials and Applications Practical	DSE	6	h	0	0	4	2	40	60	100	128
20PHU613B	Biological Physics Practical											129
20PHU691	Project	DSE	3,6,7	b,h,f	06	0	0	4	40	60	100	130
	Semester total				**18**		**12**	**22**	**280**	**420**	**700**	

	ECA / NCC / NSS / Sports / General interest etc											
	G. Total							**140**	**1880**	**2820**	**4700**	

Ability Enhancement Courses (AEC)		
SEMESTER	**Course Code**	**Name of the Course**
I	20LSU101	Language –I
	20ENU 101	English –I
II	20LSU201	Language –II
	20ENU201	English-II
	20AEC201	Environmental Studies

Generic Elective Courses (GE) / Allied Courses			
SEMESTER		**Course Code**	**Name of the Course**
I	GEC-1	20PHU103	Mathematics –I
		20PHU113	Mathematics Practical-I
II	GEC-2	20PHU203	Mathematics – II
III	GEC-3	20PHU304	Chemistry –I
		20PHU314	Chemistry Practical–I
IV	GEC-4	20PHU404	Chemistry –II
		20PHU414	Chemistry Practical–II

Core Courses (CC)			
SEMESTER		**Course Code**	**Name of the Course**
I	CC-1	20PHU101	Mechanics
		20PHU111	Mechanics Practical
	CC-2	20PHU102	Properties of Matter
		20PHU112	Properties of Matter Practical
II	CC-3	20PHU201	Electricity and Magnetism
		20PHU211	Electricity and Magnetism Practical
	CC-4	20PHU202	Principles of Electronics
		20PHU212	Principles of Electronics Practical
III	CC-5	20PHU301	Waves and optics
		20PHU311	Wave and Optics Practical
	CC-6	20PHU302	Physics of Electronic Devices and Circuits

		20PHU312	Physics of Electronic Devices and Circuits
IV	CC-7	20PHU401	Thermal Physics and Statistical Mechanics
		20PHU411	Thermal Physics and Statistical Mechanics Practical
	CC-8	20PHU402	Atomic and Nuclear Physics
		20PHU412	Atomic and Nuclear Physics Practical
V	CC-9	20PHU501	Mathematical Physics
		20PHU511	Mathematical Physics Practical
	CC-10	20PHU502	Electromagnetic Wave Propagation
		20PHU512	Electromagnetic wave Propagation Practical
	CC-11	20PHU503	Elements of Modern Physics
		20PHU513	Elements of Modern Physics Practical
VI	CC-12	20PHU601	Classical and Quantum Mechanics
		20PHU611	Classical and Quantum Mechanics Practical
	CC-13	20PHU602	Solid State Physics
		20PHU612	Solid State Physics Practical

Skill Enhancement Courses (SEC)			
SEMESTER		**Course Code**	**Name of the Course**
III	SEC-1	20PHU303A	Renewable Energy and Energy harvesting
		20PHU313A	Renewable Energy and Energy harvesting Practical
	SEC-2	20PHU303B	Physics Workshop skill
		20PHU313B	Physics Workshop skill Practical
IV	SEC-3	20PHU403A	Basic Instrumentation Skill
		20PHU413A	Basic Instrumentation Skill Practical
	SEC-4	20PHU403B	Radiation Safety
		20PHU413B	Radiation Safety Practical

Discipline Specific Elective Courses (DSE)			
SEMESTER		**Course Code**	**Name of the Course**
V	DSE-1	20PHU504A	Microprocessor and Microcontroller
		20PHU514A	Microprocessor and Microcontroller Practical
	DSE-2	20PHU504B	Medical Physics
		20PHU514B	Medical Physics Practical
VI	DSE-3	20PHU603A	Nanomaterials and Applications
		20PHU613A	Nanomaterials and Applications Practical
	DSE-4	20PHU603B	Biological Physics
		20PHU613B	Biological Physics Practical
	DSE-5	20PHU691	Project

PROGRAMME OUTCOMES

a) Be able to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

b) Understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life.

c) The graduate will have specialized knowledge and expertise to identify, formulate, investigate, analyze and implement on the problems in physical sciences.

d) Realized how developments in any science subject helps in the development of other science subjects and vice-versa and how interdisciplinary approach helps in providing better solutions and new ideas for the sustainable developments

e) Students will demonstrate proficiency in mathematics and the mathematical concepts needed for a proper understanding of physics.

f) Work and communicate efficiently in inter-disciplinary circumstances.

g) The graduate will have leadership quality to handle all kind of circumstances in diverse interdisciplinary and multidisciplinary learning environment.

h) Select, design and apply appropriate experimental techniques with computational tools to solve problems of physics.

i) Perform job in various fields' viz. science, engineering and business, etc. with precision, analytical mind, innovative thinking, clarity of thought and expression, systematic approach.

j) Understand ethical principles and responsibilities of a physics graduate to serve the society

PROGRAMME SPECIFIC OUTCOMES

k) Enhance the employable skills towards seeking appointments in the relevant areas.

l) Able to use advanced mathematical tools and algorithms to elucidate the practical problems.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To produce graduates who excel in the competencies and values required for leadership to serve a rapidly evolving global community

PEO2: To provide the students with academic excellence, leadership qualities and professional ethics to address the needs of the scientific community.

PEO3: To create strong interest in physics so as students can further develop themselves through self-study.

PEO4: To equip the students with the ability to utilize the concepts of Physics such as optics, electricity, Magnetism, Thermodynamics etc and their applications in addressing the practical and heuristic issues.

PEO5: To provide the students with creative and analytical skills for the sustainable developments and nation building initiatives.

PEO 6: Use basic laboratory equipments and data analysis techniques, including, propagating errors, and also representing data graphically.

PEO 7: Basic computer programming skills like C, C++, Scilab used in Physics can be used to solve laboratory data analysis.

PEO 8: basic mathematical tools commonly used in physics, including differential and integral calculus, vector calculus, ordinary differential equations, partial differential equations, and linear algebra to solve advanced problems encountered in the fields of applied physics and engineering.

PEO 9: To create awareness on recent trends in technology and help them to purse higher studies.

Pos	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
PEO1	X					X			X	X		
PEO2		X			X					X		
PEO3	X	X			X	X		X				X
PEO4		X	X	X	X						X	X
PEO5		X		X					X		X	
PEO6	X			X		X	X	X			X	
PEO7					X	X		X				
PEO8		X	X		X							X
PEO9		X		X	X			X				

SEMESTER – I

20LSU101 தமிழ் முதல் தாள் 4H – 4C

(இளநிலைஅறிவியல்பட்டவகுப்புகளுக்குரியது)

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும்,
  ஆய்வுநோக்கையும் மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

- இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; ' இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனைமேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.

தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்

பகுதி-I தமிழ்

இளநிலைப்பட்ட அறிவியல் வகுப்புகள்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
ஒன்று	I	4	3	40 / 60	100	4

முதல் பருவம்

20LSU101 பகுதி – I, **தமிழ், தாள் 1** 4H-4C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)
(For I-UG Science Degree Classes)

அலகு – I : தமிழ் இலக்கிய வரலாறு– I
(8மணிநேரம்)

முச்சங்க வரலாறு-சங்க இலக்கியத்தொகுப்பு-பாட்டும் தொகையும்- சங்கஇலக்கியச் சிறப்பியல்புகள்-சங்கம் மருவிய காலம்-பதினெண்கீழ்க்கணக்கு நூல்கள்- திருக்குறள்-நாலடியார்-நான்மணிக்கடிகை- பழமொழிநானூறு – பிற்கால அறஇலக்கியங்கள்-கொன்றைவேந்தன்-நீதிநூல்- காப்பியங்கள்-தமிழில் காப்பிய இலக்கணம்- தமிழில் பெருங்காப்பியங்களும் சிறு காப்பியங்களும்-சிலம்பும் மேகலையும்.

அலகு - II:சங்கஇலக்கியம் 12 மணிநேரம்)

அ).எட்டுத்தொகை

நற்றிணை:கொண்டல் மாமழை – குறிஞ்சி–தலைவன் - 140
குறுந்தொகை:வாரார் ஆயினும், வரினும் –முல்லை– தலைவி -110
ஐங்குறுநூறு :மருதம் –தோழி -வேட்கைப்பத்து:வாழிஆதன் வாழி அவனி - 6
பதிற்றுப்பத்து: சிதைந்தது மன்ற- 27
பரிபாடல்:பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு –
உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.
கலித்தொகை:பாலைக்கலி-செவிலி – எறித்தரு கதிர்தாங்கி-9
அகநானூறு:அன்னை அறியினும் அறிக–தோழி - நெய்தல் - 110
புறநானூறு :யாதும் ஊரே யாவருங் கேளிர்–பொதுவியல்- 192
ஆ).பத்துப்பாட்டு: நெடுநல்வாடை- கார்காலச் சிறப்பு : வையகம் பனிப்ப -1-70

அலகு – III: **அறஇலக்கியம் (10மணிநேரம்)**

1. திருவள்ளுவர்- திருக்குறள்– வான்சிறப்பு-அன்புடைமை-பண்புடைமை- ஒழுக்கமுடைமை-அறிவுடைமை-பொறையுடைமை-நட்பு-வாய்மை வினைத்திட்பம்-ஆள்வினை உடைமை- கல்வி-காலமறிதல்-சான்றாண்மை முதலான அதிகாரங்களிலிருந்து தேர்ந்தெடுத்த 20 குறள்கள்.
2. முன்றுறையரையனார் – பழமொழி நானூறு 5 பாடல்கள்
உணற்கு இனிய, பரந்த திறலாரை, நெடியது காண்கிலாய், இனி யாரும், உரைசான்ற
3. ஔவையார்–கொன்றை வேந்தன் (1- 50 பாடல்கள்)
அன்னையும் பிதாவும் – புலையும் கொலையும் களவும் தவிர்
4. வேதநாயகம்பிள்ளை - நீதிநூல் – (5 பாடல்கள்)
சின்னவோர் பொருள், கடவுளை வருந்தி, எப்புவிகளும், வைத்தவர், ஈன்றவர்

அலகு - IV :காப்பிய இலக்கியம் (10மணிநேரம்)

(அ). சிலப்பதிகாரம்

மங்கல வாழ்த்துப் பாடல்: (21-29)- நாக நீள் நகரொடு-கண்ணகி என்பாண் மன்னோ .

வழக்குரை காதை, (48-56) - நீர்வார் கண்ணை-புகா ரென்பதியே .

வஞ்சின மாலை: (5-34) - வன்னிமரமும் – பிறந்த பதிப் பிறந்தேன்.

நடுகற் காதை: (207-234) - அருத்திற லரசர் – மன்னவ ரேறென்,.

வாழ்த்துக்காதை: (9) - என்னேயிஃ தென்னே – மீவிசும்பிற் றோன்றுமால்.

(ஆ). மணிமேகலை

பசியின் கொடுமை: பாத்திரம் பெற்ற காதை:

'போதி நீழல்' - 'பெருகியதன்றோ' , 'ஆற்றுநர்க்களிப்போர்' - 'நல்லறம் கண்டனை' (73-98).

சிறைக்கோட்டம் அறக்கோட்டமாக்கிய காதை:மாவண் கிள்ளிக்கு காவலன் உரைத்தவை:

'பைஞ்சேறு மெழுகாப் பசும்பொன் மண்டபத்து -
அரவோர்க் காக்கினன் அரசாள் வேந்தன்' (116-163).

அலகு- V :அடிப்படை இலக்கணமும் பயன்பாட்டுத்தமிழும் -I (8மணிநேரம்)

எழுத்து, சொல், பொருள் இலக்கணம்

அ). முதல் மற்றும் சார்பெழுத்துகள்- பெயர்,வினை, இடை, உரிச்சொல் முதலான அடிப்படை இலக்கண விளக்கப் பயிற்சிகள் அகத்திணை மற்றும் புறத்திணை இலக்கணம்.

ஆ). கடிதப்பயிற்சி

1. தன்விவரக் குறிப்புடன் வேலை வேண்டி விண்ணப்பம் எழுதுதல்
2. பல்கலைக்கழகப் பன்னாட்டுக்கருத்தரங்கச் செய்தியை நாளிதழில் வெளியிட வேண்டி நாளிதழின் பதிப்பாசிரியருக்குக் கடிதம்
3. கருத்தரங்கப் பங்கேற்புக்கு அனுமதிக் கடிதம்
4. பல்கலைக்கழக விழாவுக்குத் தலைமையேற்க வேண்டி, மாவட்ட ஆட்சியருக்கு விண்ணப்பம்
5. கல்விகடன் வேண்டி வங்கிமேலாளருக்கு விண்ணப்பம்
6. வசிப்பிடத்திற்கு அடிப்படை வசதி வேண்டி வட்டாட்சியருக்கு விண்ணப்பம்
7. தேசியவிருது பெற்ற நண்பனுக்குப் பாராட்டுக் கடிதம்
8. தேர்த்திருவிழாவைக் கொண்டாட, உறவினருக்கு அழைப்புக் கடிதம்.

SEMESTER – I

20ENU101 **ENGLISH -I** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective:

- To train students to acquire proficiency in English by reading different genres of literature and learning grammar.
- To provide aesthetic pleasure through literature.

Course Outcome:

- Retrieve fundaments of the English language to construct error free sentences
- Establish and maintain social relationships
- Develop communication skills in a business environment
- Refine communication competency through LSRW skills
- Improving intrapersonal skills through literary works

UNIT - I: **Grammar**

Types of Sentences, Subject and Predicate, Parts of Speech and Articles

UNIT –II: Interpersonal Skills

Greetings&Introduction- Giving&Denying Permission- Telephone Etiquette- Oral Presentation – Plan, PowerPoint Presentation- Preparation of Speech- Audience psychology- Secrets of Good Delivery

UNIT - III: **Communication Exercise**

Importance of Business Language- Words often Confused- Words often Misspelt- Common Errors in English-Charts and Pictorial Writing.

UNIT - IV: LSRW Skills

Listening- Listening and its types, Basic Listening Lessons

Speaking- Basics of speaking, Regular English, Business English, Interview English

Reading- Reading and its purposes, Types of Reading, Reading Techniques

Writing- Types of Writing, Components of Writing, Language and Style with accordance to the contexts

UNIT - V: Literature

Prose: Let's Do What India Needs fromUs -Dr.A.P.J. Abdul Kalam

Poem: A Prayer for My Daughter - W.B. Yeats

Short Story: Sparrows- K. Ahmad Abbas

SUGGESTED READINGS:

1. Hewings Martin,2013Advanced Grammar in Use, Cambridge University Press
2. Haines Simon,2015 Advanced Skills, A resource Book of Advanced- Level Skill Activities

SEMESTER – I

20PHU101 **MECHANICS** **4H – 4C**

Instruction Hours / week: L: 5 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To know how to use Newton's laws of motion
- To solve advanced problems involving the dynamic motion of mechanical systems and other advanced mathematics in the solution of the problems.
- To find the use of conservation of energy and linear and angular momentum
- To solve dynamics problems.

Course Outcomes (COs)

Students understand:

1. Parameters defining the motion of mechanical systems and their degrees of freedom.
2. Study the interaction of forces between solids in mechanical systems.
3. Application of the vector theorems of mechanics and interpretation of their results.
4. Introduction to analytical mechanics as a systematic tool for problem solving.

UNIT I- LAWS OF MOTION

Frames of reference. Newton's Laws of motion- Inertial frames of reference- Non inertial frames- Dynamics of a system of particles. Centre of Mass. Momentum and Energy: laws of Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets. Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum.

UNIT II-GRAVITATION

Newton's Law of Gravitation. Experimental determination of the gravitation constant (G) Gravitational field- Gravitational potential-potential energy-velocity of escape from the earth-velocity of escape from the solar system-Gravitational potential field due to a spherical shell-Gravitational potential field due to a solid sphere- Gravitational potential field due to a circular disc-Superposition principle- gravitational self energy of a body- gravitational self energy of a uniform solid sphere.

UNIT III-OSCILLATIONS

Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations.

Friction-Static Friction - Laws of Friction-Angle and cone of Friction - Motion up and down on a rough inclined plane.

UNIT IV-MOTION OF RIGID BODY

Moment of inertia of a rod, disc, spherical shell, solid and hollow spheres - Theory of compound pendulum and Kater's pendulum - Determination of 'g' - Derivation of expressions for angular momentum and kinetic energy of a system of N particles.

UNIT V- ELEMENTS OF SATELLITE MOTION

Expression for orbital velocity, time period and escape velocity of a satellite. Expression for closed and open orbits, Geo-stationary satellite, Weightlessness, artificial Gravity in space station.

SUGGESTED READINGS

1. Mechanics by Mathur D.S. and P S Hemne, 2014, S. Chand & Co., New Delhi,
2. Engineering Mechanics by Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press
3. Engineering mechanics by D.P. Sharma, 2010, Pearson edition, Delhi, ISBN 978-81-317-3222-9.
4. Mechanics and Mathematical Physics by R. Murugesan, 2016, S. Chand & Company Ltd., New Delhi
5. Elements of Properties of Matter by D. S. Mathur, 2010, S. Chand & Co.
6. Mechanics by H. S. Hans, S. P. Puri, 2006, Tata McGraw Hill Publishing Company Limited, ISBN 0-07-047360-9.
7. Engineering mechanics: Statics and Dynamics by N. H. Dubey, 2013, Tata McGraw Hill Education Private Limited, ISBN: 978-0-07-107259-5.
8. https://nptel.ac.in/courses/122104014/

SEMESTER – I

20PHU102 PROPERTIES OF MATTER 4H – 4C

Instruction Hours / week: L: 5 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- Gives a brief introduction about the different physical properties of matter which are relevant to daily life applications, like elasticity, surface tension, viscosity etc.
- To give an introduction about the different properties of matter, and their different states.

Course Outcomes (COs)

1. Understanding the fundamental laws and principles of different areas of physics.
2. Students will demonstrate proficiency in mathematics and the mathematical concepts needed for a proper understanding of physics.

UNIT I - Conservation Laws

a) Linear momentum: Law of conservation of linear momentum for a system of particles. Collision between two particles, Inelastic collision and elastic collision in one dimension in laboratory and center of mass frame of reference, Conservation of momentum in case of variable mass: Example Single stage rocket -Expression for velocity (taking weight into consideration), b) Angular momentum: Definition of angular momentum its relation of angular velocity and torque. Conservation of angular momentum, central force, Kepler's laws of planetary motion (with derivation). c) Energy: Conservation of energy as a basic principle, Illustration with derivation: S.H.M of a light spiral spring.

UNIT II- ELASTICITY

Introduction to Volumetric, longitudinal, bulk stress and strain - Hooke's law- Stress-strain diagram - Elastic moduli-Relation between elastic constants- Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants- Work done in stretching & work done in twisting a wire- Twisting couple on a cylinder- Determination of Rigidity modulus by static torsion-Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q, η& by Searles method.

UNIT III- BENDING OF BEAMS

Cantilever - Expression for bending moment - Expression for depression - Cantilever oscillations - Expression for time period - Experiment to find Young's modulus - Non uniform

bending - Experiment to determine Young's modulus by Koenig's method - Uniform bending - Expression for elevation - Experiment to determine Young's modulus using microscope.

UNIT IV - SURFACE TENSION

Surface tension and Surface energy- Pressure difference across a spherical surface- Pressure difference across a curved surface - Angle of contact - Angle of contact for water in a glass - Vapour pressure over a flat and curved surface - Variation of Surface tension with temperature - Jaegar's method - Quincke's method.

UNIT V - VISCOSITY

Streamline flow and Turbulent flow - Stoke's law - Stoke's method for the coefficient of viscosity - Poiseuille's method for the coefficient of viscosity - correction to Poiseuille's equation - Ostwald's viscometer - Variation of viscosity with temperature and pressure - Friction and Lubrication - Searle's viscometer - Viscosity of gases - Modification of Poiseuille's formula for gases - Rankine's method for determining the coefficient of viscosity of a gas.

SUGGESTED READINGS

1. Elements of properties of matter by Mathur. D.S, 11th edition 2010, S. Chand & company, New Delhi
2. Properties of matter by Murugesan. R, 2004, S. Chand & Company, New Delhi.
3. Properties of matter by Brijlal and N. Subramanyam, 2004, S. Chand & Company, New Delhi.
4. Properties of Matter by Uppadahayay. J. C., 2003, Ram Prakash and Sons, Agra.
5. Properties of Matter by Katie Dicker, 2011, Wind Mills book Ltd.
6. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/105105108/lec25.pdf
7. https://nptel.ac.in/content/storage2/courses/103105066/Module%20II.pdf

SEMESTER – I

20PHU103 **MATHEMATICS - I** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

This course enables the students to learn

- To know the determinant, Eigenvalues and Eigenvectors of a real matrix
- To provide the basic knowledge of Trigonometry and hyperbolic functions.
- To give basic knowledge about Mathematical concepts in Differential calculus.
- The concepts of Integral calculus and evaluation of different types of integrals.
- To solve the ordinary differential equations.

Course Outcomes (COs)

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

1. Understanding the concept of Characteristic equations to find Eigen Values and Eigen Vector.
2. Gain knowledge of trigonometric functions and related problems.
3. Achieve the knowledge of calculating higher order derivatives
4. Evaluate definite and indefinite integrals.
5. Apply suitable methods for solving first order and second order differential equations

UNIT I: MATRICES

Definition of the Matrix – Algebra of Matrices – Types of a Matrices – Determinant – Inverse of Matrices – Eigen Values and Eigen vectors – Cayley-Hamilton theorem (without proof) – Verification and computation of inverse.

UNIT II: TRIGONOMETRY

Expansions of sin nθ, Cos nθ and Tan nθ – Expansions of $Sin^n\theta$, $Cos^n\theta$ -Expansions of sinθ , cosθ and tanθ in terms of θ – Hyperbolic and inverse hyperbolic functions and their properties – Logarithm of a complex number – General principal values – problems.

UNIT III: DIFFERENTIAL CALCULUS

The tangent line and the derivative of a function – Numerical differentiation, differentials of higher order derivatives, discontinuities, stationary points, maximum-minimum problems, inflexion points, limiting values of functions: L'Hospital's rule, combining limits, Calculus of several variables: Functions, change of variables, total differential, chain rule, partial differentiation, Euler's theorem.

UNIT- IV: INTEGRAL CALCULUS

Integration, odd-even functions, indefinite integrals, standard integrals, methods of integration (by part, substitution, partial fractions and other) Reduction formula.

UNIT V: ORDINARY DIFFERENTIAL EQUATIONS

Higher order Linear differential equations with constant coefficients – Method of variation of parameters – Simultaneous first order linear differential equations with constant coefficients.

SUGGESTED READINGS

1. Manickavasagam Pillai.T.K , and S. Narayanan, (2002).“Calculus”, Volume I, and Volume II S.V Printers & Publishers, Chennai, India

2. Veerarajan. T, (2011). Engineering Mathematics, Third edition, Tata McGraw-Hill Education- India.

3. Rasinghania M. D, (2017).Ordinary and Partial Differential Equations, S. Chand Publication, India.

4. T. K. Manickavasagam Pillai and S. Narayanan (2004). Trigonometry, Vijay Nicole Imprints Pvt, Ltd, c-7, Nelson Manickam Road, Chennai-600029.

5. Venkataraman. M. K,(1998).Engineering Mathematics, The National Publications & Co., Chennai, India.

6. https://youtu.be/SJOTtb1FTfs

7. https://youtu.be/N-Ejf2jCwn4

8. https://www.youtube.com/watch?v=F2NqTIej98Q

9. https://www.digimat.in/nptel/courses/video/111105122/L01.html

SEMESTER – I

20PHU111 MECHANICS PRACTICAL 3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 2 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

1. To impart knowledge on various types of Mechanisms and instruments.
2. To impart skills to analyze the position, velocity and acceleration.

Course Outcomes (COs)

Students can

1. Understand and analyze basic theory and principles of forces in mechanics and their relationship to engineering applications.

2. Analyze motion, forces and motion, work and energy problems and their relationship to engineering applications.

ANY SIX EXPERIMENTS

1. Measurements of internal & external diameter of the given object using vernier caliper and Measuring the thickness of the given objects using screw gauge

2. To determine the Height of a Building using a Sextant.

3. To determine g by Kater's Pendulum

4. Experimental verification of lami's theorem

5. To Find the Weight of a Given Body Using Parallelogram Law of forces.

6. To determine the co-efficient of friction between the slider and the inclined plane.

7. To determine g by compound pendulum

8. To study the Motion of a Spring and calculate Spring Constant

9. To determine the moment of inertia of a solid sphere

10. To determine g by Bar Pendulum.

SUGGESTED READINGS

1. Engineering Practical Physics, S.Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
2. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
3. B.Sc., Practical Physics, H. Singh, S. Chand & Co, (2008), 7th Edition.

SEMESTER – I

20PHU112 PROPERTIES OF MATTER PRACTICAL 3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 2 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

1. To be able to identify solids, liquids and gases, and their main properties.
2. To be able to identify changes of state.
3. To be able to discuss changes of state in terms of the energy of molecules

Course Outcomes (COs)

1. Empower the student to acquire engineering skills and practical knowledge, which help the students in their everyday life

2. The properties of solids especially knowledge of elasticity help the students to identify the materials suitable for the construction of buildings, houses etc.

3. Properties of fluids especially knowledge of viscosity and surface tension help the students in their daily life and agriculture.

ANY SIX EXPERIMENTS

1. To determine the Young's Modulus of the wooden by Optical Lever Method.
2. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
3. To determine the Young's modulus of the bar using pin and microscope – Non-uniform method.
4. To determine the Young's modulus of the bar using cantilever – Non-uniform method.
5. To determine the surface tension of water – capillary rise method
6. To determine the coefficient of viscosity by Stoke's method
7. Verification of laws of transverse vibration and frequency of tuning fork – Sonometer
8. Rigidity modulus – Torison pendulum
9. To determine the Young's modulus of the bar – Koenig's method
10. To determine the coefficient of viscosity of the liquid – Poiseuille's method

SUGGESTED READINGS

1. Engineering Practical Physics, S.Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
2. B. Sc. Practical Physics, C. L. Arora, S. Chand Publishing Ltd, 2010.

3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

4. A Text Book of Practical Physics, Vol I & II, Srinivasan and Balakrishnan, S. Viswanathan Publishers, 2000.

SEMESTER – I

20PHU113 MATHEMATICS PRACTICAL – I 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

This course enables the students

- To develop skills for quantitative estimation using computer language.
- To code various differentiation and integration methods in a modern computer language.
- To plot the graphs of function.

Course Outcomes (COs)

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

- Acquire problem-solving skills through computer programming.
  Plot various functions and parametric curves.

List of Practical

1. Finding addition, multiplication of two matrices.
2. Finding Inverse of a matrix and Determinant of a matrix.
3. Plotting of graphs of function $e^{ax + b}$, log(ax + b), 1/(ax + b), sin(ax + b), cos(ax + b), |ax +b| and to illustrate the effect of a and b on the graph.
4. Plotting the graphs of polynomial of degree 4 and 5, the derivative graph, the second derivative graph and comparing them.
5. Evaluating definite integrals.(Line integral)
6. Evaluating integrals using Reduction formulae.
7. Solution of second order ordinary differential equations with initial conditions.
8. Solving system of linear differential Equations.

SUGGESTED READING

1. Scilab Textbook Companion for Numerical Methods For Scientists And Engineers by K. S. Rao, PHI Learning Pvt. Ltd., New Delhi, 2004.

SEMESTER – II

20LSU201 **தமிழ் இரண்டாம் தாள்** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

பாடத்திட்டப் பொது நோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும்,
  ஆய்வுநோக்கையும்மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

- இந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇடம்பெறுகின்ற, ‘தமிழ்இலக்கியவரலாறு’ குறித்தமுழுமையானஅறிமுகம்பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல்மற்றும்தொல்லியல்சார்ந்தஆவணத்தேடலுக் குரியஆய்வுமனப்பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
- தமிழின்வளர்ச்சித்துறையாகிய, ‘அறிவியல்தமிழ்’ ; ‘ இணையதமிழ்’
  குறித்தபன்நோக்குஅணுகுமுறையிலானஆய்வுச்சிந்தனைவளர்ச் சி.
- வேலைவாய்ப்புக்குரியசுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத்திறன்மேம்பாடும்பெற்றிருத்தல் .
- சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவி யாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.

தாள்கள்வரிசையும் தேர்வுச்செயல்திட்டமும்

பகுதி-I தமிழ்

இளநிலைப்பட்ட அறிவியல் வகுப்புகள்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
இரண்டு	II	4	3	40 / 60	100	4

20LSU201 தமிழ், தாள்-2 இரண்டாம் பருவம் 4H-4C
(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

அலகு – I :தமிழ் இலக்கியவரலாறு- II
(5மணிநேரம்)

தமிழ்இலக்கியவரிசையில்திருமுறைகளும்நாலாயிரத்திவ்யப்பிரபந்தமும்-பன்னிருதிருமுறைகள்அறிமுகம்-
திருமுறைஆசிரியர்களின்இலக்கியப்பங்களிப்பு-
திருமுறைகளில்பக்திநெறியும்சமுதாயநோக்கும்-
சமயக்குரவரின்அருள்நெறி- பன்னிருஆழ்வார்கள்வரலாறு-
ஆழ்வார்களின்இலக்கியப்பங்களிப்பு-
திவ்யப்பிரபந்தத்தில்பக்திநெறியும்இலக்கியநயமும்-
தமிழில்சிற்றிலக்கியக்காலமும்கருத்தும்-
தொண்ணூற்றாறுவகைச்சிற்றிலக்கியவரிசை-
தமிழ்மொழியின்நாவல், சிறுகதை-கட்டுரை-கவிதை-
திறனாய்வுநூல்களின்தோற்றம்-வளர்ச்சி-உத்திகள்-
நாட்டுப்புறஇலக்கியங்கள்-
கொங்குநாட்டார்வாய்மொழிவழக்காறுகள்.

அலகு – II :பக்திஇலக்கியமும்சிற்றிலக்கியமும்:
பக்திஇலக்கியம் (10 மணிநேரம்)

சைவ, வைணவஇலக்கியங்கள் -தோற்றம் ,வளர்ச்சி, வரலாறு.

1. **சைவம்- (15பாடல்கள்)** பெரியபுராணம் – திருமூலநாயனார்புராணம் -அந்திஇளம்பிறைக்கண்ணி, மற்றுஅவர்தாம்அணிமா, காவிரிநீர்பெருந்தீர்த்தம், அந்நிலைமைத்தானத்தை, அந்தணர்தம்சாத்தனூர், மற்றுஅதன்தன்உடம்பினை, இவன்உயிர்பெற்றெழில், பாய்த்தியபின்திருமூலராய், வெய்யசுடர்கதிரவனும், அங்கவளும், பித்துஉற்றமையல்அன்று, இந்தநிலைமையில், ஆவடுதண்துறை, ஊன்உடம்பில், முன்னியஅப்பொருள்.
2. **வைணவம் – ஆண்டாள்நாச்சியார்திருப்பாவை: (11 பாடல்கள்):** மார்கழித்திங்கள், வையத்து வாழ்வீர்காள், ஓங்கிஉலகளந்த, ஆழிமழைக்கண்ணா, மாயனைமன்னுவடமதுரை, சிற்றம்சிறுகாலே, ஒருத்திமகனாய், மாலேமணிவண்ணா, கூடாரைவெல்லும், கறவைகள்பின்சென்று, வங்கக்கடல்கடைந்த.

சிற்றிலக்கியம்

1. முக்கூடற்பள்ளு- 2 பாடல்கள் - சித்திரக்காலிவாலான் (நெல்வகைகள்)
குற்றாலத்திரிகூடமால்வரை (மீன்வகைகள்)
2. நந்திகலம்பகம்- 5 பாடல்கள்- என்னையேபுகழ்ந்தேன், பதிதொறுபுயல்பொழி,
இந்தப்புவியில், அடிவிளக்கும்துகில், வானுறுமதியை
3. மதுரைச்சொக்கநாதர்தமிழ்விடுதூது –தமிழின்சிறப்பு பாடியருளபத்துப்பாட்டும்-விளம்பக்கேள்.

அலகு – III:இக்காலஇலக்கியம் (10 மணிநேரம்)

கவிதை இலக்கியம்

1. மகாகவிபாரதியார் – பரம்பொருள்வாழ்த்து.
2. புரட்சிக்கவிஞன்பாரதிதாசன் – தமிழின்இனிமை.

3. கவிமணிதேசிகவிநாயகம்பிள்ளை – கோவில்வழிபாடு.
4. கவிக்கோ. அப்துல்ரகுமான் – பாருக்குள்ளே நல்ல நாடு.
5. சிற்பிபாலசுப்பிரமணியன் – காலம்.
6. கவிஞர்தாமரை – தொலைந்துபோனேன்.

அலகு – IV :சிறுகதைஇலக்கியம் (8 மணிநேரம்)

1. மகாமசானம் – புதுமைப்பித்தன்
2. அப்பாவின்வேஷ்டி – பிரபஞ்சன்
3. அந்நியர்கள் – ஆர். சூடாமணி
4. இந்நாட்டுமன்னர் – நாஞ்சில்நாடன்

அலகு- V :அடிப்படைஇலக்கணமும்பயன்பாட்டுத்தமிழும்– II (7மணிநேரம்)

இலக்கணப்பயிற்சி: அணிஇலக்கணம்

உவமையணி-பிறிதுமொழிதல்அணி-சிலேடைஅணி-தீவகஅணி-ஏகதேசஉருவகஅணி-வேற்றுமையணி-பின்வருநிலையணி

துறைசார் கலைச்சொல் பயன்பாட்டாக்கம்

படைப் பிலக்கியப்பயிற்சிகள்

மரபுக்கவிதை, புதுக்கவிதை, சிறுகதை, கட்டுரை படைப்பாக்க உத்திகள்- பயிற்சிகள்-நேர்காணல்வினாநிரல்தயாரித்தல்நுட்பங்கள்)

மொழிபெயர்ப்புப்பயிற்சிகள்

தமிழ்-ஆங்கிலமொழிபெயர்ப்புப்பயிற்சிகள் -2.

ஆங்கிலம்-தமிழ்மொழிபெயர்ப்புப் பயிற்சிகள்-2.

பாடநூல்:கற்பகச்சோலை – தமிழ்ஏடு.

கற்பகம்உயர்கல்விகலைக்கழகத்தமிழ்த்துறைவெளியீடு.

SEMESTER – I

20ENU201 ENGLISH -II 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective:

- To refresh the grammar knowledge of the students to improvise their language.
- To make the students understand different kinds of communication involved in the business environment.
- To help the students develop their listening, speaking, reading and writing skills.
- Introducing literary works to the students to enhance their analytical and aesthetic skills.

Course Outcome:

- Strengthen the foundation of the language to elevate the command of standard grammar.
- Formulate and communicate persuasive arguments for specific business outcome.
- Apply fundamentals of language for reading, writing and effective communication.
- Standardize and demonstrate understanding of LSRW skills.
- Introduce literature to enhance the moral and aesthetic values.

UNIT –I – Grammar

Tenses, Voice,Idioms and Phrases and Clauses

UNIT –II –Business and Technical Reports

Business Correspondence –Memo, Notices, Agenda, Minutes- Resume Writing- Report Writing- Letter Writing- Personal and Social Letters- E-mail Writing

UNIT –III – Communication Practice

Verbal and Non-Verbal Communication- Group Discussion and Seminars- Note-Taking and Note-Making

UNIT –IV –LSRW Skills

Listening Skills- Listening Talks and Presentations

Speaking Skills- Public Speaking- Preparatory steps, Time Management, Handling Questions and Meeting unexpected situations

Reading Skills- Language of Newspapers, Magazines and Internet

Writing Skills-Writing Paragraphs and Essays- Content Writing

UNIT –V –Literature

Prose- Morals in the Indian Context by Francis Nicholas Chelliah

Poetry- Telephone Conversation by Wole Soyinka

Short Stories-The Last Leaf by O' Henry

SUGGESTED READINGS

1. Oxford Handbook of Writing: St. Martins Handbook of Writing 2013 CU Press
2. Sound Business, Julian Treasure 2012OUP

SEMESTER – II

20PHU201 ELECTRICITY AND MAGNETISM 6H – 5C

Instruction Hours / week: L: 6 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To establish grounding in electromagnetism in preparation for more advanced courses.
- The major concepts covered are: the abstraction from forces to fields using the examples of the gravitational, electric and magnetic fields, with some applications; the connection between conservative forces and potential energy; how charges move through electric circuits; the close connection between electricity and magnetism, leading to the discovery of electromagnetic waves.

Course Outcomes (COs)

Students can

1. Apply knowledge of electricity and magnetism to explain natural physical processes and related technological advances.
2. Use an understanding of calculus along with physical principles to effectively solve problems encountered in everyday life, further study in science, and in the professional world.
3. Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies.

UNIT I GAUSS THEOREM AND ITS APPLICATIONS

Normal electric induction Gauss theorem, application of guass theorem - Electric intensity at a point immediately adjacent to a charged conductor - Energy stored in unit volume of an electric field.

Capacitance and Capacitors Spherical capacitor: Cylindrical capacitor, Force of attraction between charged plates of a capacitor – capacity of a parallel plate capacitor; effect of introducing a dielectric slab between the plates – Guard ring condenser - polarization in dielectric materials.

UNIT II – INTRODUCTION TO MAGNETOSTATICS

Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. magnetic field B; magnetization M; magnetic field intensity H; magnetic susceptibility and magnetic permeability; magnetic materials and magnetization; magnetic hysterisis -Brief introduction of dia-, para- and ferro-magnetic materials.

Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. BH Curve Hysterisis loop, Tan A, Tan B and Tan C deflection magnetometer – Determination of magnetic moment – Tangent Galvanometer.

UNIT III

THERMO ELECTRICITY: Seebeck effect – Laws of thermo e.m.f – Peltier effect; Peltier Coefficient – determination of Peltier co-efficient – thermo dynamical consideration of Peltier effect – Thomson effect – Thomson Co-efficient – e.m.f generated in a thermocouple taking both Peltier effect and Thomson effect in the metals – Thermo electric power – Application of thermodynamics to Thermocouple – Thermoelectric diagrams and their uses. **UNIT IV – INTRODUCTION TO ELECTROMAGNETIC INDUCTION**

Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field. Transformer principle and working.

UNIT V DYNAMICS OF CHARGED PARTICLES

Charged particles in a uniform and constant electric field – Charged particles in an alternating electric field – Charged particles in a uniform and constant magnetic field – magnetic focusing – charged particles in combined electric and magnetic field when the fields are parallel and are in mutually perpendicular direction.

SUGGESTED READINGS

1. Textbook of electricity and magnetism by N Subrahmanyam, Brij Lal, Ratan Prakashan Ltd.

2. Electricity and Magnetism by D.L. Sehgal, K.L. Chopra, N.K.Sehgal, 2014, Sultan Chand & Co.

3. Electricity & Magnetism by R. Murugeshan, 7th Edition , S Chand & Company Ltd.

4. Introduction to Electrodynamics by Griffiths D.J. (2013), United States, Benjamin Cummings.

5. Halliday D, Resnick R and Walker J (2013), Fundamentals of Physics (Extended) 10th ed., New Delhi, John Wiley.

6. https://nptel.ac.in/content/storage2/courses/112108150/pdf/Web_Pages/WEBP_M16.pdf

7. https://nptel.ac.in/courses/108104130/

SEMESTER – II

20PHU202 PRINCIPLES OF ELECTRONICS 5H – 4C

Instruction Hours / week: L: 5 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- The objective of this paper is to give information about different electronic circuits and their applications.
- To understand operation of semiconductor devices.
- To understand DC analysis and AC models of semiconductor devices.
- To understand operation of LED, Photodiode and Solar cell.
- To understand the concept of zero-crossing detector and Level detector.

Course Outcomes (COs)

Students can be able:

1. To apply concepts for the design of Regulators and Amplifiers.
2. To verify the theoretical concepts through laboratory and simulation experiments.
3. To implement mini projects based on concept of electronics circuit concepts.
4. To implement mini projects related to LED and Solar cell.

UNIT I

SEMICONDUCTOR DIODES

Introduction, Semiconductor, Energy band description of semiconductors, Hole current, Intrinsic semiconductor and extrinsic semiconductor, n-type and p-type semiconductor, pn junction, properties of pn junction, Applying D.C voltage across pn junction or biasing a pn junction, Current flow in a forward biased pn junction, Breakdown voltage, Knee voltage. Semiconductor diode, equivalent circuit of crystal diode, Forward current, Peak inverse voltage, Reverse current.

UNIT II

TWO-TERMINAL DEVICES AND THEIR APPLICATIONS

Half-Wave rectifier, Full-Wave rectifier: Centre-Tap Full-Wave rectifier, Full-Wave Bridge rectifier, Ripple factor, Filter circuits and its types, Voltage stabilization, Zener diode and its equivalent circuit, Principle and Working of LED, Photo-diode and Solar cell.

Transistor, Transistor action: Working of npn and pnp transistor, Common emitter connection, Relations between α and β, Transistor load line analysis, Operating point, Cut off, Saturation and Active region.

UNIT III

AMPLIFIERS

Transistor Biasing and Stabilization Circuits. Fixed base biasing and Voltage divider bias method. Transistor as 2-port Network. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance, Current, Voltage and Power Gains. Classification of power amplifiers: Class A, B & C Amplifiers. RC coupled amplifier: frequency response curve. Feedback in amplifiers: Feedback, Positive feedback and negative feedback.

UNIT IV

SINUSOIDAL OSCILLATORS

Sinusoidal oscillator, Explanation of Barkhausen criterion. Types of oscillators: Hartley and Colpitt's oscillator, Phase shift and Wien bridge oscillator. Operational Amplifiers: Operation amplifier, CMRR, A.C. analysis of OP-Amp: Practical and Ideal OP-Amp, Slew rate, Frequency response of an OP-Amp.

UNIT V

APPLICATIONS OF OP-AMPS

Inverting and Non-Inverting amplifier, Voltage follower, Multistage OP-Amp circuits, Averaging or Adding amplifier, Subtractor amplifier, OP-Amp Integrators and Differentiators, Square wave generator, Zero-crossing detector, Level detector.

SUGGESTED READINGS

1. Mehta V.K. – Principles of electronics – S. Chand & Co. Ltd., 11th Edition, 2008.
2. Badge M.K. Singh S.P. – Elements of Electronics - S. Chand & Co. Ltd., 2002.
3. Subramanyam. A - Applied Electronics – The national publishing company, 2006.
4. OP-Amps and Linear Integrated Circuit, R.A. Gayakwad, 4th edition, 2000, Prentice Hall.
5. Millman (2010), Millman'S Integrated Electronics, 2nd Edition, New Delhi, Tata McGraw-Hill.
6. Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
7. Tietze U., Schenk C, Gamm B, (2015), Electronic circuits: Handbook of design & applications, New Delhi, Springer.
8. Streetman B.G & Banerjee S.K(2015), Solid State Electronic Devices, 6th Edn., New Delhi, PHI Learning Pvt.Ltd.

9. Electronic Devices & circuits, S.Salivahanan & N.S.Kumar, 3rd Ed., 2012, Tata McGraw-Hill.
10. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Ed., Oxford University Press.
11. Sze S.M. (2008), Semiconductor Devices: Physics and Technology. NewDelhi, Wiley.
12. Electronic circuits: Handbook of design & applications, U.Tietze, C.Schenk, 2008, Springer.
13. Rashid M.H. (2016), Microelectronic Circuits, Boston, Cengage Learning.
14. Microelectronic Circuits, M.H. Rashid, 2nd Edition, Cengage Learning Electronic Devices, 7/e Thomas L. Floyd, 2008.
15. https://nptel.ac.in/courses/117107094/
16. https://nptel.ac.in/content/storage2/courses/113106062/Lec13.pdf

SEMESTER – II

20PHU203 **MATHEMATICS - II** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

This course enables the students to learn

- To demonstrate vector differential operators to identify solenoidal and irrotational vectors.
- To get the ability of solving Partial differential equations.
- To expand the given function into Fourier series.
- To give basic knowledge in evaluating double and triple integrals.
- Numerical techniques of differentiation and integration.

Course Outcomes (COs)

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

1. Analyzing the differential operator to find Gradient, Divergence and Curl.
2. Form and solve partial differential equations of first order
3. Understand the nature of Fourier series that represent even and odd functions.
4. Evaluate line, surface and volume integrals
5. Apply the numerical concepts in solving the differentiation and integration.

UNIT-I: VECTOR CALCULUS

Scalar and vector fields –Differentiation of vectors – Gradient, Divergence and Curl - Integration of vectors – line integral – surface integral – Green's theorem in the plane – Gauss divergence theorem – Strokes theorem – (Statements only).

UNIT II: PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations by elimination of arbitrary constants and functions - Definitions of general, particular and complete solutions - solving standard forms $f(p, q) = 0$, $f(x,p,q) = 0$, $f(y,p,q) = 0$, $f(z, p, q) = 0$, $f(x,p) = f(y,q)$, $z = px + qy + f(p,q)$ - Lagrange's Differential equations $Pp+Qq = R$.

UNIT III: FOURIER SERIES

Dirichlet's Conditions **–** Definition of Fourier series **–** Finding Fourier Coefficients for a given periodic function 2π with interval $(0,2\pi)$ and $(-\pi, \pi)$ – Odd Functions – Even functions – Half Range Sine Series – Half Range Cosine series – Harmonic Analysis.

UNIT IV: MULTIPLE INTEGRAL

Double integration – Cartesian and polar coordinates – Change of order of integration – Change of variables between Cartesian and polar coordinates – Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral.

UNIT V: NUMERICAL METHODS

Solving simultaneous equations–Gauss Elimination method, Gauss Jordan method, Gauss Jacobi Method, Gauss – Seidel method. Numerical Integration – Trapezoidal Rule and Simpson's Rule.

SUGGESTED READINGS

1. Rasinghania M. D, (2017), Ordinary and Partial Differential Equations, S. Chand Publication India.
2. Kandasamy, P Thilagavathy K and Gunavathi K ,(2015), Numerical Methods S. Chand Publication, India.
3. Balaji. G, (2015), Engineering Mathematics-II, G.Balaji Publication, India.
4. Narayanan. S and Pillai, T. K. M (2011). Calculus Vol 1 and Vol 2, Viswanathan Publishers, India.
5. Kandasamy. P & Thilagarathy. K (2000). Mathematics for B.Sc .Vol I and. II, S. Chand and Co, India.
6. Shanthi Narayanan & Kapoor J. N (2014). A Text book of calculus, S. Chand & Co India.
7. S.Ranganatham & V.Rameshbabu(2014).Fourier series and integral transform, S. Chand & Co India.
8. https://www.youtube.com/watch?v=ma1QmE1SH3I
9. https://youtu.be/ISqwmuGkOXQ
10. https://www.youtube.com/watch?v=aqu6v4vdfd4
11. https://www.youtube.com/watch?v=UKHBWzoOKsY

SEMESTER – II

20PHU211 ELECTRICITY AND MAGNETISM PRACTICAL 2H – 1C

Instruction Hours / week: L: 0 T: 0 P: 2 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To establish grounding in electromagnetism in preparation for more advanced courses.
- Assess the contributions of physics to our evolving understanding of global change and sustainability while placing the development of physics in its historical and cultural context.

Course Outcomes (COs)

Students can

- Gain knowledge and develop skills in the basic concept of electric forces.
- understand Gauss law and its applications.

ANY SIX EXPERIMENTS

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. To determine Self Inductance of a Coil by Rayleigh's Method.
3. To compare capacitances using De'Sauty's bridge.
4. Measurement of field strength B & its variation in a Solenoid (Determine dB/dx).
5. To study the Characteristics of a Series RC Circuit.
6. To study a series LCR circuit and determine its (a) Resonant Frequency,
7. To determine a Low Resistance by Carey Foster's Bridge.
8. TAN A – Determination of magnetic moment of the bar magnet
9. TAN B – Determination of magnetic moment of the bar magnet
10. Measurement of charge and current sensitivity of Ballistic galvanometer
11. Calibration of low range voltmeter - Potentiometer

SUGGESTED READINGS

1.Advanced Practical Physics, Vols I & II, B. Ghosh, Sreedhar Publishers, Kolkata, 2nd Edition, 2005.

2.Engineering practical Physics, S.Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.

3.A Text Book of practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

SEMESTER – II

20PHU212 PRINCIPLES OF ELECTRONICS PRACTICAL 2H – 1C

Instruction Hours / week: L: 0 T: 0 P: 2 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- The objective of this paper is to give information about different analog electronic circuits and their applications.
- To understand operation of semiconductor devices.

Course Outcomes (COs)

1. Acquire a basic knowledge in solid state electronics including diodes, MOSFET, BJT, and operational amplifier.
2. Develop the ability to analyze and design analog electronic circuits using discrete components.

Any 6 experiments

1. To study V-I characteristics of PN junction diode.
2. To study the V-I characteristics of a Zener diode.
3. Study of V-I & power curves of solar cells, and find maximum power point & efficiency.
4. To study the characteristics of a Bipolar Junction Transistor in CE configuration.
5. To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias.
6. To study the frequency response of voltage gain of a RC-coupled transistor amplifier.
7. To design a phase shift oscillator of given specifications using BJT.
8. To design an inverting amplifier using Op-amp (741,351) for dc voltage of given gain
9. To design inverting amplifier using Op-amp (741,351) and study its frequency response
10. To design non-inverting amplifier using Op-amp (741,351) & study its frequency response

SUGGESTED READINGS

1. Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1994, Mc-Graw Hill.
2. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
3. Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.
4. Electronic Devices & circuit Theory, R.L. Boylestad & L.D. Nashelsky, 2009, Pearson

SEMESTER – II

20AEC201 ENVIRONMENTAL STUDIES 3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.

Course Outcomes (COs)

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
7. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and / or practitioners.

Unit I – INTRODUCTION - ENVIRONMENTAL STUDIES & ECOSYSTEMS

Environment Definition, Scope and importance; Ecosystem, Structure and functions of ecosystem. Energy flow, Food chains and food webs, Ecological succession. Classification of ecosystem. Forest ecosystem, Grassland Ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit II - NATURAL RESOURCES - RENEWABLE AND NON-RENEWABLE RESOURCES

Natural resources - Renewable and Non – Renewable resources. Land resources and land use change, Land degradation, soil erosion and desertification. Forest resources - Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water resources - Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water. Use of alternate energy sources, growing energy needs,

case studies. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit III - BIODIVERSITY AND ITS CONSERVATION

Levels of biological diversity - genetic, species and ecosystem diversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value. Bio-geographical classification of India. Biodiversity patterns (global, National and local levels). Hot-spots of biodiversity. India as a mega-diversity nation. Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV - ENVIRONMENTAL POLLUTION

Definition, causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution. Nuclear hazards and human health risks. Solid waste management and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Case studies.

Unit V - SOCIAL ISSUES AND THE ENVIRONMENT

Concept of sustainability and sustainable development. Water conservation - Rain water harvesting, watershed management. Climate change, global warming, ozone layer depletion, acid rain and its impacts on human communities and agriculture. Environment Laws (Environment Protection Act, Air Act, Water Act, Wildlife Protection Act, Forest Conservation Act). International agreements (Montreal and Kyoto protocols). Resettlement and rehabilitation of project affected persons. Disaster management (floods, earthquake, cyclones and landslides). Environmental Movements (Chipko, Silent valley, Bishnois of Rajasthan). Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi). Human population growth: Impacts on environment, human health and welfare.

SUGGESTED READINGS

1. Anonymous. 2004. A text book for Environmental Studies, University Grants Commission and Bharat Vidypeeth Institute of Environmental Education Research, New Delhi.
2. Anubha Kaushik., and Kaushik, C.P. 2004. Perspectives in Environmental Studies. New Age International Pvt. Ltd. Publications, New Delhi.
3. Arvind Kumar. 2004. A Textbook of Environmental Science. APH Publishing Corporation, New Delhi.

4. Daniel, B. Botkin., and Edward, A. Keller. 1995. Environmental Science John Wiley and Sons, Inc., New York.
5. Mishra, D.D. 2010. Fundamental Concepts in Environmental Studies. S.Chand & Company Pvt. Ltd., New Delhi.
6. Odum, E.P., Odum, H.T. and Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
7. Rajagopalan, R. 2016. Environmental Studies: From Crisis to Cure, Oxford University Press**.**
8. Sing, J.S., Sing. S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand & Publishing Company, New Delhi.
9. Singh, M.P., Singh, B.S., and Soma, S. Dey. 2004. Conservation of Biodiversity and Natural Resources. Daya Publishing House, New Delhi.
10. Tripathy. S.N., and Sunakar Panda. (2004). Fundamentals of Environmental Studies (2nd ed.). Vrianda Publications Private Ltd, New Delhi.
11. Verma, P.S., and Agarwal V.K. 2001. Environmental Biology (Principles of Ecology). S. Chand and Company Ltd, New Delhi.
12. Uberoi, N.K. 2005. Environmental Studies. Excel Books Publications, New Delhi.

SEMESTER – III

4H-4C

20PHU301 WAVE AND OPTICS

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

The aim and objective of the course:

- This course builds the ideas of harmonic motion to cover in depth concept of waves in physics with particular emphasis on light waves as an example.
- The foundation of the course is Fourier theory, which will then be used to understand dispersion of waves, image formation in optics and diffraction and other aspects of Fourier optics.

Course Outcome

On completion of the course, the student should be able to:

- Account for fundamental quantities for waves and optics.
- Identify, illustrate and explain physical concepts in waves and optics.
- Describe and discuss technical applications of simple optical instruments.
- Solve problems using suitable models, assumptions and approximations as well as be able to assess the results.
- Plan and conduct simple experiments and give an oral and a written presentation of the results.

UNIT I

WAVE OPTICS: Introduction to propagation of light waves – Maxwell's equation -. Definition and Properties of wave front - Huygen's wave theory of light - Huygen's principle - construction of Huygen's wavefront - Laws of reflection and refraction of a plane wave front at a plane surface- Laws of reflection and refraction of a spherical wave front at a plane surface.

UNIT II

INTERFERENCE: Introduction to Interference -Young's double slit experiment –theory and experiment of Fresnel's Bi-prism - Coherent sources and their production - Conditions for observing interference constructive and destructive interference – Calculation of thickness of the Coherent sources by division of amplitude - Interference in thin films - reflected and transmitted light - Theory of air wedge -Newton's Rings: Measurement of wavelength and

refractive index - Determination of Refractive index of a liquid.

Unit - III

Diffraction: Introduction to Fresnel and Fraunhoffer diffraction - Fresnel diffraction Concept of Fresnel's half period zones - Theory of rectilinear propagation - Construction and working of Zone plate - Comparison of Zone plate with lens - Theory of diffraction due to a straightedge - Fraunhoffer diffraction theory at a single slit - Theory of plane diffraction grating - Discussion of Dispersive power of grating –Applications of Resolving power - Expression for resolving power of prism, grating and telescope.

UNIT IV

Polarization: Introduction to Polarization and types of polarized light –production methods – Brewster's law - Huygens' explanation of double refraction -Theory of superposition of two plane polarized waves with perpendicular vibrations- Theory of retarding plates - Quarter wave plates and Half wave plates - Production of linearly, elliptically and circularly polarized light - Detection of linearly, elliptically and circularly polarized light Optical activity - Fresnel's explanation, Laurent's half shade polarimeter.

UNIT-V

Applications of Optics: The Electro-optic effect - Applications of Pockel effect and Kerr effect - Acousto-optic effect - Magneto optic effect.

Fiber Optics: Total internal reflection – modes of propagation of light in optical fibers – evaluation of numerical aperture and acceptance angle - types of optical fibers– fiber optical communication system (block diagram).

SUGGESTED READINGS

1. A Text Book of Optics by Subramaniyam N., Brij Lal, Dr.M N Avanthanulu, S.Chand Publishing, 2006.
2. Singh, Devraj (2015), Fundamentals of Optics, 2nd Edition, PHI Learning Pvt. Ltd.
3. Fundamentals of Optics, A. Kumar, H.R. Gulati and D.R. Khanna, 2011, R. Chand Publications.
4. Optics by Ghatak, McGraw Hill Education India Private Limited, 2017.
5. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/122105023/lec31.pdf
6. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/122105023/lec21.pdf
7. https://nptel.ac.in/courses/122107035/

SEMESTER – III

20PHU302 PHYSICS OF ELECTRONIC DEVICES AND CIRCUITS 4H-4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

- To know about power semiconductor devices frequently used in industries.
- To have an idea about the principle and operation of circuits using semiconductor devices to control various operations.
- To acquaint with industrial and domestic applications of power semiconductor devices.

Course outcomes

students can able to:

1. Understand the construction and working of different semiconductor devices.
2. Develop knowledge on design trade-offs in various digital electronic families with a view towards reduced power consumption
3. Design power electronic circuit for real time application like rectifier and convertor etc.

UNIT I ELECTRICITY :

Positive and Negative Polarities – Electrons and Protons in the atom –Conductors, Insulators and semiconductors. The coulomb unit of electric charge – the volt unit of Potential Difference – charge in motion is current – Resistance , Conductance – the closed circuit – the direction of the current – Direct current and Alternating Current – sources of electricity. Resistors: Types – Colour coding – Variable resistors – Rheostats and Potentiometers –Power rating of resistor – Resistance in series – Parallel, simple problems.

UNIT II CAPACITORS and INDUCTORS

Capacitors:

Charge Stored in Dielectric – Charging and Discharging Capacitor – The Farad Unit of Capacitance – Typical Capacitors – Electrolytic Capacitors – Parallel Capacitors – Series Capacitors.

Inductors: Types of Inductors: Fixed, Variable - Self and Mutual Inductance - Faraday's Law and Lenz's law of Electromagnetic Induction - Energy Stored in an Inductor - Inductance in Series and Parallel - Testing of Resistance and Inductance using Multimeter

UNIT III

CIRCUIT CONCEPTS: Ohms Law: The current – the Voltage – the Resistance – Practical, Multiple units. Electric Power – Power dissipation in resistance – Power formulas – choosing the resistor for a circuit. Kirchoff's law-Kirchoff's current law - Analysis of resistance in series

circuits, parallel circuits and series parallelcircuits - Voltage divider; Current divider; Concept of voltage source and current source - Voltage source in series and current source inparallel - Simple problems in DC circuits.

UNIT IV

NETWORK THEOREMS: Superposition theorem - Thevenin Theorem - Thevenizing a circuit with two voltage sources – thevenizing a bridge circuit - Norton's Theorem - Thevenin Norton conversion - Conversion of voltage and current sources - Millman's Theorem - Star and Delta conversion - Maximum power transfer theorem - Simple problems in DC circuits.

UNIT V

AC CIRCUITS: Introduction to Sinusoidal wave - RMS value - Average value - AC circuits with resistance - Circuits with XL alone – Circuits with XC alone - Series reactance and resistance - Parallel reactance and resistance - Series parallel reactance and resistance - Real power - Series resonant circuit – Parallel resonant circuit - Q factor. Passive filters: Low pass filters, High pass filters, Band pass filters and Band rejection filters.

SUGGESTED READINGS

1. BernardGrob ―Basic Electronics Tata McGraw-Hill Publishing Company Limited, 9thEdition. Reference books:

2. S.Salivahanan, N.Suresh Kumar, A.Vallavaraj "Electronic Devices and Circuits"-Tata McGraw-Hill Publishing Company Limited, New Delhi. 1998.

3. B.L.Theraja, "Basic Electronics-Solid State Devices",S.Chand Company Ltd. 2000

4. Millman's Electronic Devices And Circuits (3rd Edition), Jacob Millman, Christos C. Halkias, Sathyabarta Jit, Mc Graw Hill.

5. Electronic devices and integrated circuits, A.K. Singh, 2011, PHI Learning Pvt. Ltd.
6. Physics of Semiconductor Devices, By Massimo Rudan, 2015, Springer New York Heidelberg Dordrecht London, ISBN- 978-1-4939-1150-9,
7. Semiconductor Devices: Physics and Technology by S. M. Sze, John Wiley & Sons Singapore Pte. Limited, 2012, ISBN - 9780470873670.
8. Linear Integrated Circuits & Applications by U.A.Bakshi, A.P.Godse, Technical Publications Pune, 2010, ISBN- 9788184317619.

SEMESTER – III

20PHU303A RENEWABLE ENERGY AND ENERGY HARVESTING 3H - 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60**

Total: **100**

End Semester Exam: 3 Hours

Course Objective

- Understand the various forms of conventional energy resources.
- Learn the present energy scenario and the need for energy conservation
- Explain the concept of various forms of renewable energy
- Outline division aspects and utilization of renewable energy sources for both domestics and industrial application

Course Outcome

student can able to:

1. Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
2. Describe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc.
3. Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.
4. Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications.
5. Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.

UNIT -I

Fossil fuels and Alternate Sources of energy: Fossil fuels and nuclear energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, solar energy.

UNIT- II

Solar energy: Solar energy, its importance, storage of solar energy, solar pond, non convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning.

UNIT -III

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies.

Ocean Energy: Ocean Energy Potential against Wind and Solar

UNIT - IV

Hydro Energy: Hydropower resources, hydropower technologies, environmental impact of hydro power sources. Piezoelectric Energy harvesting: Introduction.

UNIT - V

Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent applications, Geothermal Energy: Geothermal Resources, Geothermal Technologies. Environmental issues and Renewable sources of energy, sustainability.

SUGGESTED READINGS

1. Solar Thermal Energy Storage, by H.P. Garg, S.C. Mullick, A K Bhargava, 1985, D Reidal Publishing Company, Holland.
2. Solar Energy: Fundamentals, Design, Modelling and Application by Tiwari G N, 2012, Narosa Publications.
3. Non conventional resources of energy, by G. S. Sawhney, 2012, PHI learning private limited, ISBN -978-81-203-4609-3.
4. Solar Energy: Application, Economics, and Public Perception edited by Muyiwa Adaramola, 2014, CRC press, Taylor and Francis group.
5. Renewable Energy, Power for a sustainable future, Godfrey Boyle, 3rdEdn., 2012, Oxford University Press.
6. Physics of Solar Energy by C. Julian Chen, 2011, John Wiley & Sons.
7. Introduction to Photovoltaics by John R. Balfour, Michael Shaw, Sharlene Jarosek, 2013, Jones & Bartlett Learning.
8. https://nptel.ac.in/courses/112105051/
9. https://nptel.ac.in/content/storage2/courses/121106014/Week8/lecture24.pdf

SEMESTER – III

20PHU303B PHYSICS WORKSHOP SKILL 3H - 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives:

The objective of this course is to enable the students to familiar and experience with various mechanical and electrical tools through hands-on mode.

Course outcome

Students can

1. Acquire knowledge about various types of wiring systems, wiring tools, lighting & wiring accessories, wiring estimation & costing, etc.
2. Acquire knowledge about household electrical appliances, electric shock, etc.
3. To get familiarized with the properties of different materials- metals and non metals

UNIT -I

Introduction: Measuring units. conversion to SI and CGS. Familiarization with meter scale, Vernier calliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.

UNIT -II

Mechanical Skill: Concept of workshop practice. Overview of manufacturing methods: casting, foundry, machining, forming and welding. Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood.

UNIT- III

Concept of machine processing, introduction to common machine tools like lathe, shaper, drilling, milling and surface machines. Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothening of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block. Use of bench vice and tools for fitting. Make funnel using metal sheet.

UNIT -IV

Electrical and Electronic Skill: Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope. Making regulated power supply. Timer circuit, Electronic switch using transistor and relay.

UNIT -V

Introduction to prime movers: Mechanism, gear system, wheel, Fixing of gears with motor axel. Lever mechanism, Lifting of heavy weight using lever. braking systems, pulleys, working principle of power generation systems. Demonstration of pulley experiment.

SUGGESTED READINGS

1. Mechanical workshop practice, K.C. John, 2010, PHI Learning Pvt. Ltd.
2. Workshop Processes, Practices and Materials by Bruce J. Black, 4th Edition, 2010, Elsevier Ltd, ISBN -978-0-0808-9064-7.
3. A text book in Electrical Technology - B L Theraja,1959, S. Chand and Company.
4. Performance and design of AC machines – M.G. Say, ELBS Edn.
5. Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn., Editor Newnes.
6. New Engineering Technology, Lawrence Smyth & Liam Hennessy, 1998, The Educational Company of Ireland.

SEMESTER – III

4H - 4C

20PHU304 CHEMISTRY - I

Instruction Hours/week: L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The student should know

1. The molecular orbital theory, preparation and properties of inorganic compounds.
2. Theory of covalent bond, polar effects and stereochemistry of organic compounds.
3. About important industrial chemicals like silicones, fuel gases and fertilizers and their impact on environment.
4. Elements of photochemistry, chemical kinetics and chromatography.
5. About the dyes, chemotherapy and vitamins.

Course Outcome

The student understand

1. The molecular orbital theory, preparation and properties of inorganic compounds.
2. Theory of covalent bond, polar effects and stereochemistry of organic compounds.
3. About important industrial chemicals like silicones, fuel gases and fertilizers and their impact on environment.
4. Elements of photochemistry, chemical kinetics and chromatography.
5. About the dyes, chemotherapy and vitamins.

UNIT-I

Chemical Bonding: Molecular orbital theory-linear combination of atomic orbitals-bonding and antibonding molecular orbitals-energy level diagram-bond order- M.O. configuration of H_2, N_2 and F_2 molecules. Diborane: Preparation, properties and structure. $NaBH_4$: Preparation and uses. Borazole: Preparation and properties. Interhalogen compounds: ICl, BrF_3, IF_5 - preparation, properties, uses and structure. Basic properties of iodine. Compounds of sulphur: Sodium hydrosulphite- preparation, properties, uses and structure. Per acids of sulphur: Preparation, properties, uses and structure.

UNIT- II

Covalent Bond and Stereoisomerism: Covalent Bond: Orbital overlap, hybridization and geometry of CH_4, C_2H_4 and C_2H_2. Polar effects: Inductive effect-electromeric effect-mesomeric effect- steric effect- hyperconjugation. **Stereoisomerism:** Elements of symmetry-

polarised light and optical activity-isomerism in tartaric acid-racemisation- resolution-geometrical isomerism of maleic and fumaric acids-keto-enol tautomerism of acetoacetic esters.

UNIT-III

Industrial Chemistry: Silicones: Synthesis, properties and uses. Fuels gases: Natural gas-water gas-semi water gas-carbureted water gas-producer gas- oil gas (Manufacturing details not required).Fertilizers: NPK fertilizer-ammonium sulphate-urea-superphosphate of lime-triple superphosphate- potassium nitrate-ammonium nitrate. Pollution: Water, air and soil pollution-sources and remedies-acid rain-ozone hole-greenhouse effect.

UNIT-IV

Elements of Photochemistry, Chemical Kinetics and Chromatography: Elements of Photochemistry: Photochemical laws-Beer Lambert's law-Grotthuss-Draper law-Stark-Einstein law (statement only). **Chemical Kinetics:** Rate-order-molecularity-pseudo first order reactions-zero order reactions-determination of order of reaction-measurement of order and rates of reactions-effect of temperature on reaction rate-energy of activation. **Chromatography:** Principles and applications of Column, Paper and Thin Layer Chromatography.

UNIT- V

Dyes, Chemotherapy and Vitamins: Dyes: Terms used chromophore, auxochrome, bathachromic shift and hypsochromic shift- classification of dyes– based on chemical structure and application-one example each for azo, triphenylmethane, vat and mordant dyes-preparation.

Chemotherapy: Preparation, uses and mechanism of action sulpha drugs- preparation and uses of prontosil, sulphadiazine and sulphafurazole-structure and uses of pencillins and Chloromycetin. **Vitamins:** Diseases caused by the deficiency of vitamins A, B_1, B_2, C and D-sources of these vitamins.

SUGGESTED READINGS

1. Thangamani, A. (2018). *Text Book on Allied Chemistry* (1st Edition). Coimbatore: Karpagam Publication.
2. Puri, B.R., Sharma, L. R., & Kalia, K. C. (2017). *Principles of Inorganic Chemistry* (33rd Edition). Jalandar: Vishal Publishing Company.

3. Bahl, A., & Bahl, B.S. (2015). *A Textbook of Organic Chemistry* (21st Revised Edition). New Delhi: S.Chand & Company Pvt. Ltd.
4. Puri, B. R., Sharma, L. R. & Pathania, M. S. (2014). *Elements of Physical Chemistry* (46th Edition). Jalandhar: Vishal Publishing Company.
5. Gopalan, R., & Sundaram, S. (2013). *Allied Chemistry* (III Edition). New Delhi: Sultan Chand & Sons.

SEMESTER – III

20PHU311 WAVE AND OPTICS PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

The aim of the course is to make them to

- Understand the resolving power of different optical instruments.
- Understand and working of polarimeter.

Course Outcomes

On successful completion of this course students will:

1. Gain knowledge on various theories of light.
2. Acquire skills to identify and apply formulas of optics and wave physics.
3. Understand the properties of light like reflection, refraction, interference, and diffraction etc.,
4. Understand the applications of diffraction and polarization.

Any 8 Experiments

1. Spectrometer – Determination of the angle of the prism and refractive index of the prism.
2. Spectrometer – To draw the i-d curve for a given prism and hence to calculate the refractive index of the material.
3. Spectrometer – Determination of wavelength of spectral lines of mercury
4. Spectrometer – Determine the dispersive power and resolving power of the material of the given prism.
5. Spectrometer – To determine the Resolving Power of a Prism.
6. Spectrometer – Determination of wavelength of spectral lines of Na atomes by using grating
7. Determine the specific rotation of Sugar, Glucose using polarimeter.
8. To determine wavelength of sodium light using Newton’s Rings.
9. Determination of refractive index of water using Newton’s Rings.
10. Determine the thickness of the given wire using air wedge method
11. To determine the wavelength of Laser light using Diffraction grating.
12. Fraunhoffer diffraction at single slit using He-Ne laser.

13. To determine wavelength of sodium light using Fresnel Biprism.
14. Determine the thickness of the given wire by diffraction pattern using He-Ne laser.
15. Verification of Malus law using half and quater wave plate.

SUGGESTED READINGS

1. Practical Physics and Electronics by C.C. Ouseph, U.J. Rao, V.Vijayendran, 2016, S.Viswanathan, Printers & Publishers Pvt Ltd

2. Advanced level Physics practical, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

SEMESTER III

4H-2C

20PHU312 PHYSICS OF ELECTRONIC DEVICES AND CIRCUITS PRACTICAL

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

- To know about semiconductor devices frequently used in industries.
- To acquaint industrial and domestic applications of semiconductor devices.

Course Objective

The course as a whole outlines some ways of thinking about analog circuits that hopefully will help to develop intuition.

1. By the end of this subject, students should have acquired reasonable proficiency in the analysis and design of basic electronic circuits.
2. Apply the concepts of basic electronic devices to design various circuits.
3. Understand operation of diodes, transistors in order to design basic circuits.
4. Design small and large signal amplifier circuits for various practical applications.
5. Design, fabricate and test small electronic circuit.

Any 6 Experiments

1. To design a power supply using bridge rectifier and study effect of C-filter.
2. To design the active Low pass and High pass filters of given specification.
3. To design the active filter (wide band pass and band reject) of given specification.
4. To study the output and transfer characteristics of a JFET.
5. To design a common source JFET Amplifier and study its frequency response.
6. To design an Amplitude Modulator using Transistor.
7. To design an Astable multivibrator of given specifications using IC 555.
8. To study the zero-crossing detector and comparator
9. To design a digital to analog converter (DAC) of given specifications.
10. To study the analog to digital convertor (ADC) IC.
11. To investigate the use of an op-amp as a Differentiator and Integrator.

SUGGESTED READINGS

1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
2. Singh S.P., 2003, Advanced practical Physics – 1, 13th Edition, Pragathi Prakashan, Meerut
3. Singh S.P., 2000, Advanced practical Physics – 2, 12th Edition, Pragathi Prakashan, Meerut.
4. Ramakant A. Gayakwad 2002, Op-amp and Linear Integrated Circuits , 4th Edition, Prentice Hall.

SEMESTER – III

20PHU313A RENEWABLE ENERGY AND ENERGY HARVESTING 3H - 1C

PRACTICAL Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Internal: **40** External: **60** Total: **100**

End SEMESTER Exam: 3 Hours

Course Objective

To Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment.

Course Outcome

Students can able to

1. Demonstrate Training modules on Solar energy, wind energy, etc.
2. Convert units of energy-to quantify energy demands and make comparisons among energy uses, resources, and technologies.
3. Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.

Any 5 Experiments

1. Solar cell characteristics
2. Solar Water heater.
3. Solar distillation unit.
4. Analysis of wind velocity
5. Analysis of solar radiation for a day
6. Study of solar distiller.
7. Study of box type solar cooker.
8. Determination of instantaneous thermal efficiency of parabolic collector.
9. Efficiency and fill factor of solar cells.

SUGGESTED READINGS

1. Non conventional Energy sources, G. D. Rai (4th edition), Khanna Publishers, Delhi.
2. Solar Energy, S.P. Sukhatme (second edition), Tata Mc.Graw Hill Ltd, New Delhi.
3. Solar Energy Utilisation, G. D. Rai (5th edition), Khanna Publishers, Delhi.
4. Laboratory Manual On Solar Thermal Experiments, HP Garg, TC Kandpal, Narosa Publishing House.

SEMESTER – III

20PHU313B PHYSICS WORKSHOP SKILL PRACTICAL 3H - 1C

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objectives

- To understand concepts of various basic equipments and devices.
- To gain a knowledge and to understand fundamental physical concepts.

Course Outcomes

Students can

- Develop skills in assessing the quality of one's own and others' work
- Develop skills in observation, interpretation, reasoning, synthesis, generalizing, predicting, and questioning as a way to learn new knowledge.

Any 4 Experiments

1. Screw guage, Vernier Calipers, Spherometer, Least count, Zero error, Measurement of thickness of the scale, breadth of scale, radius of curvature of a concave and convex surface.
2. Cutting of a metal sheet using blade. Smoothening of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block.
3. Use of bench vice and tools for fitting. Make funnel using metal sheet.
4. Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB.
5. Operation of oscilloscope. Making regulated power supply. Timer circuit, Electronic switch using transistor and relay.

SUGGESTED READINGS

1. A text book in Electrical Technology - B L Theraja – S. Chand and Company.
2. Performance and design of AC machines – M.G. Say, ELBS Edn.
3. Mechanical workshop practice, K.C. John, 2010, PHI Learning Pvt. Ltd.
4. Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn., Editor Newnes [ISBN: 0750660732]
5. New Engineering Technology, Lawrence Smyth/Liam Hennessy, The Educational Company of Ireland [ISBN: 0861674480]

SEMESTER – III

20PHU314 CHEMISTRY PRACTICAL – I 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

To make the student able to identify the elements and the functional groups present in an organic compound.

Course Outcome

On successful completion of the course the students should have

1. Learnt about the qualitative analysis of organic compounds.
2. Learnt the detection of elements and functional groups present in an organic compound by systematic analysis.

Systematic analysis of an organic compound

- Preliminary tests
- Detection of elements present
- Aromatic or aliphatic
- Saturated or unsaturated
- Nature of the functional group,
- Confirmatory tests– aldehydes, ketones, amines, amides, diamide, carbohydrates, phenols, acids, esters & nitro compounds.

Note: Each student should analyse minimum 6 compounds.

References:

1. Thomas, A.O. (2012). *Practical Chemistry for B.Sc. Main Students*. Cannanore: Kerala, Scientific Book Centre.
2. Ramasamy, R. (2011). *Allied Chemistry Practical Book.* Karur: Priya Publications.
3. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu, A. R. (2015). *Basic Principles of Practical Chemistry* (2nd ed.). New Delhi: S. Chand Publications.

SEMESTER IV

20PHU401 THERMAL PHYSICS & STATISTICAL MECHANICS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- This is an introductory course to the basic concepts in thermodynamics and statistical Mechanics. We mainly study idealized thermal system under equilibrium.
- It serves as the foundation for more advanced courses on the subjects. The course is divided in two main parts.
- In the first part we will examine the basic laws of thermodynamics with focus on first and second laws with application to thermodynamic processes.
- In the second part of the course we will focus on the Gibbs ensemble formulation of equilibrium and use various statistical mechanics to obtain in the different ensembles thermodynamic energies, potentials and other important statistical quantities. The main emphasis of the course is theoretical.

Course Outcomes (COs)

Students can understand

- describe and apply the physical concepts work, heat, inner energy, temperature, thermodynamic observables and entropy, .
- describe thermodynamic systems and states and apply the laws of thermodynamics,
- use experimental methods to investigate thermodynamic relations and present the results,
- do calculations on phase transitions,
- analyse heat processes theoretically and determine their degree of efficiency, perform calculations on heat conduction and heat radiation in various geometries

UNIT - I

Laws of Thermodynamics:

Basic Concepts –Continuum and macroscopic approach, thermodynamic systems - thermodynamic properties and equilibrium - Zeroth law of thermodynamics - concept of temperature and heat. First Law of Thermodynamics: Energy – enthalpy - specific heats - Various Thermodynamical Processes - Applications of first law to systems and control volumes. Second Law of Thermodynamics: Kelvin-Planck and Clausius statements - reversible and irreversible processes –Carnot Theorems -Carnot's cycle - thermodynamic

temperature scale - Clausius inequality - concept of Entropy. Third law of thermodynamics.

UNIT - II

Thermodynamic Potentials:

Enthalpy – Gibbs - Helmholtz and Internal Energy functions -Equilibria and stability - Maxwell's relations and applications - Joule-Thompson Effect -Maxwell construction - Gibbs Phase Rule- Clausius- Clapeyron Equation - Expression for ($C_P - C_V$) and C_P/C_V-the TdS equations -Cooling due to adiabatic demagnetization.

UNIT - III

Kinetic Theory of Gases:

Introduction to the kinetic theory ofan ideal gas - Law of equipartition of energy – Calculation of specific heat of monatomic gas. Concept of Real Gas: Van der Waals model - equation of state - comparison with experimental P-V curves. Derivation of Maxwell's law of distribution of velocities - Mean free path Transport Phenomena: Viscosity, Conduction and Diffusion. Liquification of hydrogen and helium

UNIT - IV

Basic Statistical Mechanics:

Introduction -comparison of classical and quantum statistics - Phase space, Macrostate Thermodynamic probability - Measurement of macro-properties of a thermodynamic system -Fluctuations in thermodynamic variables -Statistical interpretation of thermodynamics - Ensemble - Types of ensembles -Properties of ensembles - Application of Gibbs canonical ensembles -Black body Radiation - Stefan-Boltzmann law - Wien's displacement law.

UNIT – V

Statistical Mechanics with thermodynamics:

Statistical postulates – thermodynamic probability- Boltzman Relation between entropy and probability -Evaluation of Stirling's approximation - Maxwell-Boltzmann energy distribution law - quantum statistics - most probable distribution condition - Bose-Einstein energy distribution law - quantum statistics - most probable distribution condition - Fermi-Dirac energy distribution law - quantum statistics - most probable distribution condition - comparison of three statistics.

SUGGESTED READINGS

1. Thermal Physics: with Kinetic Theory, Thermodynamics and Statistical Mechanics , By Garg, Bansal & Ghosh, 2017, Tata McGraw Hill Education Private Limited.
2. Thermal Physics, Agarwal J. P. and Prakash, Pragati Prakashan, 2012.
3. Thermal Physics, 2/e, Kiruthiga Sivaprasath & R Murugeshan, S. Chand Publishing, 2004.
4. Concepts in Thermal Physics, By Stephen Blundell, Katherine M. Blundell, 2014, Oxford University Press, ISBN -978-0-19-956209.
5. An Introduction to Statistical Mechanics and Thermodynamics, By Robert H. Swendsen, 2012, Oxford University Press, ISBN – 978-0-19-964694-4.
6. An Introduction to Thermodynamics and Statistical Physics, **By Piero Olla, 2015, Springer International Publisher, Switzerland, ISBN-978-3-319-06187-0.**
7. Thermal Physics, A. Kumar and S.P. Taneja, 2014, R. Chand Publications.
8. https://nptel.ac.in/courses/112105123/
9. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/113106039/lec39.pdf
10. https://nptel.ac.in/courses/115106111/

SEMESTER – IV

20PHU402 ATOMIC AND NUCLEAR PHYSICS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objective

The objective of the course is to introduce students the fundamentals of atomic physics and rudimentary nuclear physics. It aims to provide a coherent and concise coverage of traditional atomic and nuclear physics

Course Outcome

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

1. Acquire knowledge and understanding about the electronic and nuclear structure of atoms.
2. Have an appreciation of the influence of atomic and nuclear physics on modern scientific development.
3. Have the foundations for examining in more detail various aspects of experimental and theoretical physics which relate to both atomic and nuclear physics.
4. Explain the key areas in which Atomic and Nuclear Physics affects everyday living.

UNIT-I

Structure of the Atom-Rutherford model-The Bohr atom model – Spectral series of hydrogen atom- Critical Potentials – Method of excitation of atoms – Experimental determination of critical potentials by davis and Goucher's method - Sommerfield's relativistic model– Vector atom model – Quantum numbers associated with Vector atom model – coupling schemes (LS, JJ coupling) – Pauli's exclusion principle – Periodic classification of elements

UNIT-II

Cathode Rays: Cathode rays – properties – e/m of cathode rays – Milliken's oil drop method – Positive rays – Properties – e/m of Positive rays: Thomson's parabola method – Aston's Bain's bridge - Determination of critical Potential – Franck and Hertz's experiment - Davi'srs and Goucher method.

UNIT- III

General Properties of Nuclei: History, basic terminology, Intrinsic properties, quantitative facts about size, shape, mass, charge density (matter energy), Nuclear force, binding energy, main features of binding energy versus mass number curve

Nuclear Models: Liquid drop model approach, semi empirical mass formula and significance of various terms, Fermi gas model, evidence for nuclear shell structure, nuclear magic

numbers, Collective model.

UNIT -IV

Nuclear Reactors: Nuclear fission - Energy released in fission - Bohr and Wheeler's theory of nuclear fission - Chain reaction - Multiplication factor - Natural uranium and chain reaction - Design of nuclear reactor - Breeder reactor - Nuclear fusion - Source of stellar energy - Thermonuclear reactions - Transuranic elements.

Ionization chamber – Geiger-Muller counter – Proportional counter – Wilson's cloud chamber – Bubble chamber.

UNIT- V

Particle physics: Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model.

SUGGESTED READINGS

1. Modern Physics by R Murugeshan, Kiruthiga Sivaprasath, S Chand Publishing; Eighteenth edition, 2016.
2. Modern Physics by Kenneth S.Krane – Third Edition, John Wiley & Sons, 2012.
3. Nuclear Physics, D.C. Tayal, Himalaya Publishing House, 2011.
4. Concepts of Modern Physics, by Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, McGraw Hill Education; Seventh edition, 2017.
5. Introductory Nuclear Physics by Samuel S. M. Wong, John Wiley and Sons, 2013.
6. Nuclear physics, Irving Kaplan, Wesley Publishing Company, 2002.
7. Introductory nuclear Physics by Kenneth S.Krane, Wiley India Pvt. Ltd., 2008.
8. Introduction to Elementary Particles, D. Griffith, John Wiley & Sons, 2008.
9. https://shodhganga.inflibnet.ac.in/jspui/bitstream/10603/58059/11/11_chapter%201.pdf
10. https://shodhganga.inflibnet.ac.in/bitstream/10603/67853/8/08_chapter%201.pdf
11. https://shodhganga.inflibnet.ac.in/bitstream/10603/157179/8/08_chapter%205.pdf
12. https://nptel.ac.in/courses/115101003/
13. https://nptel.ac.in/courses/115103101/

SEMESTER IV

20PHU403A BASIC INSTRUMENTATION SKILL 3H - 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- This course is to get exposure with various aspects of instruments and their usage through hands-on mode.
- To impart physical measurement skills.
- To make the students understand coherence between theoretical and practical measurement

Course Outcome

Students can:

1. Develop skills to impart practical knowledge in real time solutions.
2. Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.
3. Gain knowledge of new concept in the solution of practical oriented problems and to understand more deep knowledge about the solution to theoretical problems.
4. Understand measurement technology, usage of new instruments and real time applications in engineering studies.

UNIT-I

Basic of Measurement: Instruments accuracy, precision, sensitivity, resolution range. Errors in measurements and loading effects-vernier caliper and screw guage- Multimeter**:** Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

UNIT- II

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance.

AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier-amplifier. Block diagram ac millivoltmeter**,** specifications and their significance.

UNIT- III

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only – no mathematical treatment),

brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance.

UNIT- IV

CRO Measurement: Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

UNIT- V

Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic(balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges.

Digital Instruments: Principle and working of digital meters. Comparison of analog &digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution.

SUGGESTED READINGS

1. A text book in Electrical Technology (2008) - B L Theraja - S Chand and Co.
2. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
3. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
4. Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill.
5. Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer.
6. Electronic Devices, Thomas L. Floyd, 2008, Pearson India.
7. Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, Eberhard Gamm 2015, Springer.
8. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/108108111/lec40.pdf
9. https://nptel.ac.in/courses/108105153/

SEMESTER IV

20PHU403B RADIATION SAFETY 3H - 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objective

The aim of this course is to give awareness regarding radiation hazards and safety.

- To identify the parts of the x-ray machine and explain their purpose and function.
- Explain how x-rays are produced and how they travel.
- Compare the effects that x-radiation has on a variety of biological and non-biological materials.

Course Outcomes

Students can be able to :

1. List and describe the function the parts of the x-ray machine
2. Describe the spectrum of electromagnetic radiation.
3. Impact knowledge on different radiation detector.

UNIT- I

Basics of Atomic and Nuclear Physics: Basic concept of atomic structure; X rays characteristic and production; concept of bremsstrahlung and auger electron, The composition of nucleus and its properties, mass number, isotopes of element, spin, binding energy, stable and unstable isotopes, law of radioactive decay, Mean life and half life, basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission.

UNIT -II

Interaction of Radiation with matter: Types of Radiation: Alpha, Beta, Gamma andNeutron and their sources, sealed and unsealed sources, **Interaction of Photons** - Photo-electric effect, Compton Scattering, Pair Production, Linear and Mass Attenuation Coefficients, **Interaction of Charged Particles:** Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation. Beta Particles- Collision and Radiation loss (Bremsstrahlung), **Interaction of Neutrons**- Collision, slowing down and Moderation.

UNIT -III

Radiation detection and monitoring devices: Radiation Quantities and Units: Basicidea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective

dose, collective equivalent dose, Annual Limit of Intake (ALI) and derived Air Concentration (DAC).

UNIT -IV

Radiation detection: Basic concept and working principle of *gas detectors* (Ionization Chambers, Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Gieger Muller Counter), Scintillation Detectors **(**Inorganic and Organic Scintillators), Solid States Detectors and Neutron Detectors, Thermoluminescent Dosimetry.

UNIT- V

Radiation safety management: *Biological effects of ionizing radiation*, Operational limits and basics of radiation hazards evaluation and control: radiation protection standards, International Commission on Radiological Protection (ICRP) principles, justification, optimization, limitation, introduction of safety and risk management of radiation. Nuclear waste and disposal management. Brief idea about Accelerator driven Sub-critical system (ADS) for waste management.

SUGGESTED READINGS

1. W.E. Burcham and M. Jobes – Nuclear and Particle Physics – Longman (1995)
2. G.F.Knoll, Radiation detection and measurements
3. Thermoluninescense Dosimetry, Mcknlay, A.F., Bristol, Adam Hilger (Medical Physics Handbook 5)
4. G.F.Knoll (2010), Radiation detection and measurements, John Wiley & Sons
5. Orton C.G., (2013),Progress in Medical Radiation Physics, Springer Science & Business Media
6. Practical Applications of Radioactivity and Nuclear Radiations, G.C. Lowental and P.L. Airey, Cambridge University Press, U.K., 2001
7. Martin and S.A. Harbison, Beach, K, Cole,P, (2012), An Introduction to Radiation Protection, CRC Press.
8. W.J. Meredith and J.B. Massey, “Fundamental Physics of Radiology”. Butterworth-Heinemann, John Wright and Sons, UK, 2013.
9. https://nptel.ac.in/content/storage2/courses/112101007/downloads/Lecturenotes/Lecture37.pdf

SEMESTER IV

20PHU404 **CHEMISTRY – II** **4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objectives

1. To make the student to be conversant with the extraction of metals, coordination chemistry, preparation, properties uses and structure of naphthalene and heterocyclic compounds.

2. To make the student acquire sound knowledge of electrochemistry, biological functions of amino acids and proteins, thermodynamic laws, entropy, enthalpy change and the principles of electroplating.

Course Outcome

1. The student understand the metallurgy of metals and the theories of coordination compounds and the industrial importance of EDTA, haemoglobin and chlorophyll.
2. Understand the concept of aromaticity and preparation of aromatic compounds including heterocyclic compounds.
3. Understand the preparation, classifications and properties of amino acids, proteins and carbohydrates.
4. Understand the concepts of first and second laws of thermodynamics.
5. Understand the fundamentals of electrochemistry.

Unit-I

Metals and Coordination Chemistry: Metals: General methods of extraction of metals-methods of ore dressing-types of furnaces-reduction methods-electrical methods-types of refining-Van Arkel process-Zone refining. **Coordination Chemistry:** Nomenclature-theories of Werner, Sidgewick and Pauling-chelation and its industrial importance-EDTA-haemoglobin-chlorophyll-applications in qualitative and quantitative analysis.

Unit-II

Aromatic Compounds and Heterocyclic Compounds:

Aromatic Compounds: Aromaticity-Huckel's (4n+2) rule- aromatic electrophilic substitution in benzene- mechanism of nitration, halogenation, alkylation, acylation and sulphonation. Naphthalene: Isolation, preparation, properties and structure. **Heterocyclic Compounds:** Preparation and properties of pyrrole, furan, thiophene and pyridine.

Unit-III

Amino acids, Proteins and Carbohydrates: Amino acids: Classification, preparation and properties. Peptides-preparation of peptides (Bergmann method only). **Proteins:** Classification, properties, biological functions and structure. **Carbohydrates:** Classification,

preparation and properties of glucose and fructose- discussion of open chain and ring structures of glucose and fructose-glucose-fructose interconversion.

Unit-IV

Energetics: Type of systems-processes and their types - isothermal, adiabatic, reversible, irreversible and spontaneous processes-statement of first law of thermodynamics-need for the second law of thermodynamics-heat engine-Carnot cycle-efficiency-Carnot theorem-thermodynamics scale of temperature-Joule-Thomson effect- Enthalpy- Entropy and its significance-Free energy change.

Unit-V

Electrochemistry: Kohlrausch law-conductometric titrations-hydrolysis of salts-galvanic cells-E.M.F.-standard electrode potentials-reference electrodes- electrochemical series and its applications-buffer solution-buffer solution in the biological systems-pH and its determination-principles of electroplating.

SUGGESTED READINGS

1. Veeraiyan, V., & Vasudevan, A.N.S. (2012). *Text Book of Allied Chemistry* (II Edition). Chennai: Highmount Publishing House.
2. Puri, B.R., Sharma, L. R., & Kalia, K. C. (2017). *Principles of Inorganic Chemistry* (33rd Edition). Jalandar: Vishal Publishing Company.
3. Bahl, A., & Bahl, B.S. (2015). *A Textbook of Organic Chemistry* (21st Revised Edition). New Delhi: S.Chand & Company Pvt. Ltd.
4. Puri, B. R., Sharma, L. R. & Pathania, M. S. (2014). *Elements of Physical Chemistry* (46th Edition). Jalandhar: Vishal Publishing Company.
5. Gopalan, R., & Sundaram, S. (2013). *Allied Chemistry* (III Edition). New Delhi: Sultan Chand & Sons.

SEMESTER – IV

20PHU411 THERMAL PHYSICS AND STATISTICAL MECHANICS PRACTICAL 4H-2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objectives

The objective of this course is to learn how to apply thermodynamic principles in order to interpret thermodynamic systems and predict their behaviors.

Course Outcome

On successful completion of this course students will:

1. Understand the process of thermal conductivity, viscosity and diffusion in gases
2. Able to correlate theory and practicals.
3. Apply the laws of thermodynamics to real physical systems and processes.
4. Apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.

Any 7 Experiments

1. To determine the coefficient of thermal conductivity of a bad conductor by Lee's disc method.
2. Verification of Newton's law of cooling.
3. Determination of thermal conductivity of rubber.
4. To study the variation of thermo emf across two junctions of a thermocouple with temperature.
5. Cooling Curve of a metallic body.
6. To determine the temperature co-efficient of resistance of the given thermistor using post-office box.
7. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system
8. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge
9. Coefficient of thermal conductivity of copper by Searle's method
10. Thermal conductivity of copper by angstrom method.
11. To determine the specific heat capacity of liquid by Joule's Calorimetre.

SUGGESTED READINGS

1. A Text Book of practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, KitabMahal, New Delhi.
2. B.Sc., Practical Physics by Prof.M.N.Namboodirippad, Prof.P.A.Daniel, 1982 G.B.C. Publications

SEMESTER IV

20PHU412 ATOMIC AND NUCLEAR PHYSICS PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objectives

- The aim of the course is to make them to understant general properties of Nucleus.
- To study the nuclear forces and nuclear reactions.
- To understant basic concept of radiation principles.

Course Outcomes

- At the end of the course, the students can able to
- Acquire basic knowledge about nuclear and particle physics
- Develop the nuclear reactions and neutron physics.
- To introduce the concept of elementary particles

Any 5 Experiments

1. G.M.Counter-Absorption co-efficient and inverse square law.
2. Measurement of counts of radiation by radioactive source using GM counter
3. 'e/m' by Magnetron method.
4. 'e/m' by Thomson method
5. 'e/m' by Millikan oil drop method.
6. Absorption spectra of Iodine
7. Atomic transistion of Copper using Arc spectrum
8. Rydberg constant by Hydrogen gas spectrum.
9. Diameter of Lycopodium powder particies by Carona rings.
10. Absorption spectrum of Alkali earth metal - Stark effect

SUGGESTED READINGS

1. A Text Book of practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

2. Practical Physics and Electronics, C.C. Ouseph, U.J. Rao, V.Vijayendran, 2016, S.Viswanathan, Printers & Publishers Pvt Ltd

3. Advanced practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.

4. Advanced level Physics practical, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers

SEMESTER IV

20PHU413A BASIC INSTRUMENTATION SKILL PRACTICAL 3H - 1C

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objectives:

- To familiarize the students with working, design and analysis of basic amplifier circuits.
- To design and analyze wave shaping circuits, rectifiers and power supply circuits
- Introduce the basic concept of qualitative and quantitative analysis of an instruments.
- Study the concept of separation science and its applications.

Course Outcomes:

The students will be able to

1. Handle any kind of process by framing it in block diagram, mathematical model and different process variables.
2. Use modern engineering tools and techniques in the practice of electronic devices.
3. Know all the industrial processes and demonstrate their knowledge in designing the control loops for these processes.
4. Understand the working of various types of amplifiers, oscillators, wave shaping and power supply circuits
5. Design and Analyze the various types of amplifiers, oscillators, wave shaping and power supply circuits for any practical situation.
6. Discuss the terms, principle, instrumentation, operation and applications of instruments.

The test of lab skills will be of the following test items:

1. Calibration of a low range voltmeter-potentiometer.
2. Full wave rectifier
3. Calibration of an ammeter-potentiometer
4. Half wave rectifier
5. Measurement of unknown frequency using lissajous figures by CRO.
6. Measurement of risetime and falltime using CRO.
7. Study the layout of receiver circuit.
8. Trouble shooting a circuit
9. Balancing of bridges

Laboratory Exercises:s

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.
3. To measure Q of a coil and its dependence on frequency, using a Q- meter.
4. Measurement of voltage, frequency, time period and phase angle using CRO.
5. Measurement of time period, frequency, average period using universal counter/ frequency counter.
6. Measurement of rise, fall and delay times using a CRO.
7. Measurement of distortion of a RF signal generator using distortion factor meter.
8. Measurement of R, L and C using a LCR bridge/ universal bridge.

Open Ended Experiments:

1. Using a Dual Trace Oscilloscope
2. Converting the range of a given measuring instrument (voltmeter, ammeter)

SUGGESTED READINGS

1. A text book in Electrical Technology - B L Theraja - S Chand and Co.
2. Performance and design of AC machines - M G Say ELBS Edn.
3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
4. Logic circuit design, Shimon P. Vingron, 2012, Springer.
5. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
6. Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill
7. Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer
8. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India

SEMESTER IV

20PHU413B RADIATION SAFETY PRACTICAL 3H - 1C

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objectives:

- This course is aimed to cover the
- basic radiation principle.
- nuclear interactions with matter and detection.
- biological effects of radiation and measurement .
- shielding of nuclear radiation.

Course Outcomes:

- At the completion of course, student would be able to
- understood the concepts of nuclear radiation.
- know the interaction of nuclear radiation with matter.
- detect the nuclear radiation.
- be familiar with dosimeters and measurements.

Any 4 Experiments

1. Study the background radiation levels using Radiation meter
2. Study of characteristics of GM tube and determination of operating voltage and plateau length using background radiation as source (without commercial source).
3. Study of counting statistics using background radiation using GM counter.
4. Study of radiation in various materials (e.g. KSO4 etc.). Investigation of possible radiation in different routine materials by operating GM at operating voltage.
5. Study of absorption of beta particles in Aluminum using GM counter.
6. Detection of α particles using reference source & determining its half life using spark counter
7. Gamma spectrum of Gas Light mantle (Source of Thorium)

SUGGESTED READINGS

1. W.E. Burcham and M. Jobes – Nuclear and Particle Physics – Longman (1995)
2. G.F.Knoll, Radiation detection and measurements
3. Thermoluninescense Dosimetry, Mcknlay, A.F., Bristol, Adam Hilger (Medical Physics Handbook 5)
4. W.J. Meredith and J.B. Massey, “Fundamental Physics of Radiology”. John Wright and

Sons, UK, 1989.

5. J.R. Greening, "Fundamentals of Radiation Dosimetry", Medical Physics Hand Book Series, No.6, Adam Hilger Ltd., Bristol 1981.
6. Practical Applications of Radioactivity and Nuclear Radiations, G.C. Lowental and P.L. Airey, Cambridge University Press, U.K., 2001
7. Martin and S.A. Harbisor, An Introduction to Radiation Protection, John Willey & Sons, Inc. New York, 1981.
8. W.R. Hendee, "Medical Radiation Physics", Year Book – Medical Publishers Inc. London, 1981

SEMESTER IV

20PHU414 CHEMISTRY PRACTICAL– II 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objective

The student on successful completion of the course should learn the principles of volumetric analysis and to estimate the compounds by acidimetry, alkalimetry and permanganometry.

Course Outcome

1. The student learnt the principles of quantitative analysis of inorganic compounds.
2. Learnt the estimation of sample present in a solution by volumetric analysis.

Volumetric analysis

A. Acidimetry & Alkalimetry

1. Estimation of sodium carbonate using standard sodium hydroxide.
2. Estimation of sodium hydroxide using standard sodium carbonate.
3. Estimation of sulphuric acid using standard oxalic acid.
4. Estimation of potassium permanganate using standard sodium hydroxide.

B. Permanganometry

1. Estimation of ferrous sulphate using standard Mohr's salt.
2. Estimation of oxalic acid using standard ferrous sulphate.
3. Estimation of calcium-direct method.

SUGGESTED READINGS

1.Thomas, A.O. (2012). *Practical Chemistry for B.Sc. Main Students.* Cannanore: Kerala, Scientific Book Centre.

2. Ramasamy, R. (2011). *Allied Chemistry Practical Book*. Karur: Priya Publications.

3. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu A. R. (2015). *Basic Principles of Practical Chemistry* (2nd edition). New Delhi: S. Chand Publications.

SEMESTER – V

20PHU501 MATHEMATICAL PHYSICS 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objectives

- To provide students with a repertoire of mathematical methods that are essential to the solution of advanced problems encountered in the fields of applied physics and engineering.
- In addition, intended to prepare the student with mathematical tools and techniques that are required in advanced courses offered in the applied physics

Course Outcomes (COs)

They can be able to write program for mathematical problems.

1. To communicate mathematical and physical knowledge and ideas to the students.
2. To apply his/her knowledge and skills to carry out advanced tasks and projects.
3. To contribute innovations and application of basic research.

UNIT I - BASIC OF C LANGUAGE

Introduction, Data types, Operators and Expressions, Conditional Statements, Input and output Statements (Programs)

UNIT II - COMPLEX ANALYSIS:

Brief revision of Complex numbers & their graphical representation. Roots of Complex Numbers. Functions of Complex Variables. Analyticity and Cauchy-Riemann Conditions. Examples of analytic functions. Singular functions: poles and branch points, order of singularity. Integration of a function of a complex variable. Cauchy's Integral formula.

UNIT III - VECTOR CALCULUS

Operator – Divergence – Second derivative of Vector functions or fields – The Laplacian Operator – Curl of a Vector – Line Integral – Line Integral of a Vector field around an infinitesimal rectangle – Curl of Conservative field – Surface Integral – Volume Integral (without problem) – Gauss's Divergence theorem and it's proof in the simple problems – Stoke's and its proof with simple problems.

UNIT IV

DIFFERENTIAL CALCULUS: Differentiation- Curvature and radius of Curvature in Cartesian and Polar form – Evolutes – Involute.

INTEGRAL CALCULUS: Definite and Indefinite integrals – Methods of Integration – Integration by substitution – Integration by parts.

UNIT V - SPECIAL FUNCTIONS

Definition – The Beta function – Gamma function – Evaluation of Beta function – Other forms of Beta function – Evaluation of Gamma function – Other forms of Gamma function - Relation between Beta and Gamma functions – Problems.

SUGGESTED READINGS

1. Programming in ANSI C by Balagurusamy, 2017, Tata Mc-Graw Hill.
2. Mathematical Physics by Sathya prakash, 2014, S.Chand & Company, New Delhi.
3. Mathematical Physics by B.D.Gupta, 4th Edition, Vikas Publishing house Pvt Ltd, New Delhi.
4. Introduction to Mathematical Physics: Methods & concepts By Chun Wa Wong, 2013, Oxford University press.
5. Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier.
6. Fourier Analysis by M.R. Spiegel, 2004, Tata McGraw-Hill.
7. Essential Mathematical Methods, K.F.Riley and M.P.Hobson, 2011, Cambridge University Press.
8. Mathematical Physics by by Shigeji Fujita, Salvador V. Godoy, 2010, John Wiley & Son.
9. Mathematical Physics by Pavan Kumar Chaurasya, 2013, Campus Books International Publisher.
10. Mathematical Physics by Charlie Harper, 2013, Prentice Hall of India.
11. https://nptel.ac.in/courses/106/104/106104128/
12. https://nptel.ac.in/courses/111105123/
13. https://nptel.ac.in/content/storage2/courses/112104158/lecture8.pdf

SEMESTER V

20PHU502 ELECTROMAGNETIC WAVE PROPAGATION 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

The aim and objective of the course:

The aim of this course is to provide the students with the fundamental principles of electrical energy (electro- magnetism). It is very important to understand the propagation of waves in different media, its transmission and reception.

Course Outcome

Students can

1. Solve Maxwell's equations using vector calculus in three standard coordinate systems
2. calculate electric and magnetic fields from stationary and dynamic charge and current distributions.
3. solve simple electrostatic boundary problems.
4. describe simple models for electromagnetic interaction with media
5. be able to choose adequate models and solution methods for specific problems

UNIT- I

Maxwell Equations: Maxwell's equation - Review of Maxwell's equations. Displacement Current. Electromagnetic scalar and vector potential, Gauge Transformation: Lorenz and Coulomb gauge – Poynting theorem and vector.

UNIT -II

EM Wave Propagation in Unbounded Media: Plane EM waves through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive index and dielectric constant, wave impedance. Propagation through conducting media.

UNIT -III

EM Wave in Bounded Media: Boundary conditions at a plane interface between two media. Reflection & Refraction of plane waves at plane interface between two dielectric media-Laws of Reflection & Refraction. Fresnel's Formulae for perpendicular & parallel polarization cases, Brewster's law.

UNIT -IV

Propagation of Electromagnetic Waves: Electromagnetic waves in Free space - Isotropic dielectric - Anisotropic dielectric – Conducting media - Ionized gases. Fresnel's Formulae for perpendicular & parallel polarization cases, Brewster's law, Reflection & Transmission

coefficients, Total internal reflection.

UNIT -V

Wave Guides: Planar optical wave guides, Planar dielectric wave guide, Condition of continuity at interface, Phase shift on total reflection, Phase and group velocity of guided waves, Field energy and Power transmission.

SUGGESTED READINGS

1. Electromagnetic Theory, KK Chopra, GC Agrawal, K Nath & Co, ISBN-13: 1234567143745.
2. Electromagnetic fields and waves by Paul Lorrain Author, Dale Corson, W. H. Freeman Publications.
3. Introduction to Electrodynamics by David Jeffery Griffiths, Pearson, 2013, ISBN – 9780321856562.
4. Electromagnetic Theory by P.K. Basu, H. Dhasmana, 2010, Ane Books Ltd.
5. Elements of Electromagnetics by Matthew N. O. Sadiku, 2015, Oxford University Press.
6. Paul Lorrain and Dale R Corson, Electromagnetic fields and waves, 3rd Edition, W. H. Freeman and Company New York.
7. Introduction to Electromagnetic Theory, T.L. Chow, 2006, Jones & Bartlett Learning.
8. Electromagnetic Field Theory: A Collection of Problems, By Gerd Mrozynski, Matthias Stallein, Springer Vieweg, 2013.
9. Electromagnetic field Theory, R.S. Kshetrimayun, 2012, Cengage Learning, Engineering Electromagnetic, Willian H. Hayt, 8th Edition, 2012, McGraw Hill.
10. https://nptel.ac.in/content/storage2/courses/115101004/downloads/module1/ed-1-1-new.pdf
11. https://nptel.ac.in/courses/108104130/

SEMESTER V

20PHU503 ELEMENTS OF MODERN PHYSICS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

- Identify the circumstances, discoveries and people that launched Modern Physics. Enumerate and understand the postulate of relativity.
- Learn about the speed of light as a natural limit to speed.
- Explain the problem of simultaneity and calculate time changes from one frame of reference to another.
- Describe relativistic length contraction and mass-energy relation.
- Explain the work of Planck, Bohr, Heisenberg, uncertainty principle and the other features of Quantum Mechanics.

Course Outcome

Students can

1. recall and apply knowledge in the areas of optics and waves, special relativity and quantum physics (developing the knowledge capability dimension);
2. analyse and solve problems in these areas (developing the critical analysis and problem solving capability dimension);
3. conduct relevant experiments, analyse data and report results in written form (developing the technical capability and communication dimensions).

UNIT-I: RELATIVITY

Invariance of physical laws, constancy of speed of light, relativity of simultaneity, the Lorentz transformation, length contraction, time dilation, the Doppler effect, relativistic motion, relativistic momentum, relativistic energy, the Galileo transformation and Newtonian mechanics as non-relativistic limits.

UNIT-II

Wave-particle duality: Electromagnetic Waves - photoelectric effect, x-ray production, X-ray diffraction, Compton scattering, uncertainty principle, electron waves, nuclear atom and atomic spectra, energy levels and the Bohr model of the atom, lasers, and continuous spectra.

UNIT- III: QUANTUM MECHANICS

Wave function,Wave Equation - the one-dimensional Schrödinger equation, Momentum and Energy operators; stationary states; physical interpretation of a wave function, probabilities

and normalization; Probability and probability current densities in one dimension. Particle in a onedimensional box, potential wells, potentials barriers and tunneling, the harmonic oscillator.

UNIT-IV

Statistical and Solid State Physics: Statistical distribution- Maxwell-Boltzmann Statistics-Energies in ideal gas – Quantum Statistics-Einstein's Distribution – Specific heats of solids-Free electrons in a metal. Crystalline and amorphous solids-Bonding-Band theory of solids-semiconductors, superconductivity.

UNIT- V

Radioactivity: stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli's prediction of neutrino; Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus.

SUGGESTED READINGS

1. Modern Physics by Kiruthiga Sivaprasath, SChand Publications, ISBN : 9788121928014
2. Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill.
3. Quantum Mechanics by Satya Prakash, Pragati Prakashan, ISBN: 9789350065532
4. Introduction to Quantum Mechanics, David J. Griffith, 2005, Pearson Education.
5. Modern Physics, G.Kaur and G.R. Pickrell, 2014, McGraw Hill
6. Quantum Mechanics: Theory & Applications, A.K.Ghatak & S.Lokanathan, 2004, Macmillan
7. Modern Physics, J.R. Taylor, C.D. Zafiratos, M.A. Dubson, 2004, PHI Learning.
8. Theory and Problems of Modern Physics, Schaum`s, R. Gautreau and W.Savin, 2nd Edn, Tata McGraw-Hill Publishing Co. Ltd.
9. Modern Physics by Kenneth S. Krane, Wiley, 2012, ISBN – 9781118061145.
10. Introduction to Quantum Mechanics, By A. C. Phillips, Wiley, 2009, ISBN -978-0-470-85323-8.
11. Quantum Physics by Michel Le Bellac, 2006, Cambridge University Press, ISBN – 9781107602762.

SEMESTER V

20PHU504B MICROPROCESSOR AND MICROCONTROLLER 3H – 3C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

- To understand the Architecture of 8085 and 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To study the Architecture of 8051 microcontroller.
- To design a microcontroller based system

Course Outcome:

At the end of the course, the students should be able to:

- Understand and execute programs based on 8086 microprocessor.
- Design Memory Interfacing circuits.
- Design and interface I/O circuits.
- Design and implement 8051 microcontroller based systems.

UNIT I: 8085 MICROPROCESSOR

Introduction to microprocessor – Basic components of a microcomputer – I/O devices – Memory – ROM – RAM – Architecture of 8085 – Address bus – Data bus – Control bus – Pin configuration – Registers Arithmetic and logic unit – Flags – Instruction format – Types of instructions – Addressing modes – Assembly language programming – Programmes for addition, subtraction, biggest and smallest from the given list.

UNIT II: THE 8086 MICROPROCESSOR

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT III: 8086 SYSTEM BUS STRUCTURE

8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations –

Introduction to advanced processors.

UNIT IV: MICROCONTROLLER

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V: INTERFACING MICROCONTROLLER

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

SUGGESTED READINGS:

1. Fundamental of Microprocessor 8085: Architecture Programming, and Interfacing by V. Vijayendran, 2009, Viswanathan, S., Printers & Publishers Pvt Ltd.
2. Microprocessor and Microcontrollers by Krishna Kant, 2007, Eastern Company Edition, Prentice Hall of India, New Delhi.
3. Microprocessor Architecture Programming and Application with 8085 by R.S. Gaonkar, 2013, Wiley Eastern Ltd., New Delhi.
4. Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design by Yu-Cheng Liu, Glenn A.Gibson, 2007, Second Edition, Prentice Hall of India,.
5. The 8051 Microcontroller and Embedded Systems: Using Assembly and C Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, 2011, Second Edition, Pearson education.
6. Microprocessors and Interfacing, Programming and Hardware, Doughlas V.Hall, 2012, TMH. .
7. Advanced Microprocessors and Peripherals by A.K.Ray, K.M.Bhurchandi, 3rd edition, Tata McGrawHill, 2012.
8. https://nptel.ac.in/courses/108/105/108105102/
9. https://nptel.ac.in/courses/117/104/117104072/

SEMESTER V

20PHU504B **MEDICAL PHYSICS** **3H – 3C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

- This paper is aimed at giving idea to the students regarding the nature of human body, usage of different radiations for the treatment of body etc.
- To introduce the student to a number of applications of physics to medicine with particular emphasis on those commonly used in the work of the medical physicist.

Course Outcome

At the end of the course, students can

1. Define medical imaging techniques specified in the syllabus below and know where they are applied in clinical practice.
2. Describe how ionising radiation interacts with matter, how it affects living organisms and how it is used as a therapeutic technique.

UNIT – I

PHYSICS OF THE BODY-I

Basic Anatomical Terminology: Standard Anatomical Position, Planes. Familiarity with terms like- Superior, Inferior, Anterior, Posterior, Medial, Lateral, Proximal and Distal. **Mechanics of the body:** Skeleton, forces, and body stability. Muscles and dynamics ofbody movement. Physics of Locomotors Systems: joints and movements, Stability and Equilibrium. **Energy household of the body:** Energy balance in the body, Energy consumption of the body, Heat losses of the body, Thermal Regulation. **Pressure system of body:** Physics of breathing, Physics of cardiovascular system.

UNIT – II

PHYSICS OF THE BODY-II

Acoustics of the body: Nature and characteristics of sound, Production of speech, Physics of the ear, Diagnostics with sound and ultrasound. **Optical system of the body:** Physics of the eye. **Electrical system of the body:** Physics of the nervous system, Electrical signals and information transfer.

UNIT - III

PHYSICS OF DIAGNOSTIC AND THERAPEUTIC SYSTEMS-I X-RAYS: Electromagnetic spectrum, production of x-rays, x-ray spectra, Brehmsstrahlung,

Characteristic x-ray. **X-ray tubes &types**: Coolidge tube, x-ray tube design, tube cooling stationary mode, Rotating anode x-ray tube, Tube rating, quality and intensity of x-ray. X-ray generator circuits, half wave and full wave rectification, filament circuit, kilo voltage circuit. Single and three phase electric supply. Power ratings. Types of X-Ray Generator, high frequency generator, exposure timers and switches, HT cables.

UNIT - IV

RADIATION PHYSICS: Radiation units exposure, absorbed dose, units: rad, gray, relative biological effectiveness, effective dose- Rem & Sievert, inverse square law. Interaction of radiation with matter Compton& photoelectric effect, linear attenuation coefficient. **Radiation Detectors**: ionization (Thimble chamber, condenser chamber), chamber. Geiger Muller counter, Scintillation counters and Solid State detectors, TFT.

UNIT - V

MEDICAL IMAGING PHYSICS: Evolution of Medical Imaging, X-ray diagnostics and imaging, Physics of nuclear magnetic resonance (NMR), NMR imaging, MRI Radiological imaging, Ultrasound imaging, Physics of Doppler with applications and modes, Vascular Doppler. Radiography: Filters, grids, cassette, X-ray film, film processing, fluoroscopy. **Computed tomography scanner**- principle and function, display, generations, mammography. Thyroid uptake system and Gamma camera (Only Principle, function and display)

SUGGESTED READINGS

1. Medical Physics By Martin Hollins, Thomas Nelson and Sons Ltd, 2001, ISBN -0-17-448253-1.
2. Basic Radiological Physics Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003).
3. Measurement, Instrumentation, and Sensors Handbook, Second Edition: Two-Volume Set, by John G. Webster, Halit Eren, Taylor & Francis, 2014, ISBN- 9781439848838.
4. Integrated Electronics by Millman & Halkias, 2001, Tata McGraw-Hill Education, 2001, ISBN – 9780074622452.
5. Physics for Diagnostic Radiology, Third Edition, By Philip Palin Dendy, Brian Heaton 2012, CRC press, Taylor and Francis group, ISBN – 978-1-4200-8315-6.
6. Physics of the human body, Irving P. Herman, Springer (2007).
7. Physics of Radiation Therapy : F M Khan - Williams and Wilkins, 3rd edition (2003).

8. The essential physics of Medical Imaging: Bushberg, Seibert, Leidholdt and Boone Lippincot Williams and Wilkins, Second Edition (2002).

9. Handbook of Physics in Diagnostic Imaging: R.S.Livingstone: B.I. Publication Pvt Ltd.

SEMESTER – V

20PHU511 MATHEMATICAL PHYSICS PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

1. The aim of this practical is to use the computational methods to solve physical problems.
2. To communicate mathematical and physical knowledge and ideas to the students through computer programming.
3. To aware the students about the computer knowledge and modelling of mathematic functions.
4. To demonstrate the utility and limitations of a variety of powerful calculational techniques and to provide a deeper understanding of the mathematics underpinning theoretical physics.

Course Outcomes (COs)

Students will have understanding of:

- Understand matrix and partial differential equations.
- Understand complex analysis.
- Understand the integral transforms.
- Understand basics of linear transformations and tensors.
- Understand calculations of special functions.
- Students will learn the importance of computer programming.

ANY 8 EXPERIMENTS

1. Evaluate the Beta and Gamma function using C program.
2. Write the C Program to Print Square of Each Element of 2D Matrix.
3. Calculate the addition and subtraction of 2 matrices.
4. Write the C Program to Add two Complex Numbers.
5. Write C functions to add and multiply two complex numbers.
6. Program to find Transpose of Given Square Matrix.
7. Evaluate Subtraction of two matrices in C.
8. Write the C Program to perform complex number multiplication.
9. Write the C program to calculate sum of Upper Triangular Elements.
10. Write the C Program to Check whether entered matrix is magic square or not?
11. Find Inverse of a 3 X 3 Matrix using C program.
12. Write C Program to Compute Cross Product of Two Vectors.

13. Write a C Program Friend & Operator: Vector.
14. Check if a Number is Positive or Negative Using if...else.
16. Write a C Program to find the Factorial of a Number.

SUGGESTED READINGS

1. Introduction to Numerical Analysis, S.S. Sastry, 5thEdn., 2012, PHI Learning Pvt. Ltd. Schaum's Outline of Programming with C++. J.Hubbard, 2000, McGraw-Hill Pub.
2. Numerical Recipes in C^{++}: The Art of Scientific Computing, W.H. Press et.al., 2ndEdn., 2013, Cambridge University Press.
3. A first course in Numerical Methods, U.M. Ascher & C. Greif, 2012, PHI Learning.
4. An Introduction to computational Physics,T.Pang,2ndEdn., 2006,CambridgeUniv. Press
5. Mathematical Methods for Physics and Engineers, K.F Riley, M.P. Hobson and S. J. Bence, 3rd ed., 2006, Cambridge University Press
6. Complex Variables, A.S. Fokas& M.J. Ablowitz, 8th Ed., 2011, Cambridge Univ. Press

SEMESTER – V

20PHU512 ELECTROMAGNETIC WAVE PROPAGATION PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objective

The aim and objective of the course:

The aim of this course is to provide the students by corrlating the fundamental principles of electrical energy (electro- magnetism) practically.

Course Outcome

Students can

1. find electric and magnetic fields from stationary and dynamic charge and current distributions.
2. describe simple models for electromagnetic interaction with media
3. be able to choose adequate models and solution methods for specific problems

Any 8 experiments

1. To determine the specific rotation of sugar solution using Polarimeter.
2. To analyze elliptically polarized Light by using a Babinet's compensator.
3. Determination of wavelength of the monochromatic source using Young's double slit method.
4. To study the polarization of light by reflection and determine the polarizing angle for air-glass interface.
5. To verify the Stefan`s law of radiation and to determine Stefan's constant.
6. To determine the Boltzmann constant using V-I characteristics of PN junction diode.
7. To verify the law of Malus for plane polarized light.
8. To study the polarization of light by reflection and determine the polarizing angle for air-glass interface.
9. Charging and discharging of a capacitor
10. Verification of Faraday's law of electromagnetism
11. Determination of Planck's constant

SUGGESTED READINGS

1. Advanced level Physics practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
2. A Text Book of practical Physics, I.Prakash & Ramakrishna, 11th Ed., 2011, Kitab Mahal
3. Electromagnetic Field Theory for Engineers & Physicists, G. Lehner, 2010, Springer

SEMESTER V

20PHU513 ELEMENTS OF MODERN PHYSICS PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

- To identify the circumstances, in Modern Physics. Enumerate and understand the postulate of relativity.
- To Learn about the speed of light as a natural limit to speed.
- To understand the work of Planck, Bohr, Heisenberg, uncertainty principle and the other features of Quantum Mechanics.

Course Outcome

Students can

1. recall and apply knowledge in the areas of optics and waves, special relativity and quantum physics (developing the knowledge capability dimension);
2. conduct relevant experiments, analyse data and report results in written form (developing the technical capability and communication dimensions).

Any 8 Experiments

1. Measurement of Planck's constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
3. To determine the Planck's constant using LEDs of at least 4 different colours.
4. I-V characteristics of LED
5. I-V characteristics of photocell
6. Plank's constant using color filters.
7. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
8. To setup the Millikan oil drop apparatus and determine the charge of an electron.
9. To show the tunneling effect in tunnel diode using I-V characteristics.
10. To determine the wavelength of laser source using diffraction of single slit.
11. To determine the wavelength of laser source using diffraction of double slits.
12. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating

SUGGESTED READINGS

1. Advanced practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practical, Michael Nelson and Jon M. Ogborn, 4th Edition, 1985, Heinemann Educational Publishers.
3. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal

SEMESTER V

20PHU514A MICROPROCESSOR AND MICROCONTROLLER PRACTICAL 3H - 1C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

COURSE OBJECTIVES:

- To Introduce ALP concepts, features and Coding methods
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Write ALP Programmes for fixed and Floating Point and Arithmetic operations
- Interface different I/Os with processor
- Generate waveforms using Microprocessors
- Execute Programs in 8051

Any 6 experiments

1. 8-bit addition and 8-bit subtraction using 8085 microprocessor.
2. 8-bit multiplication and Division using 8085 microprocessor.
3. Conversion from decimal to hexadecimal system using 8085 microprocessor.
4. Conversion from hexadecimal to decimal system using 8085 microprocessor.
5. 16-bit addition using 8085 microprocessor.
6. Musical tone generator.
7. To find sum of series
8. To find the sum of first n natural numbers
9. To find the factorial of a number
10. To find the square root of the number.

SUGGESTED READINGS

1. Fundamental of Microprocessor 8085: Architecture Programming, and Interfacing by V. Vijayendran, 2009, Viswanathan, S., Printers & Publishers Pvt Ltd.

2. Microprocessor and Microcontrollers by Krishna Kant, 2007, Eastern Company Edition, Prentice Hall of India, New Delhi.
3. Microprocessor Architecture Programming and Application with 8085 by R.S. Gaonkar, 2013, Wiley Eastern Ltd., New Delhi.

SEMESTER V

20PHU514B MEDICAL PHYSICS PRACTICAL 3H - 1C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

- This paper is aimed at giving idea to the students regarding the nature of human body and usage of different radiations for the treatment of body.

Course Outcomes

Students can understand:

1. Different areas of research in Medical Physics
2. Understand and apply key concepts specific to energy deposition for both ionizing photon interactions and transport in matter and for energetic charged particle interactions and transport in matter.

Any 6 experiments

1) Understanding the working of a manual Hg Blood Pressure monitor and measure the Blood Pressure.
2) Understanding the working of a manual optical eye-testing machine and to learn eye-testing procedure.
3) Correction of Myopia (short sightedness) using a combination of lenses on an optical bench/breadboard.
4) Correction of Hypermetropia/Hyperopia (long sightedness) using a combination of lenses on an optical bench/breadboard.
5) To learn working of Thermoluminescent dosimeter (TLD) badges and measure the background radiation.
6) Familiarization with Geiger-Muller (GM) Counter and to measure background radiation.
7) Familiarization with Radiation meter and to measure background radiation.
8) Familiarization with the Use of a Vascular Doppler.

SUGGESTED READINGS

1. Basic Radiological Physics, Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)
2. Christensen's Physics of Diagnostic Radiology: Curry, Dowdey and Murry - Lippincot Williams and Wilkins (1990)

3. Physics of Radiation Therapy : F M Khan - Williams and Wilkins, 3rd edition (2003)
4. The essential physics of Medical Imaging: Bushberg, Seibert, Leidholdt and Boone Lippincot Williams and Wilkins, Second Edition (2002)
5. Handbook of Physics in Diagnostic Imaging: Roshan S. Livingstone: B. I. Publications Pvt Ltd.

SEMESTER – VI

20PHU601 CLASSICAL AND QUANTUM MECHANICS 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Learning Objectives

- To know how to impose constraints on a system in order to simplify the methods tobe used in solving physics problems.
- To know what central, conservative and central-conservative forces mathematically understand the conservative theorems of energy, linear momentum and angular Momentum.
- To know the importance of concepts such as generalized coordinates and constrained motion.
- To establish that Kepler's laws are just consequences Newton's laws of gravitation and that of motion.
- The main objective of this course is to make students aware about the basic formulations in quantum mechanics. There are many different types of representations of state and operators that are very useful in studying the subject deeply.

Course Learning Outcome

1. Students learn about Lagrangian and Hamiltonian formulation of Classical Mechanics.
2. Students learn about motion of a particle under central force field.
3. Students will be able to appreciate the beauty of quantum mechanics.
4. Students will know all types of representations of operators and ways to apply them in different problems.

Unit I: Lagrangian and Hamiltonian Dynamics

Lagrange's equation for conservative and Non- conservative System-Applications of Lagrange's equation- Hamilton's principle- Lagrange's Equation from Hamilton's Principle – Lagrange's equation from variational principles –Advantages-conservation theorem -Hamilton equations of motion –Cyclic coordinates and Conservation theorems- Hamilton equations from variational Principle-The principle of Least action.

Unit –II: The Two body Central Force Problem

Conservative central forces-Classification of Orbits- The Virial Theorem- The Kepler problem; Inverse Square law of Forces-Rutherford scatterings -Scattering in a central force field

Unit-III: Particle properties of waves

Planck's blackbody radiation - de Broglie waves – photoelectric effect – Compton Effect - Wave properties of particles: particle diffraction – Davison and Germer experiment – Heisenberg's uncertainty principle - wave packet - phase and group velocities.

Unit – IV: Operator and Postulates of Quantum Mechanics

The wave function – probability density – probability stream (current) density - dynamical operators – linear and hermitian operators – commuting and non-commuting operators – Hamiltonian – angular momentum operators-The Schrodinger's wave equation – time dependent form – linearity and superposition – Schrodinger equation: steady state form - eigenvalues and eigenfunctions.

Unit – V: Exactly solvable problems

Free states: Particle in a box – step potential – barrier potential – quantum tunnelling – square well free states. Bound states: infinite potential well – particle in a box – degeneracy –quantized states – normalized wave functions – expectation values - Harmonic oscillator – energy eigenvalues and eigen functions – zero point energy.

SUGGESTED READINGS

1) Concept of Modern Physics by Arthur Baiser, Shobi tMahajan, S.Rai Choudhury, 6th Edn, McGraw Hill Education Pvt Ltd, New Delhi.
2) Classical Mechanics, Upadyaya, Himalayan Publishing House, 1989, New Delhi.
3) A Text Book of Quantum Mechanics by P.M.Mathews & K.Vengatesan, Tata McGraw Hill, New York.
4) Modern Quantum Mechanics by J.J.Sakurai, 1999, Addition Wisley.
5) Principles of Quantum Mechanics, S R.Shankar, 2007, II Ed, Springer.
6) https://nptel.ac.in/courses/115105098/
7) https://nptel.ac.in/courses/122106034/

SEMESTER VI

20PHU602 SOLID STATE PHYSICS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objective:

- This course integrates theory of Solid State Physics with experimental demonstrations in the Physics Lab.
- The course will provide a valuable theoretical introduction and an overview of the fundamental applications of the physics of solids.
- It includes theoretical description of crystal and electronic structure, lattice dynamics, and optical properties of different materials (metals, semiconductors, dielectrics, magnetic materials and superconductors), based on the classical and quantum physics principles.

Course Outcomes

Students should gain basic knowledge of solid state physics. This implies that the student will:

1. be able to account for interatomic forces and bonds.
2. have a basic knowledge of crystal systems and spatial symmetries.
3. be able to account for how crystalline materials are studied using diffraction, including concepts like form factor, structure factor, and scattering amplitude.
4. know what phonons are, and be able to perform estimates of their dispersive and thermal properties.
5. be able to calculate thermal and electrical properties in the free-electron model.
6. be able to outline the importance of solid state physics in the modern society.

Unit I - CRYSTAL STRUCTURE

Classification of solids – liquids – amorphous glassy states, characteristics and structure – Bravais lattice – simple – body centered and face centered cubic lattices – Unit cell, Wigner-Seitz cell and conventional cell. Crystal structures and lattice with basis – Hexagonal close packed and diamond structure – point groups – space groups – Miller indices – Reciprocal lattice – Brillouin zones – crystal diffraction – Laue – Power – Rotating – crystal methods.

Unit II - ELEMENTARY LATTICE DYNAMICS

Ionic cohesive energy – Covalent – Metallic Vander Waals and hydrogen bonded crystals – Vibrational modes –one, two and three dimensional lattices – Thermal conductivity – Elastic constants – Phonon dispersion relation – Localised modes.

Unit III MAGNETIC PROPERTIES OF MATTER

Ferro electric crystals – Classification of polarization – Catastrophe – Landau theory of phase transition – Second order transition – First order transition soft optical phonons – Anti ferro electricity – Ferro electric domains – Piezoelectricity – Ferro electricity. Dia – paramagnetism – Quantum theory of para magnetism – ferro – Ferri – Anti ferri magnetism.Curie Neil temperature – Magnetism and susceptibility – Ferro-magnetic domains – Magnons.

Unit IV- SUPERCONDUCTIVITY

Occurrence of Superconductivity – Destruction of superconductivity by magnetic fields – Meissner effect – Heat capacity – Energy gap – Microwave and IR properties – Isotope effect – Thermodynamics of the superconducting transistors – London equation – Coherence length – BCS theory of superconductivity –Qualitative treatment of DC and AC Josephson effect.

Unit V - ELEMENTARY BAND THEORY

Transport properties – electronic specific heat – electrons in a periodic potential – energy band – Bloch's theorem, Kronig – Penney's theorem – Band Structure – Carrier concentrations – Intinsic semi-conductor – Imputiry states – Semiconductor states – Electrical conductivity, mobility – Magnetic field effects – Cyclotron resonance and Hall effect.

SUGGESTED READINGS

1. Introduction to solid state physics by C. Kittel, Kittel's, 2019, John Wiley.

2. Solid State Physics by S O Pillai, 2018, New Age International.

3. Solid state physics by N. W. Aschcroft and N. D. Mermin, Holt, Rineheart and Winston, 1976, 27th Edition, New York.

4. Elementary solid state physics by Ali Omer, 2002, Pearson Education.

5. Solid state physics, J. Dekker, 1969, MacMillan Publication.

6. Solid State Physics b**y R. J. Singh, 2012, Dorling Kindersley Publisher.**

7. Solid State Physics by J. R. Hook, H. E. Hall, 2010, John Wiley & Sons Ltd.

8. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/113104014/lec19.pdf

9. https://nptel.ac.in/courses/115101012/

SEMESTER VI

20PHU603A NANO MATERIALS AND APPLICATIONS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective:

- This course covers the different classes of nanomaterials that have been developed in recent years in light of various technological applications.
- In order to understand the behavior of these nanomaterials, quantum phenomena and the limitations of basic physical laws that are important at the nanometer length scale are introduced and developed.
- In particular, properties that exhibit size effects (including electronic, magnetic, photonic, and mechanical) at the nanometer length scale will be presented so that nanomaterials becoming increasing relevant to modern technologies can be better understood.

Course Outcome

Students can

- Explain the fundamental principles of nanotechnology and their application to biomedical engineering.
- Apply engineering and physics concepts to the nano-scale and non-continuum domain.
- Identify and compare state-of-the-art nanofabrication methods and perform a critical analysis of the research literature.
- Design processing conditions to engineer functional nanomaterials.

UNIT - I

FUNDAMENTALS: Introduction–Historical development of nanomaterials - Nanoscale architecture; Length scales in physics, Classification of nanomaterials.

Introduction to Nanostructures : Carbon Nanotubes (CNT)- Graphenes- Fullerenes- Nano Peapods- Quantum Dots -Semiconductor Nanoparticles- Metal-based Nanostructures - Nanowires - Nanostructures including dendrimers

UNIT – II

Properties and Size dependence of properties: Chemical -Optical- vibrational- thermal - Electrical -Magnetic -Mechanical -Theoretical Aspects

UNIT-III

SYNTHESIS OF NANOSTRUCTURE MATERIALS

Chemical routes- Electrochemical methods -Vapor growth- Thin films methods: chemical vapor deposition, physical vapor deposition (sputtering, laser ablation), Langmuir-Blodgett growth

Mechanical methods: ball milling, mechanical attrition -Sol-gel methods Special nanomaterials: carbon nanotubes, fullerenes, nanowires, porous silicon- Bio-inspired synthesis -Nanocomposite fabrication -Nanolithography

UNIT - IV

CHARACTERIZATION: X-Ray Diffraction- Optical Microscopy- Scanning Electron Microscopy- Transmission Electron Microscopy- Atomic Force Microscopy- Scanning Tunneling Microscopy- Fourier Transform Infrared spectroscopy- UV-visible spectroscopy.

UNIT – V

APPLICATIONS: Nano-electronics -Nano optics -Nanoscale chemical- and bio-sensing -Biological/bio-medical applications- Photovoltaic, fuel cells, batteries and energy-related applications -High strength nanocomposites Nanoenergetic materials

SUGGESTED READINGS

1. Sulabha K. Kulkarni, 3rd edition, Nanotechnology: Principles & Practices (Capital Publishing Company), Springer International Publishing, 2014.
2. C.P.Poole, Jr. Frank J.Owens, Introduction to Nanotechnology, Wiley India Pvt. Ltd.
3. The Physics and Chemistry of NanoSolids by Frank J. Owens and Charles P. Poole Jr, Wiley-Interscience, 2008.
4. K.K.Chattopadhyay and A.N.Banerjee, (2009), Introduction to Nanoscience and Technology, PHI Learning Private Limited.
5. Instrumental Methods Of Analysis By Willard. M.H, Kindle Edition- CBS Publishers and distributors pvt ltd; 7th Edition.
6. Introduction to Nanoscience and Technology, PHI Learning Private Limited.
7. Introduction to Nanoelectronics, V.V. Mitin, V.A. Kochelap and M.A. Stroscio, 2011, Cambridge University Press.
8. Richard Booker, Earl Boysen, Nanotechnology, John Wiley and Sons.
9. https://nptel.ac.in/courses/118102003/
10. https://nptel.ac.in/courses/118104008/

SEMESTER VI

20PHU603B	**BIOLOGICAL PHYSICS**	**4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives:

- The course aims to provide students with a foundation in the basic concepts of Biophysics.
- Topics will include canonical and non-canonical structures of nucleic acids, structure of proteins, enzymes etc.
- Fundamental concepts that underlie biomolecular interactions will be discussed and biophysical methods that are employed for the structural analysis of these systems will be introduced at an elementary level.

Course Outcome

1. Demonstrate knowledge of the fundamental concepts in physics and chemistry that underlie biological processes.
2. Define the structural characteristics of nucleic acids and proteins and examine parameters that variously determine their stability and function(s).
3. Describe the principles that govern biomolecular interactions and appreciate how established methods of research and enquiry are employed to analyze the different aspects of these interactions.

UNIT -I

Overview: The boundary, interior and exterior environment of living cells. Processes: exchange of matter and energy with environment, metabolism, maintenance, reproduction, evolution. Self-replication as a distinct property of biological systems. Time scales and spatial scales. Universality of microscopic processes and diversity of macroscopic form. Types of cells. Multicellularity. Allometric scaling laws.

UNIT- II

Molecules of life: Metabolites, proteins and nucleic acids. Their sizes, types and roles in structures and processes. Transport, energy storage, membrane formation, catalysis, replication, transcription, translation, signaling. Typical populations of molecules of various types present in cells, their rates of production and turnover. Energy required to make a bacterial cell. Simplified mathematical models of transcription and translation, small genetic circuits and signaling pathways. Random walks and applications to biology. Mathematical

models to be studied analytically and computationally.

UNIT -III

The complexity of life: At the level of a cell: The numbers of distinct metabolites, genes and proteins in a cell. Complex networks of molecular interactions: metabolic, regulatory and signaling networks. Dynamics of metabolic networks; the stoichiometric matrix. Living systems as complex organizations; systems biology. Models of cellular dynamics. The implausibility of life based on a simplified probability estimate, and the origin of life problem.

UNIT -IV

At the level of a multicellular organism: Numbers and types of cells in multicellular organisms. Cell types as distinct attractors of a dynamical system. Stem cells and cellular differentiation. Pattern formation and development. Brain structure: neurons and neural networks. Brain as an information processing system. Associative memory models. Memories as attractors of the neural network dynamics.

UNIT -V

At the level of an ecosystem and the biosphere: Foodwebs. Feedback cycles and self-sustaining ecosystems.

Evolution: The mechanism of evolution: variation at the molecular level, selection at the level of the organism. Models of evolution. The concept of genotype-phenotype map. Examples.

SUGGESTED READINGS

1. Physics in Molecular Biology; Kim Sneppen & Giovanni Zocchi (CUP 2005)
2. Biological Physics: Energy, Information, Life; Philip Nelson (W H Freeman & Co, NY, 2004)
3. Physical Biology of the Cell (2nd Edition), Rob Phillips et al (Garland Science, Taylor & Francis Group, London & NY, 2013)
4. An Introduction to Systems Biology; Uri Alon (Chapman and Hall/CRC, Special Indian Edition, 2013)
5. Evolution; M. Ridley (Blackwell Publishers, 2009, 3rd edition)
6. https://nptel.ac.in/courses/122103039/

SEMESTER-VI

20PHU611 CLASSICAL AND QUANTUM MECHANICS PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Learning Objectives

- To know what central, conservative and central-conservative forces mathematically understand the conservative theorems of energy, linear momentum and angular Momentum practically
- To know the importance of concepts such as generalized coordinates and constrained motion.

Course Learning Outcome

- Students learn about motion of a particle under central force field.
- Students will know all types of representations of operators and ways to apply them in different problems.

Any 8 experiments

1. To determine the coupling coefficient of coupled pendulums.
2. To determine the coupling coefficient of coupled oscillators.
3. To determine the coupling and damping coefficient of damped coupled oscillator.
4. To study population models e.g. exponential growth and decay, logistic growth, species competition, predator-prey dynamics, simple genetic circuits.
5. To study rate equations for chemical reactions e.g. auto catalysis, bistability.
6. To study examples from game theory.
7. Computational visualization of trajectories in the Sinai Billiard.
8. Computational visualization of trajectories Electron motion in mesoscopic conductors as a chaotic billiard problem.
9. Computational visualization of fractal formations of Deterministic fractal.
10. Computational visualization of fractal formations of self-similar fractal.
11. Computational visualization of fractal formations of Fractals in nature – trees, coastlines, earthquakes.
12. Computational Flow visualization - streamlines, pathlines, Streaklines.

Suggested Readings

1. Nonlinear Dynamics and Chaos, Steven H. Strogatz, Levant Books, Kolkata, 2007
2. Understanding Nonlinear Dynamics, Daniel Kaplan and Leon Glass, Springer.
3. An Introduction to Fluid Dynamics, G.K.Batchelor, Cambridge Univ. Press, 2002
4. Fluid Mechanics, 2nd Edn, L.D.Landau & E.M. Lifshitz, Pergamon Press, Oxford, 1987
5. Scilab Image Processing: L.M.Surhone. 2010, Betascript Pub., ISBN: 978-6133459274

SEMESTER – VI

20PHU612 SOLID STATE PHYSICS PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives:

- The course is to understand the basic knowledge on magnetic properties of materials.
- To understand the various parameters of the Hysteresis loop
- Acquire the knowledge of semiconducting and dielectric materials.
- To comprehend the concepts of superconductivity and magnetic properties of solids.

Course Outcome:

- At the end of this course, students will be able to
- Basic practical knowledge on magnetic materials.
- Understand the basic idea about the dielectric Properties of Solids
- Experience the behavior of Hysteresis loop of a crystal

ANY SIX EXPERIMENTS

1. Measurement of susceptibility - Quinck`s Tube Method – Ferromagnetic solution
2. Measurement of susceptibility - Quinck`s Tube Method – Paramagnetic solution
3. Measurement of susceptibility – Guoy's tube method – Ferromagnetic solution
4. Measurement of susceptibility – Guoy's tube method – Paramagnetic solution
5. Determination of Dielectric constant – Four probe method
6. Study of Hall effect
7. Study seeback's effect
8. To determine the refractive index of a dielectric layer using SPR technique.
9. To study the PE Hysteresis loop of a Ferroelectric Crystal.
10. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.
11. To measure the resistivity of a semiconductor (Ge) crystal with temperature (up to 150^{o}C) by four-probe method and to determine its band gap.
12. To determine the Hall coefficient of a semiconductor sample.

SUGGESTED READINGS

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.

2. Advanced level Physics PRACTICAL s, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers

3. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India

SEMESTER VI

20PHU613A NANO MATERIALS AND APPLICATIONS PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objective

- To provide knowledge of the Nanoscience and related fields.
- To make the students acquire an understanding the Nanoscience and Applications
- To help them understand in broad outline of Nanoscience and Nanotechnology.

Course Outcome

After Completion students can

1. Understand the synthesis of nanomaterials and their application and the impact of nanomaterials on environment
2. Apply their learned knowledge to develop Nanomaterial's

Any 8 experiments

1. Synthesis of metal nanoparticles by chemical route.
2. Analysis of XRD spectra of a sample
3. Synthesis of iron oxide nanoparticles by chemical route.
4. Analysis of FTIR spectra of a sample
5. Analysis of UV- VIS of a sample
6. Synthesis of metal nanoparticles by green synthesis method.
7. Prepare a thin film of semiconductor.
8. Analysis of Photo Luminescence of a sample
9. Analysis of Zeta- potential of a sample
10. Intensity ratio analysis of Raman Spectra
11. Study the resistivity of the prepared thin film

SUGGESTED READINGS

1. Sulabha K. Kulkarni, 3rd edition, Nanotechnology: Principles & Practices (Capital Publishing Company), Springer International Publishing, 2014.
2. C.P.Poole, Jr. Frank J.Owens, Introduction to Nanotechnology (Wiley India Pvt. Ltd.). S.K. Kulkarni,
3. Nanotechnology: Principles & Practices (Capital Publishing Company). K.K. Chattopadhyay and A.N. Banerjee,
4. Richard Booker, Earl Boysen, Nanotechnology (John Wiley and Sons).

SEMESTER VI

20PHU613B BIOLOGICAL PHYSICS PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objective

- The course aims to provide students with a foundation in the basic concepts of Biophysics and its process.

Course Outcome

1. Students will function successfully in the laboratory and use safe laboratory practices.
2. Students will critically evaluate data and design experiments to test hypotheses relevant to the practice of Biochemistry and Biophysics.
3. Students will demostrate awareness of ethical issues in the practice of science.

Any 7 Experiments

1. Measurement of the skin temperature by thermistor
2. Estimation of relative humidity
3. Continual spectrum of visible light
4. Measurement of concentration in colored solution
5. Measurement of human hair thickness by microscope
6. Blood pressure measurement
7. Estimation of audibility threshold by audiometer
8. Recording and analysis of ECG signals
9. Verification of Beers and Lambert's Law
10. Absorption spectrum of Blood/Chlorophyll.
11. PH Value of Amino acids.
12. Study of DNA melting

SUGGESTED READINGS

1. Introduction to Biophysics - by P. Narayanan. New Age Publishers.
2. Medical Instrumentation - by Khandpur, TMH
3. Laboratory Manuals of Biophysics Instruments - by P.B. Vidyasagar
4. Biophysics -by Vatsala Piramal, Dominant Publisher and Distributors, New Delhi-110002
5. Textbook of Biophysics - by R.N. Roy

SEMESTER VI

20PHU691 **PROJECT** **6H - 4C**

Instruction Hours / week: L: 6 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End semester Exam: 3 Hours

Course Objectives

The aim of the B.Sc. project work is to expose the students to preliminaries and methodology of research in Theoretical Physics and Experimental Physics. Students get the opportunity to participate in some ongoing research activity and development of a laboratory experiment.

Course Outcomes (COs)

Students can able to

1. Demonstrate a depth of knowledge of Physics.
2. Complete an independent research project, resulting in research outputs in terms of publications in journals and conference proceedings.
3. Demonstrate knowledge of contemporary issues in their chosen field of research.
4. Demonstrate an ability to present and defend their research work.