



B.Sc. Physics

Curriculum and Syllabus

Regulations 2021

(Based on Choice Based Credit System (CBCS)

and

Learning Outcomes based Curriculum Framework (LOCF))

Effective from the Academic year

2021-2022

Department of Physics

School of Basic Sciences

Vision and Mission of the Department

Vision

To establish a framework for excellence and promote the growth of the institution as a leading institution by stimulating and encouraging excitement, desires and passion for physics in the curriculum

Mission

- To provide quality education in both theoretical and experimental physics, with special emphasis on project based learning.
- To promote the developmental activities of the department by encouraging students to participate in both co-curricular and extracurricular events.
- To excel in quality teaching and research by attracting the best minds and keeping pace with contemporary research with good infrastructure and facilities.
- To enhance the teaching-learning process to engage faculty members in research.
- To create novel ideas through research based activities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- PEO1: To provide the students with broad and balanced knowledge and understanding of physical concepts, principles and theories of Physics.
- PEO2: To learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.
- PEO3: To understand the basics of Physics and it's ever evolving nature of applications in explaining the entire observed natural phenomenon as well as predicting the future applications to the new phenomenon with a global perspective.
- PEO4: To promote the academic input of students by organizing workshops, seminars, conferences and guest lectures.
- PEO5: To demonstrate Physics-related technological skills that are relevant to Physics-related job trades and employment opportunities.

PROGRAMME OUTCOMES (PO)

- PO1: **Disciplinary knowledge and skills:** Capable of demonstrating - good knowledge and understanding of major concepts, theoretical principles and experimental findings in Physics and its different subfields and other related fields of study, including broader interdisciplinary subfields like Chemistry, Mathematics, Environmental sciences, Atmospheric Physics, Computer Science, Information Technology etc.
- PO2: **Skilled communicator:** Ability to transmit complex technical information relating all areas in Physics in a clear and concise manner in writing and oral ability to present complex and technical concepts in a simple language for better understanding.
- PO3: **Critical thinker and problem solver:** Ability to employ critical thinking and efficient problem solving skills in all the basic areas of Physics.

- PO4: **Sense of inquiry:** Capability for asking relevant/appropriate questions relating to the issues and problems in the field of Physics, and planning, executing and reporting the results of a theoretical or experimental investigation.
- PO5: **Team player/worker:** Capable of working effectively in diverse teams in the classroom, laboratory, Physics workshop, as well as in industry and field-based situations.
- PO6: **Skilled project manager:** Capable of identifying/mobilizing appropriate resources required for a project, and manage a project through to completion, while observing responsible and ethical scientific conduct; and safety and laboratory hygiene regulations and practices.
- PO7: **Life-long learners:** Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling in all areas of Physics.

PROGRAMME SPECIFIC OUTCOMES (PSO)

- PSO1: Graduates will be able to demonstrate the ability to use skills in Physics and its related fields of technology to formulate and address Physics related problems.
- PSO2: Graduates will acquire methodological skills and can enroll in different disciplines such as Science and Engineering, Education, Business, Banking, Research and development, teaching and government/public service.

Board of Studies in Physics (UG) - List of Members

S. No	Name & Designation	Address	Role
1	Dr. M. Parthasarathy Associate Professor & Head	Department of Physics, School of Basics Sciences, VISTAS, Chennai	Chairman
2	Dr. K. Gunasekaran Associate Professor	CAS Crystallography & Biophysics, University of Madras Chennai – 600 025 Email: gunaunom@gmail.com Mobile: 98417 37043	Academic Expert (External Member)
3	R. Narendran Director	United Spectrum Instruments 313/455 Amara Sri Tower, 7 th Floor Anna Salai, Teynampet Chennai-18 E-mail: naren@unitedspectrum.in Mobile: 9789904948	Industrial Expert (External Member)
4	Dr. M. Sureshkumar Assistant Professor	Department of Physics, School of Basics Sciences, VISTAS, Chennai	Internal Member
5	Dr. S. Gnanam Assistant Professor	Department of Physics, School of Basics Sciences, VISTAS, Chennai	Internal Member

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

CHENNAI - 600 117

CHOICE BASED CREDIT SYSTEM (CBCS)

and

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK (LOCF)

UG REGULATIONS 2021

B.Sc. Physics

Common to All Under Graduate Full-Time Programmes

(Applicable to all the candidates admitted from the academic year 2021-22 onwards)

1. DURATION OF THE PROGRAMME

1.1. Three years (six semesters)

1.2. Each academic year shall be divided into two semesters. The odd semesters shall consist of the period from July to November of each year and the even semesters from January to May of each year.

1.3 There shall be not less than 90 working days for each semester.

2. ELIGIBILITY FOR ADMISSION

2.1. Candidates for admission to the first year of the Bachelor Degree shall be required to have passed the higher secondary Examinations (Academic or Vocational Stream) conducted by the Government of Tamil Nadu or an Examination accepted as equivalent thereof by Vels Institute of Science, Technology and Advanced Studies provided that candidates for admission into the specific Main Subject of Study shall also possess such other qualifying conditions as may be prescribed by the Institute.

3. MEDIUM OF INSTRUCTION

The medium of instruction for all UG programmes is English excluding Tamil, Hindi and French Language Papers

4. CREDIT REQUIRMENTS AND ELIGIBILITY FOR AWARD OF DEGREE

A Candidate shall be eligible for the award of the Degree only if he/she has undergone the prescribed course of study in the Institute for a period of not less than three academic years and passed the examinations of all the Six Semesters prescribed earning a minimum of 140 credits as per the distribution given in for Part I, II, III, IV & V and also fulfilled such other conditions as have been prescribed thereof.

5. COURSE

Each course / subject is to be designed under lectures / tutorials / laboratory or field work / seminar / practical training / Assignments / Term paper or Report writing etc., to meet effective teaching and learning needs.

6. COURSE OF STUDY AND CREDITS

6.1 (1) **FOUNDATION COURSES:** The course shall comprise the study of:

- a) PART-1 Tamil or Hindi or French
- b) PART – II English

(2) **MAIN COURSES** (consisting of (a) Core Subjects; (b) Discipline Specific Elective; (c) Generic Elective; (d) Practical, etc. if any)

6.2 The Course Components and Credit Distribution shall consist Part I, II & III:

(Minimum number of Credits to be obtained)

Credit Assignment Each course is assigned certain number of credits based on the following: Contact period per week CREDITS

1 Lecture Period - 1 Credit

1 Tutorial Period - 1 Credit

2 Practical Periods - 1 Credit

(Laboratory / Seminar / Project Work / etc.)

7. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER

7.1. Eligibility: Students shall be eligible to go to subsequent semester only if they earn sufficient attendance as prescribed therefor by the Board of Management from time to time.

7.2. Attendance: All Students must earn 75% and above of attendance for appearing for the University Examination. (Theory/Practical)

7.3. Condonation of shortage of attendance: If a Student fails to earn the minimum attendance (Percentage stipulated), the HODs shall condone the shortage of attendance up to a maximum limit of 10% (i.e. between 65% and above and less than 75%) after collecting the prescribed fee towards the condonation of shortage of attendance. Such fees collected and should be remitted to the University.

7.4. Non-eligibility for condonation of shortage of attendance: Students who have secured less than 65 % but more than 50 % of attendance are NOT ELIGIBLE for condonation of shortage of attendance and such Students will not be permitted to appear for the regular examination, but will be allowed to proceed to the next year/next semester of the program

7.5. Detained students for want of attendance: Students who have earned less than 50% of attendance shall be permitted to proceed to the next semester and to complete the Program of study. Such Students shall have to repeat the semester, which they have missed by rejoining after completion of final semester of the course, by paying the fee for the break of study as prescribed by the University from time to time.

7.6. Condonation of shortage of attendance for married women students: In respect of married women students undergoing UG programs, the minimum attendance for condonation (Theory/Practical) shall be relaxed and prescribed as 55% instead of 65% if they conceive during their academic career. Medical certificate from the Doctor together with the attendance details shall be forwarded to the university to consider the condonation of attendance mentioning the category.

7.7. Zero Percent (0%) Attendance: The Students, who have earned 0% of attendance, have to repeat the program (by rejoining) without proceeding to succeeding semester and they have to obtain prior permission from the University immediately to rejoin the program.

7.8. Transfer of Students and Credits: The strength of the credits system is that it permits inter Institutional transfer of students. By providing mobility, it enables individual students to develop their capabilities fully by permitting them to move from one Institution to another in accordance with their aptitude and abilities.

7.8.1. Transfer of Students is permitted from one Institution to another Institution for the same program with same nomenclature. Provided, there is a vacancy in the respective program of Study in the Institution where the transfer is requested. Provided the Student should have passed all the courses in the Institution from where the transfer is requested.

7.8.2. The marks obtained in the courses will be converted and grades will be assigned as per the University norms.

7.8.3. The transfer students are not eligible for classification.

7.8.4. The transfer students are not eligible for Ranking, Prizes and Medals.

7.8.5. Students who want to go to foreign Universities up to two semesters or Project Work with the prior approval of the Departmental / College Committee are allowed to get transfer of credits and marks which will be converted into Grades as per the University norms and are eligible to get CGPA and Classification; they are not eligible for Ranking, Prizes and Medals.

8. EXAMINATION AND EVALUATION

8.1. EXAMINATION:

i) There shall be examinations at the end of each semester, for odd semesters in the month of October / November, for even semesters in April / May. A candidate who does not pass the examination in any course(s) shall be permitted to appear in such failed courses in the subsequent examinations to be held in October / November or April / May.

ii) A candidate should get registered for the first semester examination. If registration is not possible owing to shortage of attendance beyond condonation limit / regulations prescribed OR belated joining OR on medical

grounds, the candidates are permitted to move to the next semester. Such candidates shall re-do the missed semester after completion of the programme.

iii) The results of all the examinations will be published through University Website. In the case of passed out candidates, their arrear results, will be published through University Website.

8.2 To Register for all subjects: Students shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester Examination, except for the shortage of attendance programs. For this purpose, Students shall register for all the arrear subjects of earlier semesters along with the current (subsequent) Semester Subjects.

8.3. Marks for Continuous Internal Assessment (CIA) Examinations and End Semester Examinations (ESE) for PART I, II, III

8.3.1 There shall be no passing minimum for Continuous Internal Assessment (CIA) Examinations.

8.3.2 For End Semester examination, passing minimum shall be 40% (Forty Percentage) of the maximum marks prescribed for the Course/Practical/Project and Viva-Voce.

8.3.3 In the aggregate (CIA and ESE) the passing minimum shall be of 40%.

8.3.4. He/She shall be declared to have passed the whole examination, if he/she passes in all the courses wherever prescribed in the curriculum by earning 140 CREDITS in Part I, II, III.

9. Question Paper Pattern for End Semester Examination

APPENDIX – A- PATTERN OF QUESTION PAPER

PART – A (50 words) Answer 10 questions without choice $10 \times 3 = 30$ marks

PART – B (200 words) Answer 5 questions out of 8 questions $5 \times 8 = 40$ marks

PART – C (500 words) Answer 2 questions out of 5 questions $2 \times 15 = 30$ marks

Total = 100 marks

QUESTION PAPER FOR PRACTICALS

The External examiner will prepare a question paper on the spot from the syllabus prescribed and supplied by the Controller's Office.

10. SUPPLEMENTARY EXAMINATION: Supplementary Examinations are conducted for the students who appeared in the final semester examinations. Eligible criteria for appearing in the Supplementary Examinations are as follows:

10.1 Eligibility: A Student who is having a maximum of two arrear papers is eligible to appear for the Supplementary Examination.

10.2 Non-eligibility for those completed the program: Students who have completed their Program duration but having arrears are not eligible to appear for Supplementary Examinations.

11. RETOTALLING, REVALUATION AND PHOTOCOPY OF THE ANSWER SCRIPTS:

11.1 Re-totalling: All UG Students who appeared for their Semester Examinations are eligible for applying for re-totalling of their answer scripts.

11.2 Revaluation: All current batch Students who have appeared for their Semester Examinations are eligible for Revaluation of their answer scripts. Passed out candidates are not eligible for Revaluation.

11.3 Photocopy of the answer scripts: Students who have applied for revaluation can download their answer scripts from the University Website after fifteen days from the date of publication of the results.

12. The examination and evaluation for MOOCs will be as per the requirements of the regulatory bodies and will be specified at the beginning of the Semester and notified by the university NPTEL-SWAYAM Coordinator (SPOC).

13. CLASSIFICATION OF SUCCESSFUL STUDENTS

13.1. PART I TAMIL / OTHER LANGUAGES; PART II ENGLISH AND PART III CORE SUBJECTS, ALLIED, ELECTIVES COURSES AND PROJECT: Successful Students passing the Examinations for the Part I, Part II and Part III courses and securing the marks

- a) CGPA 9.00 to 10.00 shall be declared to have passed the examination in **First class with Outstanding**.
- b) CGPA 7.50 to 8.99 shall be declared to have passed the examination in **First class with distinction**.
- c) CGPA 6.00 to 7.49 shall be declared to have passed the examination in **First Class**.
- d) CGPA 5.00 to 5.99 in the aggregate shall be declared to have passed the examination in the **SECOND Class**.
- e) CGPA 4.00 to 4.99 shall be declared to have passed the examination in the **THIRD Class**.

14. MARKS AND GRADES: The following table shows the marks, grade points, letter grades and classification to indicate the performance of the Student:

14.1. Computation of Grade Point Average (GPA) in a Semester, Cumulative Grade Point Average (CGPA) and Classification

GPA for a Semester: = $\sum_i C_i G_i \div \sum_i C_i$ That is, GPA is the sum of the multiplication of grade points by the credits of the courses divided by the sum of the credits of the courses in a semester.

Where, C_i = Credits earned for course i in any semester,

G_i = Grade Points obtained for course i in any semester

n = Semester in which such courses were credited.

CGPA for the entire programme: $= \frac{\sum n \sum_i C_n i G_n}{\sum n \sum_i C_n i}$ That is, CGPA is the sum of the multiplication of grade points by the credits of the entire programme divided by the sum of the credits of the courses of the entire programme

Grade Conversion Table - UG			
Range of Marks	Grade Points	Letter Grade	Description
90 - 100	10	O	Outstanding
82 - 89	9	A+	Excellent
75 - 81	8	A	Very Good
67 - 74	7	B+	Good
60 - 66	6	B	Above Average
50 - 59	5	C	Average
40 - 49	4	D	Minimum for pass
0 - 39	0	RA	Reappear
		AAA	Absent

14.2. Letter Grade and Class CGPA

Overall Performance - UG		
CGPA	GRADE	CLASS
4.00 - 4.99	D	Third Class
5.00 - 5.99	C	Second Class
6.00 - 6.69	B	First Class
6.70 - 7.49	B+	
7.50 - 8.19	A	First Class with Distinction*
8.20 - 8.99	A+	
9.00 - 10.00	O	First Class - Outstanding*

The Students who have passed in the first appearance and within the prescribed semester of the UG Programme (Major, Allied and Elective courses only) are eligible.

15. RANKING

- Students who pass all the examinations prescribed for the Program in the **FIRST APPEARANCE ITSELF ALONE** are eligible for Ranking / Distinction.
- In the case of Students who pass all the examinations prescribed for the Program with a break in the First Appearance are only eligible for Classification.
- Students qualifying during the extended period shall not be eligible for RANKING.

16. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAMS TO QUALIFY FOR A DEGREE

16.1. A Student who for whatever reasons is not able to complete the programs within the normal period (N) or the Minimum duration prescribed for the programme, may be allowed two years period beyond the normal period to clear the backlog to be qualified for the degree. (Time Span = N + 2 years for the completion of programme)

16.2. In exceptional cases like major accidents and child birth an extension of one year considered beyond maximum span of time (Time Span=N + 2 + 1 years for the completion of programme).

17. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

The University may from time-to-time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of examinations through the Academic Council with the approval of the Board of Management.

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)**B.Sc. PHYSICS DEGREE****COURSES OF STUDY AND SCHEME OF ASSESSMENT**

Total No. of Credits: 140

B.Sc. Physics Course Components

Component	I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	Total Credits
Core Courses & Languages	16 +6	16+6	14+6	15+6	3	-	88
Ability Enhancement Courses (AEC)	2	-	2	-	-	-	4
Discipline Specific Elective (DSE) & Generic Elective(GEC)	-	-	-	-	17	19	36
Skill enhancement Course(SEC)	-	2	2	3	2	3	12
Total Credits	24	24	24	24	22	22	140

Learning Outcomes–Based Curriculum Framework (LOCF) for undergraduate education in Physics

1. Introduction

The learning outcomes-based curriculum framework (LOCF) for the undergraduate programs in Physics like B.Sc. (Physics) is intended to provide a broad framework within which both the undergraduate programs in Physics help to create an academic base that responds to the need of the students to understand the basics of Physics and its ever evolving nature of applications in explaining all the observed natural phenomenon as well as predicting the future applications to the new phenomenon with a global perspective. The curriculum framework is designed and formulated in order to acquire and maintain standards of achievement in terms of knowledge, understanding and skills in Physics and their applications to the natural phenomenon as well as the development of scientific attitudes and values appropriate for rational reasoning, critical thinking and developing skills for problem solving and initiating research which are competitive globally and are on par in excellence with the standard Higher Education Institutions (HEI) in the advanced countries of America, Asia and Europe. The multicultural fabric of our nation requires that the institutions involved in implementing this curriculum framework also work hard towards providing an environment to create, develop and inculcate rational, ethical and moral attitudes and values to help the creation of knowledge society needed for scientific advancement of our nation.

The learning outcome based curriculum framework in Physics should also allow for the flexibility and innovation in the program design of the UG education, and its syllabi development, teaching learning process and the assessment procedures of the learning outcomes. The process of learning is defined by the following steps which should form the basis of final assessment of the achievement at the end of the program.

- The accumulation of facts of nature and the ability to link the facts to observe and discover the laws of nature i.e. develop an understanding and knowledge of the basic Physics.
- The ability to use this knowledge to analyze new situations and learn skills and tools like mathematics, engineering and technology to find the solution, interpret the results and make predictions for the future developments.
- The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the physical problems in nature and to create new skills and tools for their possible solutions.

2. Learning Outcomes based approach to Curriculum planning

2.1 Nature and extent of UG program in Physics:

The UG programs in Physics builds on the basic Physics taught at the +2 level in all the schools in the country. Ideally, the +2 senior secondary school educations should aim and achieve a sound grounding in understanding the basic Physics with sufficient content of topics from modern Physics and contemporary areas of exciting developments in physical sciences to ignite the young minds. The curricula and syllabi should be framed and implemented in such a way that the basic connection between theory and experiment and its importance in understanding Physics should be apparent to the student. This is very critical in developing a scientific temperament and urge to innovate, create and discover in Physics. Unfortunately the condition of our school system in most parts of the country lacks the facilities to achieve the above goal and it is incumbent upon the college/university system to fill the gaps in the knowledge creation of our young minds created by the lack of infrastructural and academic resources of our school system and strengthen their understanding in all the subjects through the UG programs specially in Physics and other science subjects.

The undergraduate program in Physics is presently being offered though the courses designed for granting the following degrees by various colleges and universities in India. All the courses are of three year duration spread over six semesters after the higher secondary (+2) level Physics course.

2.2 Aims of UG program in Physics:

The aims and objectives of our UG educational programs in sciences in general and Physics in particular should be structured to

- Create the facilities and environment in all the educational institutions to consolidate the knowledge acquired at +2 levels and to motivate and inspire the students to create deep interest in Physics, to develop broad and balanced knowledge and understanding of physical concepts, principles and theories of Physics.
- Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the class rooms.
- Develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Physics.
- Expose the student to the vast scope of Physics as a theoretical and experimental science with applications in solving most of the problems in nature spanning from 10^{-15} m to 10^{26} m in space and 10^{-10} eV to 10^{25} eV in energy dimensions.
- Emphasize the discipline of Physics to be the most important branch of science for pursuing the interdisciplinary and multidisciplinary higher education and/or research in interdisciplinary and multidisciplinary areas.

- To emphasize the importance of Physics as the most important discipline for sustaining the existing industries and establishing new ones to create job opportunities at all levels of employment.

In view of opening the new windows in higher education and research and opening job opportunities at all levels from technicians to innovator scientists and engineers, two undergraduate programs are offered in our universities and other higher education institutions (HEI) at the entry level of our higher education system.

3. Graduate attributes in Physics

Some of the characteristic attributes of a graduate in Physics are

- **Disciplinary knowledge and skills:** Capable of demonstrating
 - (i) good knowledge and understanding of major concepts, theoretical principles and experimental findings in Physics and its different subfields like Solid State Physics, Laser Physics and Spectroscopy, Nuclear and Particle Physics, Atomic Physics, Applied Physics and other related fields of study, including broader interdisciplinary subfields like Chemistry, Mathematics, Environmental sciences etc.
 - (ii) Ability to use modern instrumentation and laboratory techniques to design and perform experiments is highly desirable in almost all the fields of Physics listed above in (i).
- **Skilled communicator:** Ability to transmit complex technical information relating all areas in Physics in a clear and concise manner in writing and oral ability to present complex and technical concepts in a simple language for better understanding.
- **Critical thinker and problem solver:** Ability to employ critical thinking and efficient problem solving skills in all the basic areas of Physics.
- **Sense of inquiry:** Capability for asking relevant/appropriate questions relating to the issues and problems in the field of Physics, and planning, executing and reporting the results of a theoretical or experimental investigation.
- **Team player/worker:** Capable of working effectively in diverse teams in classroom, laboratory, Physics workshop and in industry and field-based situations.
- **Skilled project manager:** Capable of identifying/mobilizing appropriate resources required for a project, and manage a project through to completion, while observing responsible and ethical scientific conduct; and safety and laboratory hygiene regulations and practices.
- **Digitally Efficient:** Capable of using computers for simulation studies in Physics and computation and appropriate software for numerical and statistical analysis of data, and employing modern e-library search tools like Infilbnet, various websites of the renowned Physics labs in countries like the USA, Europe, Japan

etc. to locate, retrieve, and evaluate Physics information.

- **Ethical awareness / reasoning:** The graduate should be capable of demonstrating ability to think and analyze rationally with modern and scientific outlook and identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights, and adopting objectives, unbiased and truthful actions in all aspects of work.
- **National and international perspective:** The graduates should be able to develop a national as well as international perspective for their career in the chosen field of the academic activities. They should prepare themselves during their most formative years for their appropriate role in contributing towards the national development and projecting our national priorities at the international level pertaining to their field of interest and future expertise.
- **Lifelong learners:** Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling in all areas of Physics.

4. Qualification Descriptors

The qualification descriptors for a B.Sc. General program may include the following.

The graduates should be able to:

- **Demonstrate**
 - a fundamental/systematic or coherent understanding of the academic field of Physics, its different learning areas like Solid State Physics, Laser Physics and Spectroscopy, Nuclear and Particle Physics, Atomic Physics, Applied Physics and its linkages with related disciplinary areas/subjects like Chemistry, Mathematics, Environmental sciences;
 - procedural knowledge that creates different types of professionals related to different areas of study in Physics outlined above, including research and development, teaching and government and public service;
 - Skills in areas related to specialization area relating the subfields and current developments in the academic field of Physics.
- Use knowledge, understanding and skills required for identifying problems and issues relating to Physics, collection of relevant quantitative and/or qualitative data drawing on a wide range of sources from various Physics laboratories of the world, and their application, analysis and evaluation using methodologies as appropriate to Physics for formulating new theories and concepts.
- Communicate the results of studies undertaken accurately in a range of different contexts using the main concepts, constructs and techniques of Physics. Develop communication abilities to present

these results in technical as well as popular science meetings organized in various universities and other private organizations.

- Ability to meet one's own learning needs, drawing on a range of current research and development work and professional materials, and interaction with other physicists around the world.
- Apply one's knowledge of Physics and theoretical and laboratory skills to new/unfamiliar contexts to identify and analyze problems and issues and solve complex problems in Physics and related areas with well-defined solutions.
- Demonstrate Physics-related technological skills that are relevant to Physics-related job trades and employment opportunities.

5. Program Learning Outcomes

The student graduating with the Degree B.Sc. General should be able to

- **Acquire**
 - a fundamental/systematic or coherent understanding of the academic field of Physics, its different learning areas and applications in basic Physics like Solid State Physics, Laser Physics and Spectroscopy, Nuclear and Particle Physics, Atomic Physics, Applied Physics and its linkages with related disciplinary areas/subjects like Chemistry, Mathematics, Environmental sciences;
 - procedural knowledge that creates different types of professionals related to the disciplinary/subject area of Physics, including professionals engaged in research and development, teaching and government/public service;
 - Skills in areas related to one's specialization area within the disciplinary/subject area of Physics and current and emerging developments in the field of Physics.
- Demonstrate the ability to use skills in Physics and its related areas of technology for formulating and tackling Physics-related problems and identifying and applying appropriate physical principles and methodologies to solve a wide range of problems associated with Physics.
- Recognize the importance of mathematical modelling simulation and computing, and the role of approximation and mathematical approaches to describing the physical world.
- Plan and execute Physics-related experiments or investigations, analyze and interpret data/information collected using appropriate methods, including the use of appropriate software such as programming languages and purpose-written packages, and report accurately the findings of the experiment/investigations while relating the conclusions/findings to relevant theories of Physics.
- Demonstrate relevant generic skills and global competencies such as (i) problem-solving

skills that are required to solve different types of Physics-related problems with well-defined solutions, and tackle open-ended problems that belong to the disciplinary-area boundaries; (ii) investigative skills, including skills of independent investigation of Physics-related issues and problems; (iii) communication skills involving the ability to listen carefully, to read texts and research papers analytically and to present complex information in a concise manner to different groups/audiences of technical or popular nature; (iv) analytical skills involving paying attention to detail and ability to construct logical arguments using correct technical language related to Physics and ability to translate them with popular language when needed; (v) ICT skills; (vi) personal skills such as the ability to work both independently and in a group.

Demonstrate professional behavior such as (i) being objective, unbiased and truthful in all aspects of work and avoiding unethical, irrational behavior such as fabricating, falsifying or misrepresenting data or committing plagiarism; (ii) the ability to identify the potential ethical issues in work-related situations; (iii) appreciation of intellectual property, environmental and sustainability issues; and (iv) promoting safe learning and working environment.

6. Teaching Learning Process

The teaching learning processes play the most important role in achieving the desired aims and objectives of the undergraduate programs in Physics as elaborated in detail in the learning based curriculum framework (LOCF). Physics is basically an experimental science as any ideas and concepts, no matter how simple, complex or far-fetched have to be tested in the laboratory by performing specific experiments designed to test, validate and confirm them before they are accepted as principles of Physics applicable to natural phenomenon. While such ideas and concepts originate in the minds of the genius, anywhere and anytime in the universe, their verifications and confirmations have to be done in the laboratory established in the real world and executed by competent and well trained scientists and engineers. To achieve this goal, the appropriate training of young individuals to become competent scientists and engineers in future has to be accomplished. For this purpose a very good undergraduate program in Physics and other sciences is the first step. We should therefore have an excellent teaching-learning procedural protocol for all the colleges, universities and other higher education institutions (HEI). To be specific, it is desirable to have:

- Necessary and sufficient infrastructural facilities for the class rooms, laboratories and libraries equipped with adequate modern and modular furniture's and other requirements.
- Modern and updated laboratory equipments needed for the undergraduate laboratories and reference and text books for the libraries.

- Sufficient infrastructure for ICT and other facilities needed for technology-enabled learning like computer facilities, PCs, laptops, Wi-Fi and internet facilities with all the necessary software's.
- Sufficient number of teachers in permanent position to do all the class room teaching and perform and supervise the laboratory experiments to be done by the students.
- All the teachers should be qualified as per the UGC norms and should have good communication skills.
- Sufficient number of technical and other support staff to run the laboratories, libraries, equipment and maintain the infrastructural facilities like buildings, electricity, sanitation, cleanliness etc.
- Teachers should make use of all the approaches for an efficient teaching-learning process i.e. :
 - i) Class room teachings with lectures using traditional as well as electronic boards.
 - ii) Use of Smart class rooms for simulation and demonstration for conveying the difficult concepts of Physics in class room teaching and laboratories.
 - iii) Tutorials must be an integral part of all the theory and laboratory courses. Theory courses should have 1-2 tutorials every week depending upon the nature of the course.
 - iv) Teaching should be complimented with student's seminar to be organized very frequently.
 - v) Guest lectures and seminars should be arranged by eminent teachers to be invited by the concerned college/university/HEI.
 - vi) Open-ended project work should be given to all students individually or in group to 2-3 students depending upon the nature of the course.
 - vii) Internship of duration varying from one week anytime in the semester and/or 2-6 weeks during semester break and summer breaks should be arranged by the college / universities / HEI for the students to visit other colleges / universities / HEI and industrial organizations in the vicinity. If needed, financial assistance may also be provided for such arrangements to be made for their internship in the National Laboratories in the region of the institutions.
 - viii) Special attempts should be made by the institution to develop problem-solving skills and design of laboratory experiments for demonstration at the UG level. For this purpose a

mentor system may be evolved where 3-4 students may be assigned to each faculty member.

ix) Teaching load should be managed such that the teacher has enough time to interact with the students to encourage an interactive/participative learning.

7. Assessment Methods

In the undergraduate education of Physics leading to the B. Sc with Physics degree, the assessment and evaluation methods focus on testing the conceptual understanding of the basic ideas, development of mathematical skills and experimental techniques retention and ability to apply the knowledge acquired to explain with analysis and reason what has been learnt and to solve new problems and communicate the results and findings effectively. Since the Learning Objectives are defined clearly for each course in detail, it is easier to design methods to monitor the progress in achieving the learning Objectives during the course and test the level of achievement at the end of the course.

- The courses offered in the undergraduate Physics are the first courses at the college/university level; the priority should be given to Formative Assessment for monitoring the progress towards achieving the Learning Objectives while keeping its weightages lower than Summative Assessments. This is to assure that the students know their strengths and weaknesses periodically through the results of Formative Assessments and make amends for the gaps in their knowledge without affecting their final grades in any significant way. In this context it is suggested that 25-30% weightage be given Formative Assessments in case of theory components while 30-40% weightage be given to the Laboratory/Field work/Projects/Case Study/Dissertation components of the various courses. Moreover use of more than one method of Assessment in each course is highly recommended.
- Some of the methods suggested for Theory Component with regard to Formative Assessment are i) Regular Tutorial assignments ii) seminar presentations iii).Performance in group discussions iv) Problem based longer assignments (other than tutorials) v) True/False Tests vi) Multiple Choice Tests vii) Short Answer Tests viii) viva-voce tests ix) Any other innovative tests in the context of the course.
- In the case of substantive Summative Assessment for the theory papers, can be a combination of the following i) Mid-Semester test ii) Seminar Report iii) Individual/Team Project report iv) Oral presentations of Seminar/Projects v) Viva-Voce Examination on the above reports vi) End Semester closed book examination in the pattern of a) Short answer b) Long answer vii) End semester Open Book Examination viii) Peer examination by a group of experts a) Written b) Oral ix) Any other innovative method depending upon the nature of the course.

- B. Laboratory Experiments / Field work / Projects / Case Study / Dissertation can be assessed for Formative Assessment through i) Regular evaluation of Lab. Experiments regarding a) written report of each experiment b) Viva-Voce on each experiment ii) Test through setting experiments by assembling components iii) Mid semester examination iv) Design innovative kits to test the comprehension and analysis of the experiment done by the students.
- At the end, the main purpose of Physics teaching should be to impart objective knowledge to students in concrete, comprehensive and effective way. Here, effectiveness implies gaining knowledge and skill which can be applied to solve practical problems as well as attaining capability of logical thinking and imagination which are conducive to new knowledge and new discoveries. Once the student learns, ‘why is it worth learning?’ and ‘how does it connect to the real world?’ The student shall embrace the curriculum in a way which would incite imagination and imbibe a spirit of enquiry in them, so that in future they will opt for further investigations or research. Needless to say, there should be a continuous evaluation system for the students. This will enable the teachers not only to ascertain the overall progress of learning by the students, but also to identify the students who are slow learner and for whom special care should be taken. An appropriate grading system is the ‘relative grading system’ can also be envisaged for certain papers, introducing a competitive element among the students. All in all, the teacher should act as a facilitator and guide and not as a guardian of curriculum.
- HEI can design their own ways and methods to quantify the assessment and evaluation based on the above methods. It would then be converted to the letter grades by the procedure described by the template given by the UGC.
- Once the letter grade for a course is obtained for a course, it should be done for all the courses offered by the student. Once the letter grades for all the grades are accumulated then a CGPA should be calculated by quantifying the letter grades as described by the template provided by the UGC.

B.Sc. Physics Curriculum
CHOICE BASED CREDIT SYSTEM
Effective from the Academic Year 2021-2022

Total number of Credit: 140

Category	Code No.	Course	Hours per week			Credits
			Lecture	Tutorial	Practical	
SEMESTER I						
LANG		Language-I (Tamil, Hindi & French)	3	0	0	3
ENG		English – I	3	0	0	3
CORE		Properties of Matter & Acoustics	4	1	0	5
CORE		Mechanics	4	1	0	5
CORE		Mathematics – I	4	0	0	4
CORE		Practical Physics – I	0	0	4	2
AECC		Communication Skills	1	0	2	2
			19	2	6	24
SEMESTER II						
LANG		Language-II (Tamil, Hindi & French)	3	0	0	3
ENG		English-II	3	0	0	3
CORE		Thermal Physics	4	1	0	5
CORE		Optics	4	1	0	5
CORE		Mathematics - II	4	0	0	4
CORE		Practical Physics - II	0	0	4	2
SEC		Soft Skills –I /Sector Skill Council Course	2	0	0	2
			20	2	4	24
SEMESTER III						
LANG		Language-III (Tamil, Hindi & French)	3	0	0	3
ENG		English-III	3	0	0	3
CORE		Electricity & Magnetism	5	0	0	5
CORE		Chemistry – I	5	0	0	5
CORE		Practical Physics – III	0	0	4	2
CORE		Chemistry Practical – I	0	0	4	2
AECC		Environmental Studies	2	0	0	2
SEC		Soft Skills –II /Sector Skill Council Course	2	0	0	2
			20	0	8	24

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES
B.Sc., DEGREE COURSE IN PHYSICS
SCHEME OF EXAMINATION

SEMESTER I

Category	Code No.	Course	Marks			Exam duration	
			Internal	External	Total	Theory	Practical
LANG		Language-I (Tamil, Hindi & French)	40	60	100	3	0
ENG		English-I	40	60	100	3	0
CORE		Properties of Matter & Acoustics	40	60	100	3	0
CORE		Mechanics	40	60	100	3	0
CORE		Mathematics – I	40	60	100	3	0
CORE		Practical Physics – I	40	60	100	0	3
AECC		Communication Skills	40	60	100	3	0

SEMESTER II

Category	Code No.	Course	Marks			Exam duration	
			Internal	External	Total	Theory	Practical
LANG		Language-II (Tamil, Hindi & French)	40	60	100	3	0
ENG		English-II	40	60	100	3	0
CORE		Thermal Physics	40	60	100	3	0
CORE		Optics	40	60	100	3	0
CORE		Mathematics – II	40	60	100	3	0
CORE		Practical Physics – II	40	60	100	0	3
SEC		Soft Skills –I /Sector Skill Council Course	40	60	100	3	0

SEMESTER III

Category	Code No.	Course	Marks			Exam duration	
			Internal	External	Total	Theory	Practical
LANG		Language-III (Tamil, Hindi & French)	40	60	100	3	0
ENG		English-III	40	60	100	3	0
CORE		Electricity & Magnetism	40	60	100	3	0
CORE		Chemistry – I	40	60	100	3	0
CORE		Practical Physics – III	40	60	100	0	3
CORE		Chemistry Practical – I	40	60	100	0	3
AECC		Environmental Studies	40	60	100	3	0
SEC		Soft Skills –II /Sector Skill Council Course	40	60	100	3	0

SEMESTER IV

Category	Code No.	Course	Marks			Exam duration	
			Internal	External	Total	Theory	Practical
LANG		Language–IV (Tamil, Hindi & French)	40	60	100	3	0
ENG		English–IV	40	60	100	3	0
CORE		Atomic Physics	40	60	100	3	0
CORE		Astrophysics	40	60	100	3	0
CORE		Chemistry – II	40	60	100	3	0
CORE		Practical Physics – IV	40	60	100	0	3
CORE		Chemistry Practical – II	40	60	100	0	3
SEC		Soft Skills –III /Sector Skill Council Course	40	60	100	3	0

SEMESTER V

Category	Code No.	Course	Marks			Exam duration	
			Internal	External	Total	Theory	Practical
CORE		Quantum Mechanics	40	60	100	3	0
DSE		Discipline Specific Elective – I	40	60	100	3	0
DSE		Discipline Specific Elective – II	40	60	100	3	0
DSE		Discipline Specific Elective – III	40	60	100	3	0
DSE		Discipline Specific Elective – IV	40	60	100	3	0
DSE		Discipline Specific Elective Practical – I	40	60	100	0	3
SEC		Personality Development	40	60	100	3	0

SEMESTER VI

Category	Code No.	Course	Marks			Exam duration	
			Internal	External	Total	Theory	Practical
DSE		Discipline Specific Elective – V	40	60	100	3	0
DSE		Discipline Specific Elective – VI	40	60	100	3	0
DSE		Discipline Specific Elective Practical – II	40	60	100	0	3
GE		Generic Elective-I	40	60	100	3	0
SEC		Physics Workshop Skills	40	60	100	3	0
DE		Dissertation	40	60	100	0	3

LIST OF DISCIPLINESPECIFIC ELECTIVE COURSES (DSE)

S. No.	Code	Courses
1.		Laser Physics & Spectroscopy
2		Nuclear Physics
3		Analog and Digital Electronics
4		Microprocessor
5		Solid State Physics
6		Nanomaterials & Applications
7		Laser Physics
8		Solar Technology
		Dissertation

LIST OF GENERIC ELECTIVE COURSES (GEC)

S. No.	Code	Courses
1		Basic Physics
2		Everyday Physics
3		Electrical & Electronic Appliances
4		Renewable Energy Sources
5		Energy Physics

LIST OF ABILITY ENHANCEMENT COMPULSARY COURSES (AECC)

S. No.	Code	Courses
1		Communication Skills
2		Environmental Studies

LIST OF SKILL ENHANCEMENT COURSES (SEC)

S. No.	Code	Courses
1		Soft Skill – I
2		Soft Skill - II
3		Soft Skill - III
4		National Service Scheme – I
5		National Service Scheme – II
6		Personality Development
7		Physics Workshop Skills

SEMESTER-I

	TAMIL - I	L	T	P	Credits
		3	0	0	3

இக்காலக் கவிதைகள் – உரைநடை – பண்பாடு – மொழித்திறன்

அலகு 1: மரபுக்கவிதை 9 மணி நேரம்

1. பாரதியார் - பாரத தேசம் என்னும் தலைப்பில் ஆறு பாடல்கள்.
(பாடல் எண்கள் 1, 6, 7, 9, 12, 13)
2. பாரதிதாசன் - தமிழுக்கும் அமுதென்று பேர் என்னும் தலைப்பிலான கவிதை.
3. தேசிக விநாயகம் பிள்ளை - உடல் நலம் பேணல் என்னும் தலைப்பிலான கவிதை
4. முடியரசன் - காவியப் பாவை - "புண்படுமா" என்னும் கவிதை.

அலகு 2: புதுக்கவிதை 9 மணி நேரம்

1. நா. காமராசன் - *கறுப்பு மலர்கள்* தொகுப்பில் *காகிதப்பூக்கள்* என்னும் தலைப்பிலான கவிதை.
2. அப்துல் ரகுமான் - *ஆலாபனை* தொகுப்பில் *போட்டி* என்னும் தலைப்பிலான கவிதை
3. ஈரோடு தமிழன்பன் - *ஒரு வண்டி சென்றியு* தொகுப்பில் தேர்ந்தெடுக்கப்பட்ட சென்றியு கவிதைகள்
4. ஆண்டாள் பிரியதர்ஷினி - *முத்தங்கள் தீர்ந்துவிட்டன* தொகுப்பில் *'இங்கே வரும் போது'* என்னும் தலைப்பிலான கவிதை

அலகு 3: உரைநடை 9 மணி நேரம்

1. மாணாக்கரும் தாய்மொழியும் - திரு.வி.க.,
2. மன வலிமை வேண்டும் - மு.வரதராசனார்
3. செம்மொழித் தமிழின் சிறப்புகள்
4. பண்டைத் தமிழரின் சாதனைச் சுவடுகள்

அலகு 4: தமிழர் வாழ்வும் பண்பாடும் 9 மணி நேரம்

பண்பாடு - வாழ்வியல் முறை - அகம், புறம் - உணவு முறை - விருந்தோம்பல் - நம்பிக்கைகள் - விழாவும் வழிபாடும் - கலைகள் - கட்டடம் - சிற்பம் - ஓவியம் - இசை - கூத்து - தொழிலும் வணிகமும் - அறிவியல் நோக்கு.

அலகு 5: மொழித்திறன், இலக்கிய வரலாறு, இலக்கணம் 9 மணி நேரம்

1. எழுத்துப் பிழை, தொடர்பு பிழைகள்
2. வேற்றுமை இலக்கணம்
3. செய்யுள் நலம் பாராட்டல்
4. பாடம் தழுவிய இலக்கிய வரலாறு (மரபுக் கவிதை, புதுக்கவிதை, உரைநடை)

TOTAL HOURS: 45

COURSE OUTCOME: (Employability)

At the end of this course the students will be able to,

CO 1: Recall and recognize heritage and culture of Tamils through History of Tamil Language.

CO 2: Interpret the cultural life style of Ancient Tamils.

CO 3: Evaluate social and individuals moral value after studying Ethics In modern Literature.

CO 4: Build the humanistic concept and moral life skills after studying divine and minor Literature.

CO 5: Improve their own creativity and writing skills after studying history of Modern Tamil Literature.

பார்வைநூல்கள்

1. தமிழர்நாகரிகமும்பண்பாடும், டாக்டர் அ.தட்சிணாமூர்த்தி, ஐந்திணைப்பதிப்பகம்
2. தவறின்றித்தமிழ்எழுதுவோம், மா. நன்னன், ஏகம்பதிப்பகம்
3. தவறின்றித்தமிழ்எழுத-மருதூர்அரங்கராசன், ஐந்திணைப்பதிப்பகம்
4. தமிழ்இலக்கியவரலாறு, வரதராசன், மு., புதுதில்லி : சாகித்தியஅக்காதெமி ,
5. புதியதமிழ்இலக்கியவரலாறு, நீல. பத்மநாபன், சிற்பிபாலசுப்ரமணியம், சாகித்தியஅகாடெமி
6. செம்மொழிதமிழின்சிறப்பியல்புகள் - முனைவர்மறைமலைஇலக்குவனார்;
<https://www.youtube.com/watch?v=HHZnmJb4jSY>

பாடநூல்தேடலுக்கானஇணையம் - <https://archive.org/>

HINDI - I		L	T	P	Credits
		3	0	0	3

Course Objective: (Skill Development)

- To enable the students to develop communication skills
- To train students in official language
- To enrich their knowledge in Hindi literature
- To teach them human values & create awareness towards exploitation

Unit I	- ‘ Ek atuut kadi’ by shri Rajkishore letter writing (application), Technical words (prashasanik vakyansh:1-50).	9
Unit II	‘Devi singh’ by agyeya , letter writing (bank A/C opening&closing), Technical words (prashasanik vakyansh:51-100).	9
Unit III	‘ kabiraa ki kaashi ’by Kumar Ravindra	9
Unit IV	‘ bharathiya vigyan ki kahaani - ‘hamne diyaa ,hamne liyaa’ ’by Gunakar mule, letter writing (shikayath pathra, gyapan) Technical words: takniki shabd-25.	9
Unit V	letter writing (sarkari pathra, ardha sarkaari pathra, kaaryalaya aadesh), Technical words: takniki shabd-25.	9

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course students will be able to,

CO 1: Students will be familiar with official letter writing

CO 2: will understand their responsibility in the society

CO 3: students will be moulded with good character understand human values

CO 4: students will gain knowledge about ancient &, rich culture of India

CO 5: will know the equivalent Hindi words for scientific terms

Text /Reference Books :

Agyeya ki sampoorna kahaniyaa - Rajpal &sons, year 2017,

Yatraye our bhi ,Kumar Ravindra Rashmi prakashan ,Lucknow

Bharathiya vigyan ki kahani, Hindi book centre, NewDelhi

Gadya Khosh

Weblinks:

<http://www.hindisamay.com/content/1321/1/%E0%A4%B0%E0%A4%BE%E0%A4>

<http://gadyakosh.org/gk/%E0%A4%A6%E0%A5%87%E0%A4%B5%E0%A5%80%E0>

<http://gadyakosh.org/gk/%E0%A4%A6%E0%A5%87%E0%A4%B5%E0%A5%80%E0>

<http://gadyakosh.org/gk/%E0%A4%A6%E0%A5%87%E0%A4%B5%E0%A5%80%E0>

FRENCH - I		L	T	P	Credits
		3	0	0	3

Course Objective: (Skill Development)

- To introduce French language.
- To enable the students to understand and to acquire the basic knowledge of French language with elementary grammar.

UNIT I INTRODUCTION

9

Introduction-Alphabet-comment prononcer, écrire et lire les mots-base: les pré-noms personnel de 1er , 2eme et 3eme personnes-conjugaisons les verbes être et avoir en forme affirmative, négative Et interrogative.

UNIT II- LECON 1-3

9

Leçon 1 :Premiers mots en français- 2.Les hommes sont difficiles 3.Vive la liberté-Réponses aux questions tires de la leçon-Grammaire: Les adjectives masculines ou féminines-Les article définies et indéfinis- Singuliers et pluriels.

UNIT III-LECON 4-6

9

Leçons 4. L'heure c'est l'heure 5.Elle va revoir sa Normandie 6.Mettez-vous d'accord groupe de nom-Réponses aux questions tires de la leçon-Grammaire :A placer et accorder l'adjectif en groupe de nom-Préposition de lieu-A écrire les nombres et l'heure en français

UNIT IV-LECON 7-9

9

Leçon 7.Trois visages de l'aventure , 8. A moi Auvergne 9.Recit de voyage-Réponses aux questions tires de la leçon- Grammaire : Adjectif possessif- Les phrases au présent de l'indicatif-Les phrases avec les verbes pronominaux au présent.

UNIT V- COMPOSITION :

9

A écrire une lettre a un ami l'invitant a une célébration différente ex: mariage-A faire le dialogue- A lire le passage et répondre aux questions.

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course students will be able to,

CO1: The content of the unit 1 aids the students to explore the basics of the new foreign language.

CO2: The content of unit 2 to experience the basic formations of words and its basic grammar by differentiating with English.

CO3: This imparts the additional information in terms of general in the sense of geographical and culture.

CO4: Enable students for framing the basics sentence.

CO5: Making the students community to know the French format of letter writing and essay writing.

Text Book:

Jack GIRARDER & Jean Marie GRIDLIG, <<Méthode de Français PANORAMA>>, Clé Internationale, Goyal Publication ,New Delhi Edition 2014.

Reference Books:

1. DONDO Mathurin, "Modern French Course", Oxford University Press, New Delhi Edition 2014.
2. Nithya Vijayakumar get ready French grammar-Elementary Goyal publications, New Delhi Edition 2014.

Web Sources:

1. <https://www.thoughtco.com/french-reading-tips-1369373>
2. <https://www.bnf.fr/fr>
3. <https://www.laits.utexas.edu/tex/>

	ENGLISH - I	L	T	P	Credits
		3	0	0	3

ENGLISH I - PROSE

Course Objective: (Skill Development)

- To enable students to develop their communication skills effectively. To make students familiar with usage skills in English Language.
- To enrich their vocabulary in English
- To develop communicative competency.

UNIT I		09
	1. Dangers of Drug Abuse - Hardin B Jones	
	2. Tight Corners - E. V. Lucas	
UNIT II		09
	3. Futurology - Aldous Huxley	
	4. If You are Wrong, Admit it - Dale Breckenridge Carnegie	
UNIT III		09
	5. Industry - Dr.M.Narayana Rao & Dr.B.G.Barki	
	6. Turning Point of My Life - A.J Cronin	
UNIT IV		09
	7. Excitement - Mack R. Douglas	
	8. The Kanda Man Eater - Jim Corbett	
UNIT V		09
	9. Vocabulary and Exercises under the Lessons	

Note: Lessons prescribed are from various anthologies and respective exercises therein will be taught.

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course the students will be able to,

CO1: Examine the language of prose.

CO2: Utilize instructions on fundamentals of grammar

CO3: Develop their own style of writing after studying diverse prose essays.

CO4: Classify different essays on the basis of their types.

CO5: Critically comment on the textual content of prose.

Books Prescribed:

- English for Communication Enrichment: by Jeya Santhi June 2015.
- Dr. M. Narayana Rao and Dr. B. G. Barki – Anu’s Current English for Communication (AnuChitra). June 2012.
- Dr. Ananthan , R. Effective Communication. Ed. Chennai : Anu Chithra Pub.2010.

Web Sources:

- <https://www.gradesaver.com/>
- <https://www.enotes.com/>
- <https://www.jstor.org/>
- <https://www.sparknotes.com/>
- <https://www.cliffsnotes.com/>

	PROPERTIES OF MATTER & ACOUSTICS	L	T	P	Credits
		4	1	0	5

Course Objective: (Employability)

To make the students to understand, the different kinds of moduli via experimental methods; surface tension for liquids; wave phenomena, in general and sound wave in particular; ultrasonics and acoustics.

UNIT –I Elasticity **15**

Hooke's law – Stress – strain diagram – Elastic Moduli, three types of elastic Moduli– Relation between elastic constants – Poisson's Ratio – Expression for Poisson's ratio in terms of elastic constants – Work done in stretching and work done in twisting a wire – Determination of Rigidity modulus by static torsion - Torsional pendulum - Determination of Rigidity modulus and moment of inertia - Searle's method for determining E, G and ν .

UNIT – II Bending of Beams **15**

Cantilever – expression for bending moment – expression for depression – cantilever oscillations – Expression for time period - Experiment to find Young's modulus - uniform - non-uniform bending - theory – experiment using pin and microscope method - Experiment to determine Young's modulus using mirror and telescope.

UNIT – III Surface Tension **15**

Surface tension – Formation of liquid drops - Excess of pressure inside a liquid drop and inside a soap bubble - Quincke's Method- Experimental study of Surface tension - Drop weight method of determining surface tension and interfacial surface tension- Variation of surface tension with temperature - Theory and Experimental – Capillary rise - Angle of contact – Determination of surface tension by capillary rise method.

UNIT – IV Viscosity **15**

Streamlined motion – Turbulent motion – Coefficient of viscosity and its dimension – Rate of flow of liquid in a capillary tube – Poiseuille's formula – Terminal velocity and Stoke's formula Experimental determination – Stokes Method and experimental determination – Effect of temperature on viscosity- Oswald's Viscometer – Variation of viscosity with temperature (theory and experimental) and pressure.

UNIT – V Acoustics **15**

Music and noise – Characteristics of musical sound, quality of tone, consonance and dissonance – decibel – noise pollution. Acoustics of buildings - Reverberation - Reverberation time – Sabine's formula derivation – measurement of reverberation time – absorption coefficient – acoustical design of buildings– Ultrasonics – production, properties and applications.

TOTAL HOURS: 75

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Demonstrate the basic concepts of elastic moduli and their relation.
- CO2: Illustrate the uniform and non-uniform bending to determine Young's modulus.
- CO3: Apply the important concepts in surface tension and their experimental procedure.
- CO4: Demonstrate the rate of flow of liquid in a capillary tube.
- CO5: Utilize the different concepts in acoustics and apply it in building acoustics.

Text Books

1. R. Murugesan - Properties of Matter, S. Chand & Co, Delhi, 1994.
2. D.S. Mathur–Elements of Properties of Matter, S. Chand & Co, Delhi, 2006.
3. Brij Lal &Subramaniam–A Text book of Sound, Second Edition, Vikas Publishing, Delhi, 2008.

References

1. Resnick and Halliday - Physics, Volume – I & II, Wiley and Sons inc, Sixth edition.
2. C. J. Smith - General Properties of Matter, Orient & Longman Publishers, 1960.

Web Sources:

1. https://onlinecourses.nptel.ac.in/noc20_ce42/preview
2. <https://www.slideshare.net/MisSsiDD/surface-tension-2>
3. <https://nptel.ac.in/courses/112/106/112106225/>

	MECHANICS	L	T	P	Credits
		4	1	0	5

Course Objective: (Employability)

To have clear knowledge of mechanics so as to enable them to understand the other branches of Physics especially the mechanics of microscopic bodies, Quantum mechanics.

UNIT-I Laws of Motion

15

Newton's law of motion – Force – Mass – Momentum and Impulse, Law of Conservation of Linear Momentum – Collision – Elastic and Inelastic collision – Newton's law of impact - Coefficient of restitution – Impact of moving sphere on a fixed plane – Direct and Oblique impact of moving two smooth spheres – Calculation of final velocities – Loss of Kinetic energy – Projectile motion – Frictional forces – Conservation of Momentum in a system of particles.

UNIT-II Dynamics of Rigid Bodies

15

Moment of Inertia - Angular Momentum - Torque - Conservation of angular momentum - Kinetic energy of rotating body - Theory of Compound Pendulum - determination of g and k - Centre of Mass - Velocity and acceleration - M.I. of a diatomic molecule.

UNIT-III Gravitation

15

Centre of Gravity: Center of Gravity of a solid and hollow hemisphere, solid tetrahedron - Newton's Law of Gravitation- Determination of mass and Density of earth. Determination of 'G' by Boy's Method – Kepler's Laws of Planetary Motion - Newton's Law from Kepler's Law – Escape Velocity - Motion of Rocket - Orbital Velocity – Geo-stationary Orbit and its applications.

Unit – IV Hydrodynamics

15

Centre of pressure - Centre of pressure of a rectangular lamina and triangular lamina. Equation of continuity of flow – Euler's equation for unidirectional flow – Torricelli's theorem – Bernoulli's theorem - Venturimeter – Pitot tube.

UNIT-V Relativity

15

Frames of references - Michelson-Morley experiment - significance of negative result - postulates of special theory of relativity - Lorentz transformation equations - Length contraction - Time dilation - Law of addition of velocities – Mass energy equivalence – Basic ideas of general theory of relativity.

TOTAL HOURS: 75

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Illustrate the basic concepts about mechanics of microscopic bodies.
- CO2: Demonstrate the knowledge about the dynamics of rigid bodies.
- CO3: Select the applications of gravitational laws for solids.
- CO4: Identify the centre of pressure of a rectangular and triangular lamina.
- CO5: Apply the concepts of special theory of relativity in various fields of physics and Engineering.

Text Books

- Narayanamoorthy - Mechanics Part I and II, National Publishing Company.
- D. S. Mathur– Mechanics, II Edition, S. Chand and Co, 2001.
- R. Murugesan - Mechanics and Mathematical Methods, 1st Edition, S. Chand and Co, 1996.

References

- R.P. Feynman, R.B. Leighton and M. Sands - The Feynman Lectures on Physics, Vols. 1, 2 and 3, Narosa, New Delhi 1998.
- D. Halliday, R. Resnick and J. Walker - Fundamentals of Physics, 6th Edition, Wiley, New York, 2001.

Web Sources:

- <https://nptel.ac.in/courses/122/104/122104014/#:~:text=The%20basis%20of%20all%20solutions,acted%20upon%20by%20a%20force.&text=It%20also%20gives%20us%20how,via%20the%20equation%20F%20%3D%20ma>
- <https://nptel.ac.in/content/storage2/courses/112101096/download/lecture-1.pdf>

	MATHEMATICS - I	L	T	P	Credits
		4	0	0	4

Course objective: (Skill Development)

To develop the skills of the students in the areas of Algebra, Numerical methods Trigonometry and Calculus. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT – I ALGEBRA AND NUMERICAL METHODS

12

Algebra: Summation of series simple problems. Numerical Methods: Operators E, Δ, ∇ , difference tables -Newton’s forward and backward interpolation formulae for equal intervals, Lagrange's interpolation formula.

UNIT- II MATRICES

12

Introduction-Basic operations-Symmetric-skew symmetric-Hermitian-Skew Hermitian –Unitary-orthogonal-Inverse of a matrix -Solution of linear system(Cramer’s rule)- Finding the Eigen roots and Eigen vectors of a matrix-Cayley Hamilton theorem(without proof)

UNIT- III THEORY OF EQUATIONS

12

Polynomial equations with real coefficients, irrational roots, complex roots, symmetric functions of roots, transformation of equation by increasing or decreasing roots by a constant, reciprocal equation. Newton’s method to find a root approximately - simple problems.

UNIT IV TRIGONOMETRY

12

Introduction- Expansions of $\sin n\theta$ and $\cos n\theta$ in a series of powers of $\sin\theta$ and $\cos\theta$ - Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ in a series of sines, cosines and tangents of multiples of “ θ ” - Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in a series of powers of “ θ ” – Hyperbolic and inverse hyperbolic functions - Logarithms of complex numbers.

UNIT V DIFFERENTIAL CALCULUS

12

Differentiation-Successive differentiation, n^{th} derivatives, Leibnitz theorem (without proof) and applications, Jacobians, Curvature and radius of curvature in Cartesian co-ordinates, maxima and minima of functions of two variables.

TOTAL HOURS: 60

COURSE OUTCOME

At the end of this course the students will be able to,

CO1: Evaluate the underlying assumptions of analysis tools and relations of Set Theory

CO2: Identify the applications of matrices and utilizes.

CO3: Interpret critically the uses and limitations of Theory of equations

CO4: Utilize the key terminology, concept tools and techniques used in trigonometry.

CO5: Apply the maxima and minima in detailed ways and the applications of partial differential equations.

TEXT BOOKS

2. P. Kandaswamy and K.Thilagavathy, Allied Mathematics paper I, 1st Semester, S.Chand Publishing Pvt. Ltd. 1st Edition,2003.
3. S. Narayanan and T.K. Manickavasagam Pillai – Ancillary Mathematics, S. Viswanathan Printers, 1986, Chennai.

REFERENCE BOOKS

1. P.R. Vittal, Allied Mathematics, Margham Publications, 4th Edition 2009.
2. A. Singaravelu, Allied Mathematics, Meenakshi Agency, 2007.
3. P. Duraipandian and S.UdayaBaskaran, Allied Mathematics, Vol. I & II Muhil Publications, Chennai.

Web sources

1. https://books.google.co.in/books?id=4C4rDAAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
2. <https://ncert.nic.in/ncerts/l/keep203.pdf>
3. <http://www.universityofcalicut.info/SDE/VI%20Sem.%20B.Sc%20Maths%20-%20Additional%20Course%20in%20lie%20of%20Project%20-Theory%20of%20equations%20&%20fuzzy%20set.pdf>
4. <https://www.math.ust.hk/~machas/numerical-methods.pdf>
5. https://www.researchgate.net/publication/321825504_Differential_Calculus

	PRACTICAL PHYSICS – I	L	T	P	Credits
		0	0	4	2

Course Objective: (Skill Development)

To enable the student to explore the field of properties of matter and mechanics. To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.

Any 10 Experiments

1. Young's modulus- uniform bending (pin & microscope)
2. Young's modulus- Non-uniform bending (pin & microscope)
3. Rigidity modulus- Torsion pendulum
4. Surface tension – capillary rise method
5. Viscosity of liquid- Poiseuille's method
6. Viscosity of liquid- Stoke's method
7. Sonometer - Frequency of tuning fork
8. Compound pendulum- To determine 'g'
9. Hook's Law – To study the motion of a spring and calculate (a) Spring Constant, (b) g.
10. To determine the Moment of Inertia of a Flywheel
11. To determine the Elastic Constants of a Wire by Searle's method

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Calculate the Young's modulus of the material.
 CO2: Estimate the parameters associated with torsional oscillation.
 CO3: Analyze the coefficient of viscosity at different pressure head.
 CO4: Measure the acceleration due to gravity.
 CO5: Determine the moment of inertia of a Flywheel.

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics, 1st Edition, 2015.
2. Biswajit Saha, Practical Physics Book, LAP LAMBERT Academic Publishing, 1st Edition, 2020.

Web Sources:

1. <http://amrita.olabs.edu.in/?sub=1&brch=5&sim=155&cnt=2>
2. <https://vlab.amrita.edu/index.php?sub=1&brch=280&sim=1509&cnt=4>

SEMESTER-II

TAMIL - II			
L	T	P	Credits
3	0	0	3

அற இலக்கியம் – சிற்றிலக்கியம் – சிறுகதை – பயன்பாட்டுத் தமிழ்

அலகு 1: அற இலக்கியங்கள் 10 மணி நேரம்

1. திருக்குறள் - வான் சிறப்பு(அறம்), ஊக்கமுடைமை(பொருள்), குறிப்பறிதல்(இன்பம்) – மூன்று அதிகாரங்கள் முழுமையும்.
2. நாலடியார் – மூன்று பாடல்கள். (2, 3, 5)
3. பழமொழி நானூறு – மூன்று பாடல்கள் (74, 75, 78)
4. திரிகடுகம் – மூன்று பாடல்கள் (10, 12, 22)
5. இனியவை நாற்பது – மூன்று பாடல்கள் (1, 12, 16)

அலகு 2: சிற்றிலக்கியம் 10 மணி நேரம்

1. முத்தொள்ளாயிரம்
 - சேரன் – வீரம் 14, 15 பாடல்கள்
 - சோழன் – காதல் 23, 24 பாடல்கள்
 - பாண்டியன் – நாடு 87, 88 பாடல்கள்
2. தமிழ்விடு தூது – முதல் 20 கண்ணிகள்
3. திருக்குற்றாலக் குறவஞ்சி – மலைவளம் கூறுதல் – முதல் 5 பாடல்கள்
4. முக்கூடற்பள்ளு – மூத்த பள்ளி நாட்டு வளம் கூறுதல் 3 பாடல்கள், இளைய பள்ளி நாட்டு வளம் கூறுதல் 3 பாடல்கள்.
5. கலிங்கத்துப் பரணி – பாலை பாடியது – முதல் 5 பாடல்கள்

அலகு 3: சிறுகதை 9 மணிநேரம்

1. அறிஞர் அண்ணா - செவ்வாழை
2. புதுமைப்பித்தன் - கடவுளும் கந்தசாமிப் பிள்ளையும்
3. ஜெயகாந்தன் - யுகசந்தி
4. கு.அழகிரிசாமி - காற்று
5. அம்பை - காட்டில் ஒரு மான்

அலகு 4: பேச்சுத் தமிழ் 8 மணி நேரம்

பேச்சுத் திறன் – விளக்கம் – பேச்சுத்திறனின் அடிப்படைகள் – வகைகள் – மேடைப்பேச்சு – உடையாடல் - பயிற்சிகள்

அலகு 5: எழுத்துத் தமிழ், இலக்கிய வரலாறு, இலக்கணம் 8 மணி நேரம்

1. கலைச் சொல்லாக்கம் – தேவைகள் – கலைச்சொற்களின் பண்புகள் – அறிவியல் கலைச் சொற்கள் – கடிதம் – வகைகள் – அலுவலகக் கடிதங்கள் – உறவுமுறைக் கடிதங்கள்.
2. பாடம் தழுவிய இலக்கிய வரலாறு (அற இலக்கியம், சிற்றிலக்கியம், சிறுகதை)
3. அணி இலக்கணம்
4. விண்ணப்பக் கடிதம் எழுதுதல்

மொத்தம்: 45 மணி நேரம்

TOTAL HOURS: 45

COURSE OUTCOME (Employability)

At the end of this course the students will be able to,

- CO 1: Measure human mind through the studying of Tamil charity Literature in the aspect of moral value.
- CO 2: Identify the contemporary social issues through studying Tamil Epics.
- CO 3: Build the life skills after studying of the poetry.
- CO 4: Develop narrative skill after reading short stories.
- CO 5: Improve their own style of writing after studying Terminology methods.

பார்வைநூல்கள்

1. பேசும்கலை, முனைவர்கு. ஞானசம்பந்தன்விஜயாபதிப்பகம்
2. தமிழ்இலக்கியவரலாறு, வரதராசன், மு., சாகித்தியஅக்காதெமி, புதுதில்லி
3. தமிழ்நடைக்கையேடு, மொழிஅறக்கட்டளை
4. பயன்பாட்டுத்தமிழ், முனைவர்அரங்கிராமலிங்கம், முனைவர்ஒப்பிலாமதிவாணன், சென்னைபல்கலைக்கழகம், 2007
5. மொழிபெயர்ப்பியல்அடிப்படைகள், கா.பட்டாபிராமன், யமுனைப்பதிப்பகம், திருவண்ணாமலை
6. பாடநூல்தேடலுக்கானஇணையம்
 - <http://www.tamilvu.org/library>
 - <https://archive.org/>

	HINDI - II	L	T	P	Credits
		3	0	0	3

Course Objective: (Skill Development)

- To train students in translation
- To develop reading & writing skills
- To create interest towards reading different types of literature

Unit I	- ‘ idgah’ by Premchand’ (kahani), Translation- Definition,Types	9
Unit II	‘pitha ‘ by gyanranjan (kahani), Translation - Anuvadak ke gun	9
Unit III	- jamun ka ped by Krishna chander ‘ (kahani) , Translation Practice	9
Unit IV	- adhi rath ke baad by Shankar shesh (naatak), Translation Practice	9
Unit V	- adhi rath ke baad by Shankar shesh (naatak), Translation Practice	9

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course students will be able to,

- CO 1: Students will know the importance & process of translation
CO 2: understand the values of elders in a family & extend their support
CO 3: will know the different writing skills of authors
CO 4: gain knowledge in Hindi literature
CO 5: will acquire knowledge in Hindi Sahithya

Text/Reference book :

Adhi rath ke baad ,by Shankar shah ,kitabghar prakashan ,2000
Idgah by Premchand,Bharathiya gyan peeth ,NewDelhi ,
Jamun ka ped by Krishna Chandra, Deepak publishers, Nov. 2019
Pitha by gyan ranjan,Rajkamal publication,Jan 2018
Glossary of Administrative terms ,Commission for scientific terms & Technical Terminology,2007
Patralekhan kala by Dr.Shivshankar Pandey,2018
Gadya khosh

Weblinks:

<https://premchandstories.in/eidgaah-story-munshi-premchand-pdf/>
<https://www.google.com/search?q=pitha+by+gyan+ranjan&oq=pitha+by+gya&aqs=chrome.1.69i57j0i13j0i22i30.10387j0j4&sourceid=chrome&ie=UTF-8>
<http://db.44books.com/2020/04/%e0%a4%86%e0%a4%a7%e0%a5%80-%e0%a4%b0%e0%a4%be%e0%a4%a4-%e0%a4%95%e0%a5%87-%e0%a4%ac%e0%a4%be%e0%a4%a6.html>
http://gadyakosh.org/gk/%E0%A4%A6%E0%A5%87%E0%A4%B5%E0%A5%80%E0%A4%B8%E0%A4%BF%E0%A4%82%E0%A4%B9/_/%E0%A4%85%E0%A4%9C%E0%A5%8D%E0%A4%9E%E0%A5%87%E0%A4%AF

FRENCH - II		L	T	P	Credits
		3	0	0	3

Course Objective: (Skill Development)

- To fortify the grammar and vocabulary skills of the students.
- To enable the students have an idea of the French culture and civilization

UNIT I LECON 10-11

9

Leçons :10 Les affaires marchent,11 un repas midi a problèmes- Réponses aux questions tiresde la leçon-grammaire ;présent progressif passe récent ou future proche-complément d'Object directe-complément d'objet

UNIT II- LECON 12-13

9

Leçons 12 :tout est bien qui fini bien,-13 aux armes citoyens-réponses aux questions tires de la leçon-grammaire :les pronoms<<en ou y>> rapporter des paroles-Les pronoms relatifs que,qui ou ou.

UNIT III-LECON 14-15

9

Leçons 14.Qui ne risque rien n'a rien-15.la fortune sourit aux audacieux-réponses aux questions tires de la leçon-grammaire : comparaison-les phrases au passe compose.

UNIT IV-LECON 16-18

9

Leçons 16 la publicité et nos rêves 17 la France la monde 18 campagne publicitaire réponsesaux questions tires de la leçon-grammaire :les phrases a l'imparfait-les phrases au future

UNIT V- COMPOSITION :

9

A écrire une lettre de regret//refus a un ami concernant l'invitation d'une célébration reçue-aécrire un essaie sur un sujet générale-a lire le passage et répondre aux questions.

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course students will be able to,

CO 1: This enable students to learn the language without any grammatical errors.

CO 2: As a result of the content makes the students to known about the types of pronouns and their usage.

CO 3: This imparts the students in order to develop their basic writing skills.

CO 4: Enable students for framing the basics sentence.

CO 5: Making the students community to know the French format of letter writing and essay writing.

Text Book:

Jack GIRARDER & Jean Marie GRIDLIG,<<Méthode de Français PANORAMA>>, CléInternationale, Goyal Publication, New Delhi Edition 2014.

Reference Books:

1. DONDO Mathurin, "Modern French Course", Oxford University Press, New Delhi Edition2014.
2. Nithya Vijayakumar get ready French grammar-Elementary Goyal publications, New DelhiEdition 2014.

Web Sources:

1. <https://www.thoughtco.com/french-reading-tips-1369373>
2. <https://www.bnf.fr/fr>
3. <https://www.laits.utexas.edu/tex/>

	ENGLISH - II	L	T	P	Credits
		3	0	0	3

ENGLISH II – POETRY

Course Objective: (Skill Development)

- To enable students to develop their communication skills effectively.
- To enrich their vocabulary in English
- To develop communicative competency.

UNIT I		09
	1. Growing Old - Winston Farewell	
	2. Ecology - A. K. Ramanujan	
UNIT II		09
	3. Stopping by Woods on a Snowy Evening - Robert Frost	
	4. Our Casuarina Tree - Toru Dutt	
UNIT III		09
	5. Goodbye Party for Miss Pushpa T.S. - Nissim Ezekiel	
	6. The Bull - Ralph Hodgson	
UNIT IV		09
	7. If - Rudyard Kipling	
	8. The Drowned Children - Louise Glück	
UNIT V		09
	9. Australia - A.D.Hope	
	10. A Far Cry from Africa - Derek Walcott	

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course the students will be able to,

CO1: Learn to employ Poetic expressions in the course of daily speech.

CO2: Prove their better communicative ability.

CO3: Prove their skill in writing sentences with poetic impact.

CO4: Develop different sensibilities in approaching life.

CO5: Solve life’s problems as highlighted in the selections.

Books Prescribed:

- Selections from Caribbean Literature. Mahaam Publishers, Chennai.
- Our Casuarina Tree - Vasan Publication By Dr.A Shanmugakani

Web Sources:

- <https://www.gradesaver.com/>
- <https://www.enotes.com/>
- <https://www.jstor.org/>
- <https://www.sparknotes.com/>
- <https://www.cliffsnotes.com/>

THERMAL PHYSICS			
L	T	P	Credits
4	1	0	5

Course Objective: (Employability)

To understand the concept of heat, transmission of heat, kinetic theory of gases and laws of thermodynamics

UNIT I Thermometry and Calorimetry 15

Platinum resistance thermometer – Calendar and Griffith’s bridge – Thermistor – Specific heat capacity – Specific heat capacity of solids – Method of mixtures – Radiation correction - Dulong and Petit’s law – Specific heat capacity of liquid – Newton’s law of cooling – Callendar & Barne’s methods – Specific heat of gases – Two specific heat capacities of a gas - Determination of Cv by Joly's Differential Steam Calorimeter - determination of Cp by Regnault's method.

UNIT II Conduction & Radiation 15

Definition of thermal conductivity – thermal conductivity of bad conductor – Lee’s disc method-radial flow of heat-thermal conductivity of rubber.
Radiation – Black body radiation – Wien’s law, Rayleigh-Jean’s law-Planck’s quantum theory of radiation - Planck’s law – Stefan’s law-Deduction of Newton’s law of cooling from Stefan’s law – solar constant (Definition only).

UNIT III Kinetic Theory of Gases 15

Maxwell’s law of distribution of molecular velocities – Experimental verification of molecular velocities – Mean free path of gaseous molecules – Transport phenomena – Diffusion of gases – Viscosity and thermal conduction of gases – Vander Waals equation of state – Determination of Vander Waals constant – Comparison of Vander Waals equation with Andrews experiment - Relation between Vander Waals constant and critical constants.

UNIT IV Low Temperature 15

Joule – Thomson’s effect – Porous plug experiment – Liquefaction of gases – Linde’s method – Adiabatic demagnetization – Properties of He¹ and He² – Practical applications of low temperature – Refrigeration and air conditioning.

UNIT V Laws of Thermodynamics 15

Zeroth and first law of thermodynamics – Reversible and irreversible process – Second law of thermodynamics – Carnot’s engine – Derivation of efficiency – Carnot’s theorem. Entropy – Change of entropy in reversible and irreversible processes– Temperature – entropy diagram (T.S) – Thermodynamic Scale of temperature – Third law of thermodynamics.

TOTAL HOURS: 75

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Demonstrate the basic concepts of specific heat capacities of solids, liquids and gases.
- CO2: Identify the good and bad conductors and concepts of blackbody radiation and their applications.
- CO3: Apply the fundamental principles of diffusion of gases and its practical problems related to Vander Waals equation of state.
- CO4: Apply the concepts of Liquefaction of gases in the low temperature and its practical applications.
- CO5: Develop the design and fabrication of various Heat engines and improve its efficiency.

Text Books

1. Brijljal and Subramininan, Heat & Thermodynamics, S. Chand &Co.1999.

References

1. R. Murugesan, Thermal Physics- S. Chand & Co, 2015.
2. D.S. Mathur, Heat and Thermodynamics, S. Chand and Company, 2006.

Web Sources:

1. <https://www.slideshare.net/CandelaContent/calorimetry-48238312>
2. https://onlinecourses.nptel.ac.in/noc21_me07/preview

	OPTICS	L	T	P	Credits
		4	1	0	5

Course Objective: (Employability)

To understand the concepts of optics, to study interference and diffraction of light and to learn the techniques of optical instruments

UNIT I Geometrical Optics 15

Spherical aberration in lenses - methods of minimizing spherical aberration and conditions – Coma - Chromatic aberration in lenses - Condition for achromatism of two thin lenses (in and out of contact) - Astigmatism - Dispersion produced by a thin prism - Combination of prisms to produce - Dispersion without deviation - Deviation without dispersion.

UNIT II Interference 15

Interference – Coherence – condition for coherence, Young’s double slit experiment - Optical path difference between the waves, Air wedge – Newton’s rings – Brewster’s fringes – Michelson Interferometer and its applications – Interference filter – Holography- Construction and reconstruction of a hologram – Applications.

UNIT III Diffraction 15

Fresnel’s diffraction – Diffraction at a circular aperture and narrow wire – Fraunhofer diffraction - single slit – Double slit (Theory)– Diffraction pattern – Grating (theory) – Determination of wavelengths using grating - Rayleigh’s criterion of resolution- Resolving power of a Telescope – Dispersive power and resolving power of a grating - Difference between resolving power and Dispersive power

UNIT IV Polarization 15

Double refraction - Nicol prism – Nicol prism as an analyzer and polarizer – Huygens’s explanation of Double refraction in uniaxial crystals – Double Image polarizing prisms – Elliptical and Circularly polarized light – Production and detection – Quarter wave and half wave plates – Dichroism - polaroids and their uses – Optical activity – Specific rotation - Laurent’s Half shade polarimeter.

UNIT V Optical Instruments 15

Microscopes – Simple Microscope (Magnifying glass) – Compound Microscope – Ultra-Microscope – Eyepieces - Huygen’s Eyepiece - Ramsden’s Eyepiece — Comparison of Eyepieces – Telescope – Refracting astronomical telescope – Abbe Refractometer – Pulfrichrefractometer - Photographic Camera – Prism binocular

TOTAL HOURS: 75

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Illustrate the various types of aberrations in lens.
- CO2: Identify the application of interference in interferometer.
- CO3: Demonstrate the concept of diffraction and its application in finding the wavelength.
- CO4: Identify circular and elliptical polarization and methods to generate it.
- CO5: Analyze the working principle of various optical instruments.

Text Book

1. Subramaniam N &Brij Lal, Optics, S Chand & Co. Pvt. Ltd., New Delhi, 2004
2. Murugesan, Optics and Spectroscopy, S Chand & Co. Pvt. Ltd., New Delhi, 2010.

References

1. Eugene Hecht, Optics, 4th Edition, Addison Wesley, 2002.
2. Okan K. Ersoy, Diffraction, Fourier Optics and Imaging, John Wiley & Sons,2007
3. Optics by Khanna D R & Gulati H R, R Chand & Co. Pvt. Ltd., New Delhi, 1979
4. Singh & Agarwal, Optics and Atomic Physics, PragatiPrakashan Meerut, Nineth edition, 2002.

Web Sources:

1. <https://www.cliffsnotes.com/study-guides/physics/light/geometrical-optics>
2. <https://www.toppr.com/guides/physics/ray-optics-and-optical-instruments/optical-instruments/>

MATHEMATICS - II				L	T	P	Credits
				4	0	0	4

Course Objective: (Skill Development)

To impart the knowledge of Integral calculus, Differential Equations, Fourier Series and Laplace transform. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I Integral Calculus 12

Integral calculus: Integration – Definite integrals – Bernoulli's formula -Reduction formula for $\int \sin^n x dx, \int \cos^n x dx, \int \tan^n x dx, \int x^n e^{ax} dx$.

UNIT-II DIFFERENTIAL EQUATIONS 12

Ordinary Differential Equations: First order of higher degree equations – Second order and non-homogenous linear differential equations with constant coefficient.

Partial Differential Equations: Formation of partial differential equations by eliminating arbitrary constants and arbitrary function- Solutions of four standard types of first order equation-Lagrange method of solving linear partial differential equation $Pp + Qq = R$

UNIT-III FOURIER SERIES 12

Fourier series of periodic functions on the interval $[c, c+2\pi]$ –Even and Odd functions- Half range sine and cosine series.

UNIT-IV LAPLACE TRANSFORM 12

Laplace transformation: Definition, Laplace transform of basic trigonometric, exponential and algebraic functions - Inverse Laplace transform- Solving differential equation of second order with constant coefficients using Laplace transform

UNIT – V VECTOR DIFFERENTIATION 12

Introduction-Scalar point functions-Vector point functions-Vector differential operator ∇ , Gradient-Divergence-Curl-Solenoidal-irrotational-identities- Simple problems

TOTAL HOURS: 60

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Solve the key terminology, concept tools and techniques used in Integral calculus.
- CO2: Identify the applications of differential equations.
- CO3: Analyze the uses, limitations and applications of Fourier series.
- CO4: Evaluate Laplace transform and its applications.
- CO5: Utilize the key terminology, concept tools and techniques used in Vector Differentiation.

Text Books

- P. Kandaswamy and K.Thilagavathy, Allied Mathematics paper II, 2nd Semester, S. Chand Publishing Pvt. Ltd. 1st Edition, 2004.
- S. Narayanan and T.K. Manickavasagam Pillai – Ancillary Mathematics, S. Viswanathan Printers, 1986, Chennai.

Reference Books

- P.R. Vittal, Allied Mathematics, Margham Publications, 4th Edition 2009.
- A. Singaravelu, Allied Mathematics, Meenakshi Agency, 2007.
- P. Duraipandian and S.UdayaBaskaran, Allied Mathematics, Vol. I & II Muhil Publications, Chennai

Web Sources:

- http://mdudde.net/pdf/study_material_DDE/M.Sc.MAthematics/DIFFERENTIAL%20EQUATIONS.pdf
- <https://ncert.nic.in/ncerts/l/lemh201.pdf>
- http://www.universityofcalicut.info/SDE/Vector_calculus_BSc_Maths.pdf

	PRACTICAL PHYSICS - II	L	T	P	Credits
		0	0	4	2

Course Objective: (Skill Development)

To enable the student to explore the field of thermal physics and optics. To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.

Any 10 Experiments

1. Lee's Disc method – Thermal conductivity of bad conductor
2. Joule's Calorimeter - determination of Specific heat capacity of liquid
3. Verification of Boyle's law
4. Newton's law of cooling
5. Specific heat capacity- Mixture of Solid and Liquid
6. Spectrometer – Grating (N & λ)
7. Spectrometer – Dispersive power of prism
8. Air wedge
9. Newton's Ring-Sodium lamp (Microscope)
10. Convex and convex lens – f, R and m
11. Solar constant.

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Examine the thermal conductivity of bad conductor using Lee's disc method.
 CO2: Calculate the wavelengths of different spectral line using spectrometer grating.
 CO3: Examine the refractive index dispersive power of the prism using spectrometer.
 CO4: Calculate the specific heat capacity of a given liquid.
 CO5: Measure the focal length of convex and concave lenses by UV method.

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiaendran, Practical Physics, 1st Edition, 2015.
2. Biswajit Saha, Practical Physics Book, LAP LAMBERT Academic Publishing, 1st Edition, 2020.

Web Sources:

1. <https://vlab.amrita.edu/index.php?brch=194&cnt=1&sim=354&sub=1>
2. https://www.kau.edu.sa/Files/0011208/Files/59779_4-THIN_FILMS.pdf

SEMESTER-III

TAMIL - III				L	T	P	Credits
				3	0	0	3

பக்தி இலக்கியம் – காப்பியம் – புதினம் - மொழிபெயர்ப்பு

அலகு 1: பக்தி இலக்கியம்

10 மணி நேரம்

1. மாணிக்கவாசகர் - திருவாசகம் – மூன்று பாடல்கள்
 - ✓ புல்லாகி பூடாகி (சிவபுராணம்)
 - ✓ எல்லாப் பிறப்பும் (சிவபுராணம்)
 - ✓ உற்றாரை யான் வேண்டேன் (திருப்பலம்பல்)
2. ஆண்டாள் - திருப்பாவை – மூன்று பாடல்கள் (1, 3, 4)
 - ✓ மார்கழித் திங்கள் ... (பாசுரம் 1)
 - ✓ ஓங்கி உலகளந்த... (பாசுரம் 3)
 - ✓ ஆழிமழைக் கண்ணா... (பாசுரம் 4)
3. வீரமாமுனிவர் - தேம்பாவணி – மூன்று பாடல்கள்
 - ✓ நீ ஒரு தாய்; ஒரு தாதையும் நீ (698 - சூசை இறைவனின்தாயைப்போற்றுதல்)
 - ✓ அணிக் கலத்து அழகு அழுந்திய (1089 - வானவர் இயேசு நாமத்தைப் போற்றி வணங்கிய செய்தி)
 - ✓ வான் புறத்து இலகும் செஞ் சுடர் காண (3510 - இறைவன் சூசை முனிவர்க்கு ஏழு மணிகள் புறத்தில் ஒளிவிடும் முடியைச் சூட்டுதல்)
4. குணங்குடி மஸ்தான் சாகிபு- பராபரக் கண்ணி 1-10 கண்ணிகள்
5. திருமூலர் - திருமந்திரம் – மூன்று பாடல்கள்
 - ✓ உடம்பார் அழியின் உயிரார் அழிவர் (திருமந்திரம்: 724)
 - ✓ படமாடக் கோயில் பகவற்கு ஒன்று ஈயில் (திருமந்திரம்: 1857)
 - ✓ மரத்தை மறைத்தது மாமத யானை (திருமந்திரம்: 2290)
6. இராமலிங்க அடிகள் - திருவருட்பா – மூன்று பாடல்கள்
 - ✓ எத்துணையும் பேதமுறா... (5297)
 - ✓ ஒருமையுடன் நினது திருமலரடி நினைக்கின்ற (2938)
 - ✓ கோடையிலே... (4091)

அலகு 2: காப்பியம்-1

9 மணி நேரம்

1. சிலப்பதிகாரம் – அடைக்கலக் காதை

(தெரிவுசெய்யப்பட்ட பாடல் அடிகள் 120-199)
2. சீவக சிந்தாமணி – விமலையார் இலம்பகம்

(தெரிவுசெய்யப்பட்ட பாடல்கள்)

அலகு 3: காப்பியம்-2

9 மணி நேரம்

1. கம்பராமாயணம் – மந்தரை சூழ்ச்சிப் படலம்
(தெரிவு செய்யப்பட்ட பாடல்கள்)
2. பெரியபுராணம் – பூசலார் நாயனார் புராணம்
(தெரிவு செய்யப்பட்ட பாடல்கள்)

அலகு 4: புதினம்

8 மணி நேரம்

1. கல்மரம் - கோ. திலகவதி

அலகு 5: மொழிபெயர்ப்பு, இலக்கணம், இலக்கிய வரலாறு

9 மணி நேரம்

1. அலுவல்சார் மொழிபெயர்ப்பு
2. இலக்கணக் குறிப்பு
3. பாடம் தழுவிய இலக்கிய வரலாறு (பக்தி இலக்கியம், காப்பியம், புதினம்)

மொத்தம்: 45 மணி நேரம்

TOTAL HOURS: 45

COURSE OUTCOME (Employability)

At the end of this course the students will be able to,

- CO 1: Utilize the fundamental Tamil Grammar in their practical life.
CO 2: Improve their oratorical skill after studying of concept of oratory.
CO 3: Develop their own style of Translation Studies
CO 4: Translate English passage to Tamil.
CO 5: Apply their knowledge into journals, articles writings.

பார்வைநூல்கள்

1. தமிழ்இலக்கியவரலாறு, வரதராசன், மு., சாகித்தியஅக்காதெமி ,புதுதில்லி
2. தமிழ்நடைக்கையேடு, மொழி அறக்கட்டளை
3. பயன்பாட்டுத்தமிழ், முனைவர் அரங்கஇராமலிங்கம் முனைவர் ஒப்பிலாமதிவாணன், சென்னை பல்கலைக்கழகம், 2007
4. மொழிபெயர்ப்பியல் அடிப்படைகள், கா.பட்டாபிராமன், யமுனைப்பதிப்பகம், திருவண்ணாமலை
5. பாடநூல்தேடலுக்கான இணையம்
 - <http://www.tamilvu.org/library>
 - <https://www.tamildigitallibrary.in/book>

	HINDI – III	L	T	P	Credits
		3	0	0	3

Course Objective: (Skill Development)

- To enrich the knowledge of students through Tamil literature
- Enable them to learn ancient poems
- To develop interest in learning history of hindi literature

Unit I	- ‘Thirukkural’, Hindi Sahitya_ka ithihas (aadikal)	9
Unit II	- ‘Kabir ke pad’, Hindi Sahitya_ka ithihas (aadikal)	9
Unit III	- ‘Sur ke pad’, Hindi Sahitya ka ithihas (bhakthi kal)	9
Unit IV	- Thulsi ke pad, Hindi Sahitya ka ithihas (bhakthi kal)	9
Unit V	- Rahim ke dohe , Hindi Sahitya ka ithihas (Rithikal)	9

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course students will be able to,

CO 1: Students will know the valuable messages in Thirukkural

CO 2: will create interest in knowing ancient poems.

CO 3: Gain knowledge in Hindi literature

CO 4: will know the difference between Hindi & the languages used by ancient poets

CO 5: will be familiar with different styles of poetry writing

Text / Reference books:

Thirukkural translation by Venkata Krishnan

Ramcharitha manas, Githa press , Gorakhpur by Sri Hanuman Prasad

Sur Sanchayitha by Rajkamal prakashan , New Delhi

Padya khosh

Hindi Sahitya ka Ithihas by Dr. Nagendra, Dr. Hardayal ,

Noida

Weblinks:

http://gadyakosh.org/gk/%E0%A4%A6%E0%A5%87%E0%A4%B5%E0%A5%80%E0%A4%B8%E0%A4%BF%E0%A4%82%E0%A4%B9/_/%E0%A4%85%E0%A4%9C%E0%A5%8D%E0%A4%9E%E0%A5%87%E0%A4%AF

http://gadyakosh.org/gk/%E0%A4%A6%E0%A5%87%E0%A4%B5%E0%A5%80%E0%A4%B8%E0%A4%BF%E0%A4%82%E0%A4%B9/_/%E0%A4%85%E0%A4%9C%E0%A5%8D%E0%A4%9E%E0%A5%87%E0%A4%AF

FRENCH - III		L	T	P	Credits
		3	0	0	3

Course Objective: (Skill Development)

To strengthen the Grammar and Composition in French language. To train the students to enhance his skills in French language for communication.

UNIT I LECON 11

9

Leçon 16-La famille Vincent. Page 44-Grammaire :Passe compose. Leçon 29- Vers l'hôtel. Page 80-Grammaire :Impératif, a mettre phrases Singulier, Pluriel.

UNIT II- LECON 12-13

9

Leçon 40-L'Epicerie les Légumes et les Fruits. Page 112-Grammaire;Présent del'indicatif. Leçon 44 La poste. Page-124 l'Grammaire :A mettre les phrases a l'impératif

UNIT III-LECON 14-15

9

Leçon 51-Le café et tabac page 142- Grammaire :A changer les phrases en interrogatif. Leçon 58-La chasse et la pêche. Page 160-Grammaire :Le plus queparfait

UNIT :IV-LECON 16-18

9

Leçons 61-Un mariage a la campagne. Page-170 -grammaire :a changer auparticipe présent.

UNIT :V- COMPOSITION :

9

A écrire une lettre a un ami l'invitation d'une célébration différente

ex :Mariage-a faire un essaie sur un sujet générale-a lire le passage et répondreaux questions.

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course students will be able to,

CO 1: The content of the unit 1 aids the students to explore the basics of the new French culture and civilisation.

CO 2: The content of the unit 3 aids the students to adapt to the French society.

CO 3: The content of the unit 3 aids the students to adapt to the French society.

CO 4: The content of the unit 4 aids the students to know about francophonie.

CO 5: The content of the unit 5 aids the students to acquire the language proficiency.

Text Book:

Les leçons ont été choisi et tire de i & ii degré de gauger<<Cours de Langue et de Civilisation Française>> The Millenium, Publication Hachette, édition 2002

Reference Books:

DONDO Mathurin, "Modern French Course", Oxford University Press, NewDelhi Edition 2014.

Web Sources:

1. <https://www.thoughtco.com/french-reading-tips-1369373>

2. <https://www.bnf.fr/fr>

<https://www.laits.utexas.edu/tex/>

	ENGLISH - III	L	T	P	Credits
		3	0	0	3

ENGLISH III - DRAMA AND COMPOSITION

Course Objective: (Skill Development)

- To train students in the use of English language in varied literary and non-literary contexts.
- To teach them soft skills and strengthen their foundation in grammar and composition.
- To evaluate their comprehension skills.

UNIT I		09
	<ul style="list-style-type: none"> • Introduction to Drama. 	
UNIT II		09
	<ul style="list-style-type: none"> • Shakespeare: Funeral Oration (Act III Scene II Julius Caesar) & • Monkey’s Paw - W.W.Jacobs 	
UNIT III		09
	<ul style="list-style-type: none"> • Comprehension 	
UNIT IV		09
	<ul style="list-style-type: none"> • Precis -Writing and Note Taking 	
UNIT V		09
	<ul style="list-style-type: none"> • General Essay on Current Topics 	

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course the students will be able to,

- CO 1: Estimate the dramatic scenes in the light of appeal of values.
- CO 2: Prioritize pragmatic day- to - day communication through comprehension.
- CO 3: Develop dramatic skill after reading the scenes of plays.
- CO 4: Improve their own style of writing after an expose to the prescribed dramatic pieces.
- CO 5: Adapt themselves to life - context wherein soft skill demonstration is a must.

Books Prescribed:

- An Introduction to Drama. II Edition by George Whitfield
- Reading Comprehension for College Students Paperback – Import, 1984 by Reinhart G. Kussat (Author)
- The Monkey’s Paw By W. W. Jacobs Publisher: Perfection Learning

Web Sources:

- <https://www.gradesaver.com/>
- <https://www.enotes.com/>
- <https://www.jstor.org/>
- <https://www.sparknotes.com/>

<https://www.cliffsnotes.com/>

	ELECTRICITY & MAGNETISM	L	T	P	Credits
		5	0	0	5

Course Objective: (Employability)

To understand the general concepts in Electrostatics, to educate scientifically the principles of magnetism and apply the physics concepts in solving problems.

UNIT-I Electrostatics 15

Coulomb's inverse square law – Gauss theorem and its applications (Intensity at a point due to a charged sphere & cylinder) – Principle of a capacitor – Capacity of spherical and cylindrical capacitors – Energy stored in a capacitor – Loss of energy due to sharing of charges.

UNIT II Chemical Effects of Electric Current 15

Faraday's laws of Electrolysis - Ionic velocities and mobilities. Calculation and experimental determination of ionic mobilities - transport number. Thermoelectricity- Peltier effect - Experimental determination of Peltier coefficient - Thomson coefficient – experimental determination of Thomson coefficient - application of thermodynamics to a thermocouple and connected relations - thermoelectric diagram and uses

UNIT-III DC and AC Circuits 15

DC Circuits: Growth and decay of current in a circuit containing resistance and inductance - growth and decay of charge in a circuit containing resistance and capacitor – growth and decay of charge in an LCR circuit - condition for the discharge to be oscillatory – frequency of oscillation - network analysis - Thevenin and Norton's Theorems.

AC Circuits: AC Voltage and current - Power factor and current values in and AC circuit containing LCR circuit - series and Parallel resonant circuits - AC motors - single phase, three phase - star and delta connections - electric fuses - circuit breakers.

UNIT IV Magnetic effect of electric current 15

Biot and Savart's law - magnetic field intensity due to a solenoid carrying current – effect of iron core in a solenoid - Helmholtz galvanometer - moving coil ballistic galvanometer – theory - damping correction - determination of the absolute capacity of a condenser using B.G.

UNIT V Electromagnetic Induction and its applications 15

Faraday's laws of electromagnetic induction - inductor and inductance - determination of self-inductance of a coil using Anderson method - mutual inductance – experimental determination of absolute mutual inductance - coefficient of coupling - Earth inductor - uses of earth inductor – Ballistic Galvanometer (B.G) - calibration of B.G. - Induction coil and its uses.

TOTAL HOURS: 75

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Illustrate the basic concepts of electrostatics and its applications.
- CO2: Apply the concepts of chemical effect in the thermoelectricity and its experimental techniques.
- CO3: Identify the various concepts involved in AC and DC circuits.
- CO4: Analyze the magnetic effect of electric current used in various galvanometer and its instrumentation techniques.
- CO5: Develop the design, fabrication and characterization techniques for the self and mutual inductances.

Text Books

1. Brijlal and N. Subrahmanyam, A Text Book of Electricity and Magnetism, RatanPrakasanMandir Educational & University Publishers, New Deih,2000.
2. R. Murugesan, Electricity and Magnetism, 7th Edition, S. Chand & Company Pvt. Ltd. 2008
3. D. L. Sehgal, K. L. Chopra and N. K. Sehgal, Electricity and Magnetism, S. Chand & Sons. New Delhi. 1996.

References

1. Griffith D.J, Introduction to Electrodynamics, 4th Edition, Prentice Hall of India, 2012.
2. NavinaWadhani, Electricity and Magnetism, Prentice Hall of India, 2012.

Web Sources:

1. <https://www.slideshare.net/shanoofsharafsrk/electrolysis-38176704>
2. https://sajitsir.tripod.com/Books/Biot_Savart_Law.pdf
3. <https://www.wlww.k12.or.us/cms/lib/OR01001812/Centricity/Domain/1335/4%20Faradays%20Law.pdf>

CHEMISTRY - I			
L	T	P	Credits
5	0	0	5

Course Objective: (Employability)

To understand the various theories of coordination chemistry. To study the various concepts of nuclear chemistry and bonding in metals. To learn the concepts of electro chemistry and its applications

UNIT I Nuclear Chemistry 15

Nuclear Chemistry: Fundamental particles of nucleus- isotopes, isobars, isotones and isomers – differences between chemical reactions and nuclear reactions, nuclear chain reactions - nuclear fusion and fission- Light water nuclear power plant - radioactive series.

UNIT II Coordination Chemistry 15

Nomenclature - Werner Theory - EAN Rule – Chelation - Stability of complexes – factors affecting the stability – structural isomerism- stereoisomerism – geometrical and optical isomerism in 4 and 6 coordinated Complexes - Valence bond theory

UNIT III Polymers and Composites 15

Polymers – definition – polymerization – types – addition and condensation polymerization –free radical polymerization and mechanism – Plastics, classification – preparation, properties and uses of PVC, polycarbonate, nylon-6,6 – Rubber – vulcanization of rubber. Synthetic rubbers. Composites – definition, types, polymer matrix composites – FRP only

UNIT IV Chromatographic Techniques and Applications 15

Principles of adsorption and partition chromatography - Column and Paper, TLC, ion-exchange chromatography – technique and applications. Gas chromatography, principle, detector and applications. Purification of solid organic compounds: recrystallisation, sublimation.

UNIT V Electrochemistry 15

Cells - electromotive force – electrode potential – their thermodynamic significance. Nernst equation standard electrode potentials and its determination - Reference electrodes - hydrogen, calomel and glass electrodes. Conductance – cell constant - specific conductance and equivalent conductance.

TOTAL HOURS: 75

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Utilize the knowledge of nuclear chemistry.
- CO2: Analyze about coordination chemistry.
- CO3: Analyze study on polymers and composites.
- CO4: Adapt the fundamental concept of chromatographic techniques and applications.
- CO5: Extend the knowledge about the electromotive force and electrode potential in electrochemistry.

Text Books:

1. Gopalan R, Text Book of Inorganic Chemistry, 2nd Edition, Hyderabad, Universities Press, (India), 2012.
2. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011)
3. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co.

Reference Books:

1. R. Gopalan, “Elements of nuclear Chemistry” S. Viswanathan & Co., 7th edition, 2009.
2. P. L. Soni, “Text Book of Inorganic Chemistry” Sultan Chand & sons. 32nd edition. 2013.
3. R. D. Madhan, “Modern Inorganic Chemistry” S. Chand & Co., 6th edition 2012.

Web Sources:

1. <https://www.slideshare.net/MeenalAggarwal2/chromatographic-techniques>
2. <https://www.slideshare.net/surendranparambadath7/electrochemistry-15300181>

	PRACTICAL PHYSICS - III	L	T	P	Credits
		0	0	4	2

Course Objective: (Skill Development)

To enable the student to explore the field of electricity and magnetism. To allow the student to have a deep knowledge of the fundamentals electromagnetic circuits.

Any 10 Experiments

1. Deflection magnetometer – Tan A position
2. Deflection magnetometer – Tan B position
3. Carey Foster Bridge – Determination of specific resistance of unknown coil
4. Potentiometer – EMF of thermocouple
5. Potentiometer-Calibration of Ammeter
6. Potentiometer- Calibration of Low range voltmeter
7. Field along the axis of a coil – Determination M
8. Field along the axis of a circular coil – Determination of B_H
9. Bifilar Pendulum
10. Young's modulus - Uniform bending (Optical Lever)
11. Young's modulus - Non-uniform bending (Optical Lever)

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Examine the magnetic moment of a bar magnet using deflection magnetometer by Tan A and Tan B position.
- CO2: Calculate the EMF of a thermocouple.
- CO3: Calculate the specific resistance of unknown coil using Carey Foster Bridge.
- CO4: Measure the depression and elevation by uniform and non-uniform bending method.
- CO5: Examine the refractive index dispersive power of the prism using spectrometer.

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics, 1st Edition, 2015.
2. Biswajit Saha, Practical Physics Book, LAP LAMBERT Academic Publishing, 1st Edition, 2020.

Web Sources:

1. <http://arunkumard.yolasite.com/resources/4%20Young's%20Modulus%20Non%20Uniform%20Bending.pdf>
2. <https://www.vidyarthiplus.com/vp/attachment.php?aid=6506>

	CHEMISTRY PRACTICAL - I	L	T	P	Credits
		0	0	4	2

Course objective: (Employability)

To know about different types to titrations namely acid base, redox, iodometry and complexometric titrations.

1. Acidimetry and alkalimetry

- (a) Strong acid VS strong base
- (b) Weak acid VS strong base
- (c) Determination of hardness of water.

2. Permanganometry

- (a) Estimation of ferrous sulphate
- (b) Estimation of oxalic acid

3. Iodometry

- (a) Estimation of potassium dichromate
- (b) Estimation of potassium permanganate

4. Acid – Base Titrations

- (a) Estimation of Hydrochloric acid using oxalic acid
- (b) Estimation of sodium Hydroxide using sodium carbonate
- (c) Estimation Borax

5. Redox Titration

- (a) Estimation of oxalic acid using Mohr's salt
- (b) Estimation of Calcium
- (c) Estimation of Ferrous Sulphate using oxalic acid

COURSE OUTCOME

At the end of this course the students will be able to,

CO1: Make use of the chemicals safely in lab as well as in industry.

CO2: Estimate quantity of the acid or base in the given solution.

CO3: Determine the hardness of water.

CO4: Identify the various types of titrations.

CO5: Estimate the amount of inorganic salt present in given solution.

Text Books

- 1. Vogel's – "Textbook of quantitative Inorganic Analysis", Longmann, 12th edition, **2011**
- 2. N. S. Gnanapragasam and G. Ramamurthy, Organic Chemistry lab manual, S. Viswanathan and Co. Pvt. Ltd. Chennai-1998.

Reference Books

- 1. S. Sundaram and K. Raghavan "Practical Chemistry", S. Viswanathan. Co. 3rd edition **2011**
- 2. J. N. Gurtu and R. Kapoor "Advanced experimental Chemistry", S. Chand and Co. 6th edition, **2010**

Web Sources:

- 1. <http://chemcollective.org/vlab/106>
- 2. <https://vlab.amrita.edu/?sub=3&brch=193&sim=352&cnt=1>

SEMESTER-IV

TAMIL - IV			L	T	P	Credits
			3	0	0	3

சங்க இலக்கியம் – நாடகம் – வளர் தமிழ் - பொதுக்கட்டுரை

அலகு 1: சங்க இலக்கியம் - 1

10 மணி நேரம்

1. புறநானூறு (மூன்று பாடல்கள் - 183, 184, 192)
2. பதிற்றுப்பத்து (இரண்டு பாடல்கள் - 14, 69)
3. பட்டினப்பாலை (காவிரியின் சிறப்பு பாடல் அடிகள் 01-07, சோழநாட்டு வளம் பாடல் அடிகள் 20-28, பல்பொருள் வளம் பாடல் அடிகள் 183-193)
4. மதுரைக் காஞ்சி (பாண்டியர் பரம்பரை பாடல் அடிகள் 01-23, மன்னர்க்கு மன்னன் பாடல் அடிகள் 64-74, பாண்டியன் புகழ் பாடல் அடிகள் 197-209).

அலகு 2: சங்க இலக்கியம் - 2

9 மணி நேரம்

1. நற்றிணை (இரண்டு பாடல்கள் - 1, 172)
2. குறுந்தொகை (மூன்று பாடல்கள் - 3, 40, 135)
3. ஐங்குறுநூறு (மூன்று பாடல்கள் - 281, 283, 286)
4. அகநானூறு (இரண்டு பாடல்கள் - 4, 86)
5. கலித்தொகை (இரண்டு பாடல்கள் - 9, 133)

அலகு 3: நாடகம்

8 மணி நேரம்

1. ஆட்டனத்தி ஆதிமந்தி - கவிஞர் கண்ணதாசன்

அலகு 4: வளர்தமிழ்

9 மணி நேரம்

1. ஊடகத் தமிழ் – கணினித் தமிழ் அறிமுகம்

ஊடகத் தமிழ்: அச்சுக்கலை - இதழியல் - ஊடக வகைகள் - அச்சு ஊடகங்கள் - மின்னணு ஊடகம் -இதழியல் முன்னோடிகள் - அச்சு ஊடகங்களில் தமிழ் - கருத்துப் பரிமாற்றம் - மொழி நடையின் தன்மை - நாளிதழ்கள் - வார, மாத இதழ்கள் - மின்னணு ஊடகங்களில் தமிழ் - வானொலி- தொலைக்காட்சி- திரைப்படம்.

கணினித் தமிழ்: கணினித் தமிழின் அடிப்படையும் பயன்பாடும் -கணிப்பொறியின் வரலாறும் வளர்ச்சியும், கணினியும் தமிழும், விசைப்பலகை (Keyboard) - எழுத்துருக்கள் (Fonts) - தமிழைத் தட்டச்சு செய்ய உதவும் மென்பொருள்கள், தமிழைத் தட்டச்சு செய்யும் முறைகள் - தமிழ்த் தட்டச்சுப் பயிற்சி - இணையமும் தமிழ்ப் பயன்பாடும் - தேடுபொறி (Search) - வலைப்பூ (Blog), மின்னூலகம் (Online e-Library), - மின்னகராதி (e-Dictionary), - மின் செய்தித்தாள் - e-Paper, - இணையவழித் தமிழ்க் கற்றலும்-கற்பித்தலும் - மின்வழிக் கற்றல் - e Learning.

அலகு 5: பொதுக்கட்டுரை, இலக்கிய வரலாறு, இலக்கணம்

9 மணி நேரம்

1. பொதுக்கட்டுரை வரைதல்
2. பாடம் தழுவிய இலக்கிய வரலாறு (சங்க இலக்கியம், நாடகம், வளர்தமிழ்)
3. இலக்கணம் (பொருளிலக்கணம்) திணை, துறை விளக்கம்.

மொத்தம்: 45 மணி நேரம்

TOTAL HOURS: 45

COURSE OUTCOME (Employability)

At the end of this course the students will be able to,

CO 1: Interpret the cultural life style of Ancient Tamils.

CO 2: Formulate the new methods of fine arts through the sprite of ancient art of Tamils.

CO 3: Find out the solutions for the problems of life through the philosophical ideology of Tamil religions.

CO 4: Develop the Knowledge and understanding theories of Media Tamil - Introduction of Tamil Computing

CO 5: Formulate the art of life through Tamil traditional scientific approach.

பார்வைநூல்கள்

1. கணினித்தமிழ், முனைவர்இல.சுந்தரம், விகடன்பிரசுரம்
2. கணிப்பொறியில்தமிழ், த.பிரகாஷ், பெரிகாம்
3. தமிழ்க்கணினிஇணையப்பயன்பாடுகள், முனைவர்துரை.மணிகண்டன், மணிவானதிபதிப்பகம்
4. இதழியல்கலை, டாக்டர்மா. பா. குருசாமி, குரு - தேமொழிபதிப்பகம், திண்டுக்கல்
5. அச்சுக்கலைவழிகாட்டி, பாலசுப்பிரமணியன், ஆ., சென்னை : தனசுபதிப்பகம், 1966
6. தொலைக்காட்சிக்கலை, முனைவர்வெ. நல்லதம்பி,மங்கைப்பதிப்பகம், சென்னை42
7. பாடநூல்தேடலுக்கானஇணையம்
 - <http://www.tamilvu.org/courses/nielit/Chapters/Chapter1/11.pdf>
 - <https://www.tamildigitallibrary.in/>

HINDI - IV		L	T	P	Credits
		3	0	0	3

Course Objective: (Skill Development)

- To develop interest in modern poetry
- To teach them the importance & development of hindi journalism.
- To train them in advertisement writings

Unit I	- Sansar by Mahadevi varma, Hindi Sahitya_ka ithihas (adhunik kal)	9
Unit II	- ‘ Mouun nimanthran’ by Sumithranandan panth, Hindi Sahitya_ka ithihas (adhunik kal)	9
Unit III	- ‘rah rahkar Tuutthaa rab kaa kahar’ by Dharmendra kumar nivathiya Hindi Sahitya_ka ithihas (adhunik kal)	9
Unit IV	‘samarpan’ by Subhadra kumara chouhan , Advertisement writing	9
Unit V	- ‘panthrah agasth kii pukaar ‘by atal bihari vajpayee, Advertisement writing	

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course students will be able to,
CO 1: Students will be familiar with modern poetry
CO 2: Students will understand the importance of protecting atmosphere
CO 3: will know the real meaning of patriotism & the value of freedom.
CO 4: will get the ability to write various types of advertisement
CO 5: will understand the different methods adopted in writing them

Text / Reference books:

Hindi swachandata kavya by Prem Shankar,Vani prakashan
Meri ikyavan kavithaye ,Kithab gharprakashan ,20106
Sanchayan :Mahadevi Verma by Nirmala jain ,Vani prakashan ,2016
Padya khosh
Hindi Advertisement writing - ek parichaya .Bokcrot.com

Weblinks:

http://gadyakosh.org/gk/%E0%A4%A6%E0%A5%87%E0%A4%B5%E0%A5%80%E0%A4%B8%E0%A4%BF%E0%A4%82%E0%A4%B9_/_%E0%A4%85%E0%A4%9C%E0%A5%8D%E0%A4%9E%E0%A5%87%E0%A4%AF
http://gadyakosh.org/gk/%E0%A4%A6%E0%A5%87%E0%A4%B5%E0%A5%80%E0%A4%B8%E0%A4%BF%E0%A4%82%E0%A4%B9_/_%E0%A4%85%E0%A4%9C%E0%A5%8D%E0%A4%9E%E0%A5%87%E0%A4%AF
http://gadyakosh.org/gk/%E0%A4%A6%E0%A5%87%E0%A4%B5%E0%A5%80%E0%A4%B8%E0%A4%BF%E0%A4%82%E0%A4%B9_/_%E0%A4%85%E0%A4%9C%E0%A5%8D%E0%A4%9E%E0%A5%87%E0%A4%AF

FRENCH - IV			L	T	P	Credits
			3	0	0	3

Course Objective: (Skill Development)

To strengthen the Grammar and Composition in French language. To train the students to enhance his skills in French language for communication.

UNIT:I **9**

Leçon 20 : Une grande Nouvelle-Grammaire Le future.

Leçon 46 :Le mètre ;l'autobus-Grammaire-A former ou a changer L'adjectif masculin ou féminine a l'adverbe-Trouvez les noms quicorrespondent aux verbes suivants.

UNIT :II **9**

Leçon 48 : A la préfecture de police-Grammaire Les pronoms relatifs.Leçon 63 :les sports-Grammaire le conditionnel présent.

UNIT :III **9**

Leçon :56 A Biarritz la page-Grammaire le future antérieure. Leçon :57 Dans les Pyrénées-Grammaire le future antérieure suite.

UNIT :IV **9**

Leçons 65-a fin des vacances Grammaire-a changer les phrases du pluriel ausingulier, le présent du subjonctif.

UNIT :V **9**

Grammaire et composition :Transduction - réponses aux questions sur lespassage-essaie sur un sujet générale, :lettre :Ecrire une lettre a une amie.

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course students will be able to,

CO 1: This unit enables the student to know about the French poet and poetry.

CO 2: To teach about the advanced grammar and the civic responsibility.

CO 3: To teach about the advanced grammar and the French monuments

CO 4: This unit enables the student to know about the French topographies

CO 5: This unit enables the student to know about the formal letter drafting.

Text Book:

Les leçons ont été choisi et tire de i & ii degré de gauger<<Cours de Langue et de Civilisation Française>> The Millenium, Publication Hachette, édition 2002

Reference Books:

DONDO Mathurin, "Modern French Course", Oxford University Press, NewDelhi Edition 2014.

Web Sources:

1. <https://www.thoughtco.com/french-reading-tips-1369373>
2. <https://www.bnf.fr/fr>
3. <https://www.laits.utexas.edu/tex/>

ENGLISH - IV			L	T	P	Credits
			3	0	0	3

ENGLISH IV - PRACTICAL ENGLISH (CONVERSATION PRACTICE)

Course Objective: (Skill Development)

- To train students in the use of English language in varied literary and non-literary contexts.
- To teach them soft skills and strengthen their foundation in grammar.
- To evaluate students to sensitivity in conversational competency.

UNIT I		09
i. At the Airport		
ii. In a Bank		
iii. On a Bus		
UNIT II		09
iv. In Flight		
v. In a Hotel		
vi. In a Library		
UNIT III		09
vii. Tea Time		
viii. On a Train		
ix. In a Restaurant		
UNIT IV		09
x. On a Picnic		
xi. In a Police station		
xii. In a Post office		
UNIT V		09
xiii. In a travel agency		
xiv. Asking the way		
xv. At the theatre		

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course students will be able to,

CO1: Feel confident to speak in different situations.

CO2: Learn befitting vocabulary words.

CO3: Have the ability to visualize speaking situations.

CO4: Be conversant with other conversational situations.

CO5: Categorize the nature of questions asked usually in interviews.

Books Recommended:

- English Conversation Practice, D.H.Spencer, Oxford.
- Communicative English by Department of English, National College (Autonomous), Trichy.

Web Sources:

- <https://self-publishingschool.com/how-to-write-dialogue/>
- <https://www.masterclass.com/articles/how-to-write-dialogue>

	ATOMIC PHYSICS	L	T	P	Credits
		4	0	0	4

Course Objective: (Employability)

To make the student understand the principles of atomic physics. To enable the student to explore the field of atomic structure, energy levels, and X-rays.

UNIT I Discharge Phenomenon through Gases 12

Determination of the Electronic Charge: Millikan's Oil-drop Method (Motion of a charge in transverse electric and magnetic fields) - Specific charge of an electron - Dunnington's method - Discovery and properties of positive rays- positive ray analysis- Thomson's Parabola Method (Positive rays) – Aston's and Dempster's mass spectrographs.

UNIT II Photo-electric Effect 12

Photo electric effect-Nature of the photo particles-Lenard's method to determine e/m for Photoelectrons-Richardson and Crompton experiment - Laws of photoelectric emission - Einstein photo electric equation - Millikan's experiment - Verification of photoelectric equation - Photo electric cells - Photo emissive cells - Photovoltaic cell - Photo conducting cell -Applications of photoelectric cells (Photomultiplier).

UNIT III Atomic Structure 12

Vector atom model - spatial quantization-various quantum numbers -Pauli's exclusion principle - angular momentum and magnetic moment - coupling schemes - LS and JJ coupling - Bohr magnetron – Selection rules - Explanation of periodic table - Stern and Gerlach experiment.

UNIT IV Ionization Potential and Splitting of Energy Levels 12

Excitation and ionization potential - Davis and Goucher's method - Zeeman effect - Larmor's theorem - Debye's explanation of normal Zeeman effect - Anomalous Zeeman effect - theoretical explanation. Lande's 'g' factor and explanation of splitting of D1 and D2 lines of sodium - Paschen back effect-theory - Stark effect (qualitative treatment only).

UNIT V X-Rays 12

Origin of X- ray spectrum – Continuous and characteristics spectra – X-ray Spectroscopy – Auger effect - X-ray absorption and fluorescence - Moseley's law - uses of X-rays - Compton Effect - experimental verification of Compton Effect.

TOTAL HOURS: 60

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Demonstrate the discharge phenomenon through gases.
- CO2: Illustrate the ionization potential and splitting of energy levels.
- CO3: Interpret the structure of the atom.
- CO4: Analyze the continuous and characteristics spectra of X-rays.
- CO5: Analyze the working concepts of photo electric effect and their applications.

Text Books

1. R. Murugesan, KiruthigaSivaprasath, Modern Physics, S. Chand & Co., New Delhi, 2008.
2. N Subramanian and Brij Lal, Atomic and Nuclear Physics, S. Chand & Co. - 2000

References

1. Robley D. Evans, The Atomic Nucleus, TMH, 1982
2. Christopher. J. Foot, Atomic physics, Oxford University Press Inc, 2005.

Web Sources:

1. <https://nptel.ac.in/content/storage2/courses/115101003/downloads/module2/lecture25.pdf>
2. <https://www.lkouniv.ac.in/site/writereaddata/siteContent/202006151236284892NK-Paulis%20Exclusion%20Principle.pdf>
3. http://www.tcm.phy.cam.ac.uk/~bds10/aqp/lec12-14_compressed.pdf

	CHEMISTRY - II	L	T	P	Credits
		4	0	0	4

Course Objective: (Employability)

To learn the basics of spectral analysis and nature of the compound. To understand the properties and applications of carbohydrates, amino acids and proteins. To study the basic nature of halogens and noble gases. To study the properties of aromatic compounds and organic reactions.

UNIT I Analytical Techniques 12

Beer–Lambert’s law (problem) – UV – visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry.

UNIT II Carbohydrates, Amino acids and Proteins 12

Carbohydrates: classification – glucose and fructose – preparation and properties –structure of glucose – Fischer and Haworth cyclic structures.

Amino acids and proteins: Amino acids – Classification based on structure.

Essential and non – essentials amino acids – preparation, properties and uses – peptides (elementary treatment only) – proteins – Classification based on physical properties and biological functions. Structure of proteins – primary and secondary (elementary treatment).

UNIT III Aromaticity and Preparation of Aromatic Compounds 12

Aromaticity-Huckel’s rule-resonance in benzene –electrophilic substitution in aromatic compounds-general nitration, sulphonation, chlorination - Friedelcraft’s alkylation and acylation- polynuclear hydrocarbons – naphthalene, anthracene and phenanthrene – preparation, properties and uses.

UNIT IV Halogens and Nobel Gases 12

Comparative study of F, Cl, Br, I– elements reactivities, hydrogen halides, oxides and oxyacids. Exceptional properties of Fluorine. Electronic configuration and position of halogens in the periodic table. Applications, clathrates and compounds of xenon, hybridization and geometries of XeF₂, XeF₄, XeOF₄.

UNIT V Photosynthesis and Toxicity 12

Chloroplast- light reactions – structure of chlorophyll- Photosynthesis – Reactions – Type I and Type II photosynthetic reactions – Role of Manganese complex in evolution of oxygen Toxicity – Hg, Cd, Zn, Pb, and As.

TOTAL HOURS: 60

COURSE OUTCOME

At the end of this course the students will be able to,

CO1: Apply the principle and application of UV-Visible and IR Spectroscopy.

CO2: Demonstrate the structure of Carbohydrates, Aminoacids and Proteins.

CO3: Identify aromaticity and Preparation of Aromatic Compounds.

CO4: Analyze the properties and uses of Halogens and Nobel Gases.

CO5: Demonstrate the reaction of Photosynthesis and Toxicity.

Text Books

1. P. L. Soni, “Text Book of Organic Chemistry” Sultan Chand & sons. 32nd edition. 2013
2. R. D. Madhan, “Modern Inorgnaic Chemistry” S. Chand & Co., 6th edition 2012
3. Lippard and Berg, “Principle of Bioinorganic Chemistry” –University- Science Book 7th edition, 1994

Reference Books

1. Robert Thornton Morrison, Robert Neilson Boyd, “Organic Chemistry” Ashok K. Ghosh 10th edition, 2013
2. James E. Huheey, Ellen, A. Keiter, Richard, L. Keiter, “Inorganic Chemistry” Pearson education (Singapore Pvt Limited) 9th edition, 2013

Web Sources:

1. <https://www.slideshare.net/Arrehome/halogens-and-noble-gases>
2. <https://www.slideshare.net/mnikzaad/plants-nutrients-and-deficiency-toxicity-symptoms>

	PRACTICAL PHYSICS - IV	L	T	P	Credits
		0	0	4	2

Course Objective: (Skill Development)

To enable the student to explore the field of electricity and mechanics of solids. To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.

Any 10 Experiments

1. Rigidity modulus - Static torsion
2. Lamis Theorem
3. Young's modulus- Cantilever/Stretching (pin & microscope)
4. Post office box – Temperature coefficient
5. Metre bridge experiment
6. Spectrometer – i-d curve
7. Spectrometer- i-i' curve using prism.
8. Sonometer – AC frequency
9. Potentiometer- Calibration of High range voltmeter
10. LCR series resonance circuit
11. LCR parallel resonance circuit
12. Melde's string

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Determine the refractive index of the prism using spectrometer i-d curve.
 CO2: Analyze the rigidity modulus of a wire by static torsion method.
 CO3: Measure the temperature coefficient of resistance of a given wire by P.O box method.
 CO4: Determine the frequency of the tuning fork by using Sonometer.
 CO5: Construct the calibration of high range ammeter circuit using potentiometer.

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics, 1st Edition, 2015.
2. Biswajit Saha, Practical Physics Book, LAP LAMBERT Academic Publishing, 1st Edition, 2020.

Web Sources:

1. <https://repo.iitbhu.ac.in/db/2016/ir-2016-373/LCR%20Manual.pdf>
2. http://www.stpius.ac.in/crm/assets/download/Practical_paper-2.pdf
3. <https://www.govinfo.gov/content/pkg/GOVPUB-C13-de3deba65157b29e94808d389a27adb2/pdf/GOVPUB-C13-de3deba65157b29e94808d389a27adb2.pdf>

	CHEMISTRY PRACTICAL - II	L	T	P	Credits
		0	0	4	2

Course objective: (Skill Development)

To learn the technique to identify acid radicals and basic radicals of each two with to interfering radicals as well as to prepare simple coordination compounds.

Inorganic Qualitative Analysis

Reactions of mercury, lead, copper, bismuth, cadmium, antimony, tin, ferrous and ferric iron, aluminium, zinc, manganese, cobalt, nickel, calcium, strontium, barium, magnesium, and ammonium; sulphide, carbonate, nitrate, sulphate, chloride, bromide, iodide, fluoride, oxalate, arsenite, phosphate, chromate and borate radicals.

Semimicro analysis of a mixture containing one cation and one anion.

List of Experiments

1. Reaction of simple radicals.
2. Reactions of groups I, II and III cations.
3. Reactions of groups IV, V and VI cations.
4. Analysis of salt mixture – I
5. Analysis of salt mixture – II
6. Analysis of salt mixture – III
7. Analysis of salt mixture – IV
8. Analysis of salt mixture – V
9. Preparation of Ferrous ammonium sulphate.
10. Preparation of tetraamminecopper (II) sulphate.
11. Preparation of potassium trioxalatoluminate.
12. Preparation of potassium trioxalatochromate.

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Make use of the chemicals safely in lab as well as in industry.
 CO2: Utilize the procedure for analyzing an inorganic salt.
 CO3: Analyze the reaction of simple radicals.
 CO4: Identify acid and basic radicals in a simple inorganic salt.
 CO5: Analyze the preparation of simple coordination compounds.

Text Book:

1. Vogel's – "Textbook of qualitative Inorganic Analysis", Longmann, 12th edition, 2011

Reference Books:

1. S. Sundaram and K. Raghavan "Practical Chemistry", S. Viswanathan.Co. 3rd edition 2011
2. J. N. Gurtu and R. Kapoor "Advanced experimental Chemistry", S. Chand and Co. 6th edition, 2010

Web Sources:

1. <https://vlab.amrita.edu/index.php?sub=2&brch=193>
2. <https://icv-au.vlabs.ac.in/>

SEMESTER-V

QUANTUM MECHANICS		L	T	P	Credits
		4	0	0	4

Course Objective: (Employability)

To understand the concepts of matter waves, quantum theory of the hydrogen atom, selection rules and operator formalism of quantum mechanics.

UNIT I Wave properties of particles

12

Inadequacy of classical mechanics–Matter waves–Expression for de Broglie wavelength–Group velocity–Experimental study of matter waves: Davisson and Germer’s experiment–G.P. Thomson’s experiment–Heisenberg’s uncertainty principle–Mathematical proof–Bohr’s complementarity principle.

UNIT II Quantum theory of the hydrogen atom

12

The hydrogen atom–Solution of polar wave and radial equation–Expression for the energy of the electron of the hydrogen atom in the ground state–Normalized wave functions of the hydrogen atom–Significance of various quantum numbers–Electron probability density–Radiative transitions–Selections rules.

UNIT III Schrodinger Equation and its Applications

12

Derivation of time-dependent forms of Schrodinger equation–Time independent Schrodinger equation (steady state form)–Eigen values and Eigen functions–Physical significance of wave function–Applications of Schrodinger’s equation–The particle in a box: Infinite square well potential–Finite square potential well–The barrier penetration problem–Tunnel effect–Linear harmonic oscillator.

UNIT IV Operator formalism of quantum mechanics

12

Postulates of quantum mechanics–Operators in quantum mechanics: momentum, kinetic energy and total energy–Orbital angular momentum operator–Commuting operators–Simultaneous Eigen functions–Theorem of commutativity and simultaneity–Hermitian operator–Properties–Motion of wave packets–Ehrenfest’s theorem–Orthogonality of Eigen functions–Dirac delta function.

UNIT V Scattering and Perturbation theory

12

Introduction–Scattering experiment–Definitions of cross-section–Reduction of the two-body problem into one-body problem–Quantum theory theory–Partial wave analysis–Perturbation theory: time-independent for a non-degenerate energy level–Ground state of Helium.

TOTAL HOURS: 60

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Demonstrate the wave-particle duality and Heisenberg’s uncertainty principle.
- CO2: Identify the solution of polar wave and radial equation.
- CO3: Analyze the postulates and operators formalism of quantum mechanics.
- CO4: Apply the Schrodinger’s equation to particle in a box.
- CO5: Develop the perturbation theory for selected problems in quantum mechanics.

TEXT BOOKS

1. Robert Eisberg and Robert Resnick, Quantum Physics, Wiley, 2nd Edition, 2002.
2. Arthur Beiser, Concepts of Modern Physics, 6th Edition, McGraw Hill Education, 2009.
3. R. Murugesan, Kiruthiga Sivaprasath, Modern Physics, S Chand, Eighteenth Edition, 2016

REFERENCES

1. Thankappan V.K., Quantum Mechanics, 2nd Edition, New Age International (P) Ltd, 1996.
2. Merzbacher E., Quantum Mechanics, 3rd edition, Wiley Publishing, 1998.
3. David J. Griffiths, Introduction to Quantum Mechanics, 2nd Edition, Pearson Publication, 2009.

Web Sources:

1. <https://nptel.ac.in/courses/122/106/122106034/>
2. <https://nptel.ac.in/courses/115/102/115102023/>
3. <https://nptel.ac.in/courses/115/101/115101107/>

SYLLABUS
DISCIPLINE SPECIFIC
ELECTIVE (DSE) COURSES

	LASER PHYSICS & SPECTROSCOPY	L	T	P	Credits
		4	0	0	4

Course Objective: (Employability)

To enable the students to understand the basic concepts of Lasers. To emphasize the principles involved in various spectroscopes.

UNIT I Fundamentals of Lasers and Types 12

Characteristics of a Laser - Directionality- High Intensity-High Degree of Coherence- Spatial and temporal coherence- Spontaneous and stimulated emission - Einstein's coefficients- Absorption - Amplification of radiation- Population Inversion- Laser pumping- Resonance cavity- Threshold condition for Laser emission - Ruby Laser-He-Ne Laser - Nd-YAG laser- CO₂ laser, Applications of Laser.

UNIT II Control of Laser Properties and Production 12

Resonators - Vibration modes of resonators- Number of modes/unit volume - Open resonators- Control resonators - Q Factor- Losses in the cavity - Threshold condition - Quantum Yield – Mode locking (active and passive) - Q Switching.

UNIT III Microwave Spectroscopy 12

Rotation of molecules-Rotational Spectra-Rigid and non-rigid diatomic rotator-Intensity of spectral lines- Isotopic Substitution-Poly atomic molecules (Linear and symmetric top)-Hyperfine structure and quadrupole effects-Microwave Spectroscopy-Techniques and instrumentation.

UNIT IV Infra-Red Spectroscopy 12

Basic Theory- Vibration of molecules-Diatomic vibrating rotator-vibrational rotational spectrum -Influence of rotation on the vibrational spectrum of linear and symmetric top and poly atomic molecules -Instrumentation- Sample Handling- Characteristic Vibrational Frequencies- Overtones- Combination bands and Fermi Resonance-FTIR.

UNIT V Resonance Spectroscopy 12

NMR - Basic principles - Classical and quantum mechanical description- Bloch equations - Spin-spin and spin-lattice relaxation times – Chemical shift and coupling constant. ESR: Basic principles – ESR spectrometer – Nuclear interaction and hyperfine structure –relaxation effects – g-factor – Characteristics – Free radical studies and biological applications.

TOTAL HOURS: 60

COURSE OUTCOME

At the end of this course the students will be able to,

CO1: Illustrate the fundamental and operation principle of modern lasers.

CO2: Apply the laser operation principles to atom and molecular physics, solid state physics, quantum mechanics and physical optics.

CO3: Identify the applications of modern laser spectroscopic techniques.

CO4: Interpret the working principles and taking spectrum of IR spectroscopy device.

CO5: Examine the properties of different materials by applying the basic principles of NMR and ESR spectroscopy.

Text Books

- Colin Banwell and McCash, Fundamentals of Molecular Spectroscopy, TMH Publishers, 4th Edition, 2002.
- R. Murugesan - Optics & Spectroscopy, S. Chand & Co., New Delhi

References

- SuneSvanbag, Atomic and Molecular Spectroscopy: Basic Aspects and Practical Applications, Springer, 3rd Edition, 2001.
- Jeanne L Mc Hale, Molecular Spectroscopy, Pearson Education, 1 Indian Edition, 2008.
- Aruldas G., Molecular Structure and Spectroscopy, Prentice Hall of India, 2001.

Web Sources:

- <https://nptel.ac.in/courses/104/106/104106122/>
- <https://nptel.ac.in/courses/104/104/104104085/>
- <https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cy13/>

	NUCLEAR PHYSICS	L	T	P	Credits
		4	0	0	4

Course Objective: (Employability)

To make the student understand the principles of nuclear physics. To enable the student to explore the field of nuclear structure. To understand the concept of radioactivity, nuclear fission and fusion. To understand the elementary particles and their interactions.

UNIT I Structure of Nuclei 12

Structure of nucleus – Classification of nuclei – Nucleus properties - Nuclear size –Density – Charge – Nuclear magnetic moment - Electric quadrupole moment - Atomic mass unit and binding energy - Mass defect and packing fraction –Nuclear Model – Liquid drop model – Shell model – Magic numbers.

UNIT II Radioactivity 12

Natural radioactivity - α , β and γ decays – properties - Activity – α -decay - Geiger-Nuttall law - Gamow's theory of α decay - β -decay - Continuous β -spectrum - Neutrino hypothesis - Gamma rays-origin of the gamma rays - Internal conversion - Fundamental laws of radioactivity – Law of radioactive disintegration - Half-life period and mean life - Radioactive dating.

UNIT III Nuclear Detectors & Accelerators 12

Principle and working - solid state detector - proportional Counter - Wilson's cloud chamber - Scintillation counter. Accelerators: Synchrocyclotron - Synchrotron - Electron synchrotron - proton synchrotron - Betatron.

UNIT IV Nuclear Fission and Fusion 12

Nuclear fission – Energy released in Fission – Bohr and Wheelers theory of Nuclear fission – Chain reaction – Multiplication factor – Critical size – Atom Bomb – Nuclear reactor – Nuclear fusion – Source of Stellar energy – Carbon Nitrogen cycle – Proton-Proton cycle – Hydrogen bomb – Controlled thermo nuclear reactions.

UNIT V Elementary Particles 12

Classification of elementary particles - types of interaction - Elementary particle quantum numbers - symmetry and conservation laws - hadrons - leptons - baryons - mesons - strangeness - hyperons - antiparticles - Basic ideas about quarks - Types of quarks - Three generations of quarks and leptons.

TOTAL HOURS: 60

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Demonstrate the knowledge of fundamental aspects of the structure of the nucleus.
- CO2: Utilize the radioactive decay, nuclear reactions and the interaction of radiation.
- CO3: Develop the various types of nuclear detectors and accelerators.
- CO4: Apply the knowledge of nuclear fission and fusion reactions.
- CO5: Identify the different kinds of interactions between elementary particles.

Text Books

1. D. C. Tayal, Nuclear Physics, Himalaya Publishing House, 2009
2. S. N. Ghoshal, Nuclear Physics, S. Chand & Co., Edition, 2003.

References

1. M. L. Pandya& R. P.S. Yadav, Elements of Nuclear Physics, KedarNath& Ram Nath, 2000.
2. Satya Prakash, Nuclear Physics, APragatiPrakasan Publication, 2011.
3. Jahan Singh, Fundamentals of Nuclear Physics, APragati Publication, 2012.

Web Sources:

1. <https://nptel.ac.in/courses/115/104/115104043/>
2. <https://nptel.ac.in/courses/112/103/112103243/>
3. <https://nptel.ac.in/courses/115/103/115103101/>

	ANALOG & DIGITAL ELECTRONICS	L	T	P	Credits
		3	0	0	3

Course Objective: (Employability)

To understand the concept of diodes and transistors. To familiarize the operation of amplifiers. To understand the basic concepts of number systems. To develop the digital concepts using logic gates. To apply digital concepts in sequential logic systems. To study operational amplifiers and clocks.

UNIT I Diode Characteristics and Applications 9

Zener Diode and its breakdown mechanism - voltage regulator - Half wave and full wave rectifier and their efficiency calculation - Ripple factor - Equivalent circuit – linear circuit analysis - Tunnel diode - Varactor diode - Gunn diode – Photo diode - LED.

UNIT II Transistor Characteristics and Biasing Techniques 9

Transistor-Transistor characteristics - CB, CE, CC - comparison between the three configurations - basic CE amplifier circuit -selection of operating point - need for bias stabilization - requirements of a biasing circuit - fixed bias - voltage divider biasing circuit -Types of FET - JFET - working principle - symbol - comparison with bipolar transistor - output characteristics - JFET parameters.

UNIT III Amplifiers 9

Single stage transistor amplifier - BJT, FET – Single stage amplifier-Multistage amplifier – graphical method - equivalent circuit method - gain of a multistage amplifier - RC and transformer coupling - frequency response curve of an RC coupled amplifier - analysis of two stage RC coupled amplifier - classification of amplifiers - single ended and power amplifier - push pull amplifier.

UNIT VI Number Systems and Logic Gates 9

Number Systems and Logic Gates: Different Number Systems -Binary, Octal and Hexa-decimal. Conversion between the number systems. Different Digital codes - ASCII, BCD, Gray codes. Basic logic gates: AND, OR, NOT, NOR, NAND, Ex-OR (Symbol, Truth-table, Circuit diagram, Working) Boolean algebra and K-Maps, Introduction, SOP and POS form of Boolean function, Karnaugh Map simplification (upto 4 variables), implementations of SOP and POS form using NAND, NOR gates

UNIT V Combinational and Sequential Circuits 9

Half adder, full adder, 8421 adders, 1's and 2's complement adders/subtractor, Excess 3 adder, multiplexer, demultiplexer, encoders and decoders, Flip-Flop (RS, JK, Master Slave JK, D and T-Type) Shift Register, Binary Counter, Modulo- N counter, up-down counter.

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Illustrate the properties and applications of semiconductor diodes.
- CO2: Analyze the rectifier and regulator circuits.
- CO3: Design and implement combinational logic circuits using reprogrammable logic devices.
- CO4: Demonstrate the programs of digital to analog and analog to digital conversion.
- CO5: Create circuits to solve clocked Flip-Flops problems.

Text Books:

1. Basic Electronics (Solid state), B.L. Theraja, S. Chand & Co., (2000)
2. Principles of Electronics, Metha, V.K. S. Chand & Co., (2001)
3. Digital Principles and Applications, Malvino and Leach, TMH.

Reference Books:

1. Digital Electronics, Avinash Kapoor &Maheswari, Principles and Practice.
2. Digital Electronics, A.P. Godse, Technical Publisher, Pune.

Web Sources:

1. <https://nptel.ac.in/courses/117/107/117107095/>
2. <https://nptel.ac.in/courses/117/101/117101106/>
3. <https://nptel.ac.in/courses/108/105/108105113/>

	MICROPROCESSOR	L	T	P	Credits
		3	0	0	3

Course Objective: To understand the architecture of 8085 and to impart the knowledge about the instruction set.

UNIT I Architecture 9

Architecture of 8085 – registers, flags, ALU, address and data bus, demultiplexing address/data bus – control and status signals – control bus, Programmer’s model of 8085 – Pin out diagram – Functions of different pins.

UNIT II Programming Techniques 9

Instruction set of 8085 – data transfer, arithmetic, logic, branching and machine control group of instructions – addressing modes – register indirect, direct, immediate and implied addressing modes. Assembly language & machine language – programming techniques: addition, subtraction, multiplication, division, ascending, descending order, largest and smallest (single byte)

UNIT III Interfacing memory to 8085 9

Memory interfacing – Interfacing 2kx8 ROM and RAM, Timing diagram of 8085 (MOV Rd, Rs – MVI R, data (8)).

UNIT IV Interfacing I/O Ports to 8085 9

Interfacing input port and output port to 8085 – Programmable peripheral interface 8255 – Flashing LEDs – Stepper Motors - Keyboards.

UNITV Interrupts 9

Interrupts in 8085 - hardware and software interrupts – RIM, SIM instructions – Priorities – Simple polled and interrupt controlled data transfer.

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Demonstrate the interfacing of various peripheral devices with the microprocessor.
- CO2: Identify the use of hardware and software interrupts with suitable examples.
- CO3: Develop the assembly language and machine language in microprocessors.
- CO4: Construct the architecture of 8085 microprocessor programming techniques.
- CO5: Develop the everyday life useful microprocessor based applications.

Text Books:

1. R. S. Gaonkar, Microprocessor Architecture programming and application with 8085/8080A, Wiley Eastern Ltd., 1992.
2. V. Vijayendran and S.Viswanathan, Fundamental of microprocessor 8085 by Publishers, Chennai, 2003.
3. B. Ram – Dhanpat, Fundamentals of Microprocessors and microcomputers, RAI publication.

References:

1. AdityaMathur, Introduction to microprocessor Tata McGraw Hill Publishing Company Ltd., 1987.
2. Douglas V. Hall, Microprocessor and digital system, 2nd Edition - McGraw Hill Company, 1983.

Web Sources:

1. <https://nptel.ac.in/courses/108/103/108103157/>
2. <https://nptel.ac.in/courses/108/107/108107029/>
3. <https://nptel.ac.in/courses/117/104/117104072/>

	DISCIPLINE SPECIFIC ELECTIVE PRACTICAL- I	L	T	P	Credits
		0	0	4	2

Course Objective: (Skill Development)

To enable the student to explore the field of analog and digital electronics. To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.

Any 10 Experiments

1. Transistor characteristics Common Emitter.
2. Regulated power supply using Zener diode characteristics.
3. PN junction diode characteristics.
4. Dual power supply using IC.
5. OP AMP- Inverting amplifier, Non-inverting amplifier and Unity follower.
6. Basic gates (OR, AND, NOT, NOR, NAND and XOR).
7. Verification of Associative laws for AND and OR gates.
8. K-map reduction and logic circuit implementation.
9. Verification of DeMorgan's laws.
10. NAND as universal gate.
11. NOR as universal gate.
12. Half adder and Half subtractor.
13. Astable multivibrator using IC555

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Construct and verify the operations of basic logic gates.
CO2: Construct and verify the operations of universal logic gates.
CO3: Analyze the working operation of D/A convertor and A/D convertor.
CO4: Construct and verify the characteristics of operational amplifier using IC741.
CO5: Design and verify the operations of astable and monostable multivibrator using IC555.

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics, 1st Edition, 2015.
2. Biswajit Saha, Practical Physics Book, LAP LAMBERT Academic Publishing, 1st Edition, 2020.

Web Sources:

1. <https://vlab.amrita.edu/?sub=1&brch=282&sim=1207&cnt=1>
2. <http://vlabs.iitkgp.ac.in/dec/>
3. <http://vlabs.iitkgp.ac.in/be/>

	SOLID STATE PHYSICS	L	T	P	Credits
		5	0	0	5

Course Objective: Employability)

The course is to understand the basic knowledge on crystal structures and crystal systems. To understand the various techniques available in X-Ray Crystallography. To acquire the knowledge of bonding in solids and Lattice waves. To comprehend the concepts of dielectric properties of solids and superconductivity.

UNIT I Crystal Physics 15

Crystalline and amorphous solids- Lattice and basis-Unit cell and primitive cell-Crystal systems- Bravais lattice - Cubic Crystal system - Simple - Body centered and face centered cubic lattices-Hexagonal close packed - Miller indices -Interplanar spacing.

UNIT II Bonding in Solids 15

Types of bonds in crystals – Ionic, covalent, metallic, Van-der-Waal’s and hydrogen bonding – characteristic of various bonding – cohesive energy of cubic ionic crystals – Madelung constant for sodium chloride crystal – Phonons – monoatomic one-dimensional lattice – specific heat of solids – Einstein’s theory – Debye theory.

UNIT III Free Electron Theory of Metals 15

Free electron theory – Drude Lorentz theory – Explanation of Ohm’s law – Electrical conductivity – Thermal conductivity –Wiedemann and Franz law – Hall effect – Hall voltage and Hall coefficient – Mobility and Hall angle – Importance of Hall effect – Experimental determination of Hall coefficient.

UNIT IV Dielectrics and Superconductivity 15

Dielectrics- Dielectric constant and displacement vector – Polarization – Types of polarization – Clausius-Mossotti relation– Superconductivity - Occurrence of superconductivity – Destruction of superconductivity by magnetic fields – Meissner effect - Type I and Type II superconductors – London equation – Josephson effect – Elements of BCS theory –Application of superconductors.

UNIT V Magnetic Properties 15

Different types of magnetic materials - classical theory of diamagnetism (Langevin theory) - Langevin theory of paramagnetism - Weiss theory of paramagnetism – Heisenberg interpretation on internal field and quantum theory of ferromagnetism - Antiferromagnetism - Hard and soft magnetic materials.

TOTAL HOURS: 75

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Apply the knowledge of crystal systems and spatial symmetries.
- CO2: Analyze the different types of matter depending on nature chemical bonds and their properties.
- CO3: Identify the lattice vibration phenomenon and thermal properties of solids.
- CO4: Analyze the characteristic features of different types of magnetic materials.
- CO5: Develop the applications of dielectric and superconducting materials.

Text Books

1. Pillai S.O., Solid State Physics, 6th Edition, New Age Science, 2013.
2. Charles Kittel, Introduction to Solid State Physics, Wiley, 2005.

References

1. Ashcroft W and Mermin N.D., Solid State Physics, Holt-Rinehart-Winston, 1976.
2. Blakemore J. S., Solid State Physics, 2nd Edition, Cambridge University Press, Cambridge, 1974.
3. Dekker A. J., Solid State Physics, Mac Millan, 1971.

Web Sources:

1. <https://nptel.ac.in/courses/115/104/115104109/>
2. <https://nptel.ac.in/courses/113/104/113104014/>
3. <https://nptel.ac.in/courses/115/105/115105122/>

	NANOMATERIALS AND APPLICATIONS	L	T	P	Credits
		4	1	0	5

Course Objective: (Employability)

To make the student understand the basic concepts in nanoscience. To enable the student to explore the field of nanomaterials. To acquire knowledge on the various applications of nanotechnology.

UNIT I Basics of Nanoscience 15

Basics of nanophase materials - Difference between bulk and nanoscale materials and their significance – Quantum confinement effect - Optical property - Magnetic property and electronic property - Size dependent behavior – Mechanical properties of Nanomaterials and Chemical properties of Nanoparticles.

UNIT II Classes of Nanomaterials 15

Classification of nanomaterials - Quantum dots - Quantum Wires - Quantum wells - Bucky balls - Carbon nanotubes (CNT) - Single walled and Multi walled CNT-Structure - Fullerenes/Bucky Balls/ C60 – Graphene – Nanocomposites.

UNIT III Synthesis of Nanomaterials 15

Top-down approach – Nanolithography - Soft lithography and hard lithography - E-beam lithography – Ball milling – Bottom-up approach - Physical Vapor deposition (PVD) - Chemical Vapor Deposition(CVD) – Sol-gel processing and Hydrothermal methods.

UNIT IV Characterization of Nanomaterials 15

X-Ray Diffraction (XRD) – Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) - Atomic Force Microscope (AFM) – UV-Vis absorption spectroscopy – Brunauer–Emmett–Teller (BET) Surface area analysis – X-Ray Photoelectron Spectroscopy (XPS).

UNIT V Applications of Nanomaterials 15

General applications of nanophase materials - Environment - Photocatalysis and waste water treatment - Energy Storage - Solar Cells and Fuel cells - Battery and Supercapacitor - Electronics - Nano Electro Mechanical Systems (NEMS) - Biomedical applications.

TOTAL HOURS: 75

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Demonstrate the general concepts and physical phenomena of relevance within the field of nanoscience.
- CO2: Identify the different types of nanostructures based on their dimensionality.
- CO3: Select the facile synthesis methods for nanostructured materials.
- CO4: Examine the various characterization techniques for synthesized nanomaterials.
- CO5: Analyze the various applications of prepared nanoscale materials.

Text Books

1. Pradeep T., Fundamentals of Nanoscience and Nanotechnology, McGraw Hill, 2012.
2. Chris Binns, Introduction to Nanoscience and Nanotechnology, 1STEdition, Wiley- Publication, 2010.

References

1. Gabor L. Hornyak, H. F. Tibbals, Joydeep Dutta, John J. Moore, Introduction to Nanoscience and Nanotechnology, CRC Press, 2008.
2. Chattopadhyay K.K., Introduction to Nanoscience and Nanotechnology, APH Publishing Corporation, 2006.
3. Charles P. Poole Jr and Frank J. Owens, Introduction to Nanotechnology, Wiley Interscience, 2007.

Web Sources:

1. <https://nptel.ac.in/courses/118/104/118104008/>
2. <https://nptel.ac.in/courses/118/107/118107015/>
3. <https://nptel.ac.in/courses/118/102/118102003/>

	DISCIPLINE SPECIFIC ELECTIVE PRACTICAL- II	L	T	P	Credits
		0	0	4	2

Course Objective:

To enable the student to explore the field of materials science. To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.

Any 10 Experiments

1. Semiconductor diode laser– To determine the particle size using diffraction method.
2. Determination of wavelength of laser light using semiconductor laser
3. Determination of band gap by Four probe method
4. Dielectric Constant Measurement
5. Characteristics of thermistor.
6. Characteristics of photodiode
7. Characteristics of solar cell
8. Characteristics of phototransistor
9. Comparison of EMF of two given cells-Potentiometer
10. Determination of M and B_H TAN C position-Vibration magnetometer
11. Band gap determination of a thermistor using meter bridge
12. Determination of compressibility of a material using ultrasonic interferometer
13. Spectrometer – Cauchy's constant
14. Copper Voltammeter – Determination of B_H

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Determine the particle size by diffraction method using semiconductor diode laser.
 CO2: Analyze the V-I characteristics of photodiode.
 CO3: Analyze the V-I characteristics of solar cell.
 CO4: Determine the resistivity of a semiconductor material by four probe method.
 CO5: Determine the horizontal component of earth's magnetic field by copper voltammeter.

Text Book

1. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics, 1st Edition, 2015.
2. Biswajit Saha, Practical Physics Book, LAP LAMBERT Academic Publishing, 1st Edition, 2020.

Web Sources:

1. <https://vlab.amrita.edu/?sub=1&brch=282>
2. <https://vlab.amrita.edu/index.php?sub=1&brch=195>
3. <https://vlab.amrita.edu/index.php?sub=1&brch=189>

LOW TEMPERATURE PHYSICS		L	T	P	Credits
		4	0	0	4

Course Objective: To understand the general scientific concepts of low temperature physics. To understand the properties of materials at low temperature. To educate the new techniques available to produce and measure low temperatures. To understand the concept of specific heat and hyperfine properties.

UNIT I Production of Low Temperature

12

Introduction - Joule Thomson effect - Regenerative cooling - Vacuum pumps - liquefaction of air - Hydrogen - Helium - Maintenance of low temperature -production of temperature below 1 K - Adiabatic demagnetization - Evaporative cooling of He-3 - Dilution refrigeration - Laser cooling - Nuclear demagnetization.

UNIT II Measurement of Low Temperature

12

The gas thermometer and its corrections - Secondary thermometers- resistance thermometers, thermocouples- vapour pressure thermometers- magnetic thermometers.

UNIT III Liquid and Solid Cryogenics

12

Liquid Nitrogen - Liquid oxygen - Liquid hydrogen - Liquid He -4 and He -3 - Solid He- 4 and He -3 - Lambda point - Superfluidity - Density - Compressibility factor - viscosity and thermal properties - Velocity of sound in liquid helium.

UNIT IV Electrical and Magnetic Properties

12

Experimental observations - Theories of Sommerfeld and Bloch - Superconductivity - magnetic properties of superconductors - Thermal properties of superconductors - penetration depth and high frequency resistance - Ferromagnetism - Diamagnetism - paramagnetism - Paramagnetic saturation.

UNIT V Specific Heats, Spectroscopic and Hyperfine Properties

12

Specific heats - Rotational specific heat of Hydrogen - Einstein's and Debye's theories -Schottky effect - Anomalies in specific heats at low temperature - Infrared- visible spectra - Zeeman spectra at low temperature - Dielectric constant and its measurement - Magnetic susceptibility - NMR and electron paramagnetic resonance at low temperature - Nuclear magnetic properties - Mossbauer effect and other hyperfine properties at low temperature.

TOTAL HOURS: 60

COURSE OUTCOME

At the end of this course the students will be able to,

CO1: Illustrate the basic concepts of low temperature physics

CO2: Identify the properties of materials at low temperature.

CO3: Apply the new techniques available to produce and measure low temperature.

CO4: Measure the NMR and electron paramagnetic resonance at low temperature.

CO5: Analyze the concept of specific heat and hyperfine properties.

Text Books:

1. Cornelis Jacobus Gorter, D. F. Brewer, Progress in Low Temperature Physics, Elsevier Ltd, 2011.
2. Christian E. and Siegfried H, Low Temperature Physics, Springer, 2005.

References:

1. Jack Ekin, Experimental Techniques for Low-Temperature Measurements, OUP Oxford, 2006.
2. Charles P. Poole Jr., Horacio A. Farach, Richard J. Creswick and Ruslan Prozorov, Superconductivity Elsevier Ltd, 2007.
3. John Wilks, Properties of Liquid and Solid Helium, Oxford University Press, 1967.
4. Jackson L.C., Low Temperature Physics, Methuen and Company, 1962.
5. Ching Wu Chu and J. Woollam, High Pressure and Low Temperature Physics, Plenum Press, 1978.

Web Sources:

1. <https://slideplayer.com/slide/13024029/>
2. <https://www.slideshare.net/AkelRidha/superconductivity-a-presentation>

LASER PHYSICS		L	T	P	Credits
		4	0	0	4

Course Objective: To introduce the physical and engineering principles of laser operation and their applications.

UNIT I Fundamentals of LASER 12

Spontaneous emission – stimulated emission – metastable state – Population inversion – pumping – Laser Characteristics

UNIT II Types of LASER 12

Nd-YAG laser - Helium – Neon Laser – Ruby Laser – CO₂ Laser – Semiconductor Laser (homojunction and heterojunction)

UNIT III Industrial Applications of LASER 12

Laser cutting – welding – drilling – Hologram – Recording and reconstruction of hologram

UNIT IV Lasers in Medicine 12

Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment

UNIT V Lasers in Communication 12

Optic fibre communication- Total internal reflection – Block diagram of fibre optic communication system – Advantages of fibre optic communication

TOTAL HOURS: 60

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Illustrate the fundamental and basic characteristics of laser.
- CO2: Classify the types of laser and identify their applications.
- CO3: Demonstrate solid knowledge of modern laser spectroscopic techniques.
- CO4: Examine the medical applications using laser source of light.
- CO5: Analyze the advantages of fibre optic communication using laser source.

Text Books:

1. N. Avadhanulu, An introduction to LASERS, S. Chand & Company, 2001

References:

1. William T. Silfvast, Laser fundamentals, Cambridge University Press – Published in South Asia by foundation books, 23, Ansari Road, New Delhi.
2. K. Thyagarajan and A. K. Ghatak, LASER Theory and Application, Mac millan, India Ltd.

Web Sources:

1. <https://nptel.ac.in/courses/115/102/115102124/>
2. <http://courseware.cutm.ac.in/courses/laser-technology/>
3. <https://nptel.ac.in/courses/104/106/104106122/>

SOLAR TECHNOLOGY			
L	T	P	Credits
4	0	0	4

Course Objective: To learn the fundamentals of Solar Energy Technologies. To learn the solar thermal based energy systems. To learn basic principles and applications of Photovoltaic systems.

UNIT I Solar Radiation 12

Energy emitted by sun and energy that reaches the earth - Sun-Earth Geometry-Solar angles - Angles of incidence- Zenith angle - Azimuthal angle - Hour angle - Latitude and longitude - Solar Spectrum and Solar constant – Extraterrestrial characteristics - Measurement and estimation on horizontal and tilted surfaces.

UNIT II Solar Collectors 12

Solar Collector Basics - Flat plate collector – Evacuated tubular collectors - Concentrator collectors - Tracking systems - Compound parabolic concentrators - Parabolic trough concentrators - Concentrators with point focus.

UNIT II Solar Thermal Technologies 12

Solar heating and cooling system - Principle of working – Types - Design and operation - Thermal Energy storage - Types of thermal Energy Storage systems - Sensible Heat Storage – Liquids - Latent heat Storage - Thermo chemical storage - Solar thermal power plant - Solar Desalination - Solar cooker – Domestic - Community - Solar pond technology - Principle of working and description - Solar drying.

UNIT IV Solar Photovoltaic Fundamentals and Design 12

Semiconductor – Properties – Energy levels – P-N junction - Homo and Hetero junctions – Basic Silicon Solar cell - Efficiency limits – Variation of efficiency with band gap and temperature - Photovoltaic cell – Photovoltaic module – PV array - Solar cell array design concepts – PV system design - Hybrid and Grid connected system – System installation – Operation and maintenances

UNIT V Solar Passive Architecture 12

Passive heating concepts - Direct heat gain – Indirect heat gain - Thermal storage wall - Attached Greenhouse – Isolated gain and sunspaces – Passive cooling concepts - Evaporative cooling – Shading and ventilation - Radiative cooling – Green coupling - Application of wind - Water and earth for cooling – Paints and cavity walls for cooling – Roof radiation traps – Energy efficient landscape design.

TOTAL HOURS: 60

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Interpret the fundamentals of solar energy technologies.
- CO2: Construct the solar heating and cooling system.
- CO3: Analyze the V-I characteristics of PV cells.
- CO4: Design the solar photovoltaic cells and study the installation process.
- CO5: Analyze the fundamental concepts of solar passive architecture.

Text Books:

1. Sukhatme S P and J K Nayak, Solar Energy, Principle of Thermal Storage and Collection, 3rdEdition, Tata McGraw Hill, 2008.
2. Chetan Singh Solanki, Solar Photovoltaics, Fundamentals, Technologies and Applications, PHI Learning Private Limited, 2011.

References:

1. Peter Würfel, Physics of Solar Cells: From Basic Principles to Advanced Concepts, Wiley-VCH, 2009.
2. Jeffrey M. Gordon, Solar Energy: The State of the Art, Earthscan, 2013.
3. Garg H. P. and Prakash J., Solar Energy Fundamentals and application, Tata McGraw- Hill Publishing, 7thReprint 2006.
4. Roger A. Messenger and Jerry Vnetre, Photovoltaic Systems Engineering, CRC Press, 2010.
5. Kalogirou S. A., Solar Energy Engineering: Processes and Systems, 2ndEdition, Academic Press, 2013

Web Sources:

1. <https://nptel.ac.in/courses/115/103/115103123/>
2. <https://nptel.ac.in/courses/115/107/115107116/>
3. <https://nptel.ac.in/courses/112/104/112104300/>

SYLLABUS
GENERIC ELECTIVE
COURSES

BASIC PHYSICS				L	T	P	Credits
				3	0	0	3

Course Objective: To understand the basic concepts of Physics

UNIT I **9**
 Mechanics Force – Weight – Work – Energy – Power – Horsepower – Centrifuge – Washing machine

UNIT II **9**
 Heat Variation of boiling point with pressure – Pressure cooker – Refrigerator – Air Conditioner – Principle and their capacities – Bernoulli principle – Aero plane

UNIT III **9**
 Sound and Optics Sound waves – Doppler effect – Power of lens – Long sight and short sight – Microscope – Telescope – Binocular – Camera

UNIT IV **9**
 Geo Physics and Medical Physics Earthquake – Richter scale – thunder and lightning – Lightning arrestors – Cosmic showers – X-rays – Ultrasound scan – CT scan – MRI scan

UNIT V **9**
 Space science and Communication Newton’s law of gravitation – Weather forecasting and communication satellites – Indian satellites – Electromagnetic spectrum – Radio waves – AM and FM transmission and reception

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Analyze the basic concepts of physics.
- CO2: Demonstrate the working principle of Bernoulli and their applications.
- CO3: Make use of lens, microscope and telescope in optical systems.
- CO4: Analyze the properties and applications of X-rays.
- CO5: Construct the AM and FM transmission and reception circuit.

Text Book

1. The Learner’s series – Everyday science – Published by INFINITY BOOKS, New Delhi
2. The Hindu speaks on Science, Vol I & II, Kasturi & Sons, Chennai

Reference

1. D. Halliday, R. Resnick and J. Walker, Fundamentals of Physics, 637th edition, Wiley, NY (2001).
2. D. Halliday, R. Resnick and K. S. Krane, Physics, Vols I, II, III, 4th Edition, Wiley, New York (1994).
3. R. P. Feynmann, R.B. Leighton & M. Sands, The Feynmann Lectures on Physics Vols I, II, III, Narosa, New Delhi (1998)

Web Sources:

1. <https://www.slideshare.net/tarunjoshi54/electromagnetic-spectrum-its-uses>
2. <https://www.slideshare.net/msdoni/satellites-launched-by-india>
3. <https://slideplayer.com/slide/7442788/>

	EVERYDAY PHYSICS	L	T	P	Credits
		3	0	0	3

Course Objective: To understand the working of things which we use in everyday life

UNIT I **9**

Physics behind Home appliances – Light bulb – Fan – Hair drier – Television – Air Conditioners – microwave ovens – Vacuum cleaners – Dishwasher – Washing machines

UNIT II **9**

How things work – Basic principles – Tape recorder – Taps – Lifts – Submarines – Jet planes – Helicopters – Rockets – fax machines – Pagers – Cellular phones

UNIT III **9**

Demonstration – making a switch board with multiple points – wiring – one lamp controlled by one switch/Two switches – fixing a fuse – soldering – P.C.B Preparation

UNIT IV **9**

Study of resistors, chokes, Capacitors and Transformers – multimeter – Basic principles – measurement of resistance, Voltage AC & DC

UNIT V **9**

Study of astronomy and cosmology – Atmospheric physics – Global warming – Vibrations and waves –Musical sounds and noise pollution – Plasma Physics - Nuclear power plants - Biophysics- Application of the electromagnetic waves in medicine

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Identify the various circuit components and their combinations in a circuit.
- CO2: Analyze the various electrical parameters and their significance involved AC and DC circuits.
- CO3: Identify the electrical symbols and circuits, applying it to power circuits.
- CO4: Utilize the resistors, chokes and capacitors in electrical and electronic devices.
- CO5: Demonstrate the hands-on learning of multimeter, voltmeter and ammeter.

Text Book

1. The Learner’s series – Everyday science – Published by INFINITY BOOKS, New Delhi
2. The Hindu speaks on Science, Vol I & II, Kasturi Ranga Publishers, Chennai Books for

Reference:

1. D. Halliday, R. Resnick and J. Walker, Fundamentals of Physics, 6th edition, Wiley, NY (2001).
2. D. Halliday, R. Resnick and K. S. Krane, Physics, Vols I, II, III, 4th Edition, Wiley, New York (1994).
3. R.P. Feynmann, R.B. Leighton & M. Sands, The Feynmann Lectures on Physics Vols I, II, III, Narosa, New Delhi (1998).

Web Sources:

1. <https://nptel.ac.in/courses/108/105/108105053/>
2. <https://www.youtube.com/watch?v=5cr71HISw6k>
3. <https://www.youtube.com/watch?v=n-CYKFZKxX8>

	ELECTRICAL & ELECTRONIC APPLIANCES	L	T	P	Credits
		3	0	0	3

Course Objective: To know the working of electrical and electronic appliances

- | | | |
|---------------|--------------------------|----------|
| UNIT I | Basic Electricity | 9 |
|---------------|--------------------------|----------|
- Study of resistors and chokes, Capacitors – multimeter – Basic principles – measurement of resistance, Voltage AC & DC - Demonstration – making a switch board with multiple points – wiring – one lamp controlled by one switch/Two switches – fixing a fuse – soldering.
- | | | |
|----------------|--------------------------|----------|
| UNIT II | Basic Electronics | 9 |
|----------------|--------------------------|----------|
- Ammeter, Voltmeter, Galvanometer: principle, construction, and working - Electronic multimeter - Digital voltmeter. Transistors - NPN – PNP – amplifiers.
- | | | |
|-----------------|----------------------------------|----------|
| UNIT III | Structure of Power System | 9 |
|-----------------|----------------------------------|----------|
- Structure of electric power system: generation, transmission and distribution; Types of AC and DC distributors – distributed and concentrated loads – interconnection
- | | | |
|----------------|------------------------------|----------|
| UNIT IV | Electrical Appliances | 9 |
|----------------|------------------------------|----------|
- Transformer - principle - construction details - classification of transformers - testing of transformers Principle and operation of Fans, Wet grinder, Mixie, Water Heater, Electric iron - Refrigerator - Microwave Oven.
- | | | |
|---------------|-------------------------------|----------|
| UNIT V | Electronics Appliances | 9 |
|---------------|-------------------------------|----------|
- Introduction to Semiconductor diode - transistor - LED - LCD - Photo diode - Photo transistor - their uses. Diode rectifiers - half wave and full wave - regulated power supply TV receivers (qualitative study only) - TV antenna’s - Dish antenna.

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Interpret the principle and construction details of transformer.
- CO2: Classify and testing of transformers operation in electrical appliances.
- CO3: Construct the half wave and full wave rectifier circuits.
- CO4: Demonstrate the working of electrical and electronic appliances.
- CO5: Analyze the V-I characteristics of phototransistor.

Books for Study:

1. B. L Theraja, A text book in Electrical Technology, S Chand & Co.
2. A. K. Theraja, A text book of Electrical Technology
3. M. G. Say, Performance and Design of AC Machines, CBS Publishers, 3rd Edition, 2005
4. P. K. Palanichamy, Semiconductor Physics and Opto Electronics, Scitech Publications, 2010
5. B. L. Theraja, Basic Electronics, S Chand & Co.
6. Arokh Singh and A. K. Chhabra, Principles of Communication Engineering, S Chand & Co.

Web Sources:

1. <https://nptel.ac.in/courses/108/101/108101167/>
2. https://www.electronics-tutorials.ws/transistor/trans_4.html

	RENEWABLE ENERGY SOURCES	L	T	P	Credits
		3	0	0	3

Course Objective: To understand the concepts of renewable energy sources

UNIT-I **9**

Fossil fuels - their limitations - need for renewable energy - non-conventional energy sources - solar energy - wind energy - wind mills - types - biomass - biochemical conversion - biogas generation - ocean thermal energy conversion - geothermal energy tidal energy - fuel cells.

UNIT-II **9**

Solar energy - importance - storage of solar energy - solar pond - non-convective solar pond - applications of solar pond - applications of solar energy, solar water heater, flat plate collector - solar distillation - solar cooker, drier - solar greenhouses - solar cell - absorption air conditioning - LiBr-H₂O system

UNIT-III **9**

General characteristics - Definitions - Methods of classifications – Thermal energy storage - Sensible heat storage - Liquids - Solids - Latent heat storage - Thermal and chemical storage

UNIT-IV **9**

Performance analysis - -Transmissivity of the cover system based on reflection - Refraction - Absorption - Transmissivity for diffuse radiation - Transmissivity - Absorptivity product

UNIT-V **9**

Photovoltaic conversion - Principle and working of solar cells - Conversion efficiency - Single crystal silicon – Polycrystalline and amorphous silicon--Cadmium sulphide - Cadmium telluride

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Analyze the basic concepts of renewable energy sources.
- CO2: Interpret the environmental issues and sustainability of renewable energy sources.
- CO3: Demonstrate the various resources and technologies for Geothermal and Hydropower energy.
- CO4: Demonstrate the recent advancements in ocean energy applications.
- CO5: Analyze the various applications of solar energy process.

Books for study:

1. G.D. Rai, Non- Conventional Energy Sources, Khanna Publishers, 2011
2. D.P. Kothari, K.C. Singal & Rakesh Ranjan, Renewable energy sources and emerging Technologies, Prentice Hall of India Pvt. Ltd., New Delhi, 2008.

Web Sources:

1. <https://www.slideshare.net/nirajsolanki33/photovoltaic-power-conversion-systems>
2. https://www.slideshare.net/ms_optimisstic/solar-energy-7541878
3. <https://www.slideshare.net/saranraj107/solar-energy-storage-and-its-applications-ii>

	ENERGY PHYSICS	L	T	P	Credits
		4	0	0	4

Course Objective: (Employability)

To make the students to understand the present-day crisis of need for conserving energy and alternatives are provided.

UNIT I Conventional Energy Sources 12
 Conventional Energy Sources - Coal – Oil – Gas – Agriculture and Organic Wastes – Water Power – Nuclear Power – thermal Power

UNIT II Non-Conventional Energy Sources 12
 Non-Conventional Energy Sources - Solar Energy – Wind Energy – Energy from Bio Mass and Bio-Gas – Ocean Energy – Tidal Energy – Geo Thermal Energy – Advantages of Renewable Energy

UNIT III Solar Energy 12
 Solar Radiation – Solar Constant – Solar Radiation Measurements – Pyrheliometers – Pyranometers – Estimation of Average Solar Radiation – Applications of Solar Energy

UNIT IV Wind Energy 12
 The Nature of Wind – Power in The Wind – Wind Energy Conversion – Basic Components of a Wind Energy Conversion System (WECS)- Advantages and Disadvantages Of WECS.

UNIT V Energy from Biomass 12
 Biomass Conversion Technologies – Wet Process – Dry Process – Photosynthesis – Bio Gas Generation – Bio Gas from Plant Wastes – Methods for Maintaining Biogas Production – Fuel Properties of Bio Gas

TOTAL HOURS: 60

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Illustrate the knowledge about conventional energy sources and the working of thermal and nuclear power plant.
- CO2: Demonstrate the general concepts of non-conventional energy sources and its types.
- CO3: Apply the knowledge of solar energy for domestic purposes.
- CO4: Illustrate the basic concept of wind energy and wind energy conversion system.
- CO5: Analyze the different types of biogas production technique.

Text Books:

1. G.D. Rai, Non- Conventional Energy Sources, Khanna Publishers, 2011
2. D.P. Kothari, K.C. Singal & Rakesh Ranjan, Renewable energy sources and emerging Technologies, Prentice Hall of India Pvt. Ltd., New Delhi (2008).

References:

1. Solar Energies of Thermal Processes, A. Duffie and W. A. Beckmann, John-Wiley, 1980.
2. F. Kreith and J. F. Kreider, Principle of Solar Engineering, McGraw-Hill, 1978
3. S.A. Abbasi and Nasema Abbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd., New Delhi, 2008.

Web Sources:

1. <https://www.slideshare.net/qwertyuidhfjkdsjhnb/ppt-on-sources-of-energy>
2. <https://slideplayer.com/slide/8433535/>

SYLLABUS
ABILITY ENHANCEMENT
COMPULSORY COURSES

COMMUNICATION SKILLS		L	T	P	Credits
		1	0	2	2

Course Objective:

- This course is to subject the students to practice the components in various units. To make students ready for placement interviews within campus.
- To infuse confidence to face job situations.

UNIT I		6
<ul style="list-style-type: none"> • Resume and CV Writing • Complaint Letter • Social Correspondence • Letter of Enquiry 		
UNIT II		6
<ul style="list-style-type: none"> • Short Essay Writing 		
UNIT III		6
<ul style="list-style-type: none"> • Explaining Proverbs 		
UNIT IV		6
<ul style="list-style-type: none"> • Use of Prepositions 		
UNIT V		6
<ul style="list-style-type: none"> • Synonymous Words 		

TOTAL HOURS: 30

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: To enhance learners' confidence level.
 CO2: To make learners' feel the assimilation of skills.
 CO3: To engage in a conversation with others to exchange ideas
 CO4: To impart leadership qualities among the participants.
 CO5: To express opinions to enhance their social skills.

Books Prescribed

- For Unit I – V Effective Communication For You – V. Syamala Emerald Publishers, Chennai.
- Cameron, David. Mastering Modern English, Hyderabad: Orient Blackswan, 1978 (rpt. 1989, 1993, 1995,1998).
- Freeman, Sarah. Written Communication in English, Hyderabad: Orient Blackswan, 1977 (21st Impression,2007).
- Singh, Vandana R. The Written Word. New Delhi: Oxford university Press, 2003 (3rd Impression, 2007)
- Seely, John. Oxford Guide to Effective Writing and Speaking. New Delhi: Oxford University Press, 2000 (4thImpression,2008)

Web Sources:

- <https://www.myperfectresume.com/career-center/resumes/how-to/write>
- <https://www.englishgrammar.org/>
- <https://www.thesaurus.com/browse/>

	ENVIRONMENTAL STUDIES	L	T	P	Credits
		2	0	0	2

Course Objective: (Skill Development)

To inculcate the importance of environmental pollution, preservation of nature and environmental management for human welfare.

UNIT I Multidisciplinary Nature of Environmental Studies, Natural Resources 6

Definition, scope and importance, need for public awareness.

Renewable and non-renewable resources - Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - Role of an individual in conservation of natural resources- Equitable use of resources for sustainable lifestyles.

UNIT II Ecosystems, Biodiversity and its conservation 6

Concept of an ecosystem. - Structure and function of an ecosystem Producers, consumers and decomposers. - Energy flow in the ecosystem. Ecological succession. - Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Introduction–Definition, genetic, species and ecosystem diversity. Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III Environmental Pollution 6

Definition, Cause, effects and control measures of a) Air pollution b) Water pollution c) Soil pollution d) Marine pollution e) Noise pollution f) Thermal pollution g) Nuclear hazards. Solid waste Management. Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management- floods, earthquake, cyclone and landslides.

UNIT IV Social Issues and the Environment 6

From Unsustainable to Sustainable development, Urban problems related to energy - Water conservation, rain water harvesting, watershed management- Resettlement and rehabilitation of people; its problems and concerns. Case Studies - Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Waste land reclamation. Consumerism and waste products. Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act - Issues involved in enforcement of environmental legislation. Public awareness.

UNIT V Human Population and the Environment 6

Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Case Studies.

Field work - Visit to a local area to document environmental assets river/forest/grassland/hill/mountain, Visit to a local polluted site-Urban/Rural/Industrial/Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hill slopes, etc.

TOTAL HOURS: 30

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Identify the various natural resources and the problems associated.
- CO2: Interpret the basic concepts of ecosystems and their types.
- CO3: Analyze the different types of pollution and apply it to control the pollution in our environment.
- CO4: Analyze the concept of climate change and environmental protection act.
- CO5: Apply the knowledge of family welfare program and human rights.

Text Books:

1. De AK, Environmental Chemistry, Wiley Eastern Ltd.
2. Bharucha Erach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, India.
3. Brunner RC, 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480pgs.
4. Clark RS, Marine Pollution, Clarendon Press, Oxford (TB).

Reference Books:

1. Agarwal KC, 2001. Environmental Biology, Nidi Publishers Ltd. Bikaner.
2. Gleick HP, 1993. Water in Crisis, Pacific Institute for Studies in Development, Environment and Security. Stockholm Environmental Institute, Oxford University Press, 473pgs.
3. Heywood VH, and Watson RT, 1995. global Biodiversity Assessment. Cambridge University Press 1140pgs.
4. Jadhav H and Bhosale VM, 1995. Environmental Protection and Laws. Himalaya Publishing House, Delhi 284pgs.
5. McKinney ML and Schoch RM, 1996. Environmental Science Systems and Solutions. Web enhanced edition, 639pgs.
6. Miller TG, Jr. Environmental Science, Wadsworth Publishing CO. (TB)

Web Sources:

1. <https://www.slideshare.net/tanujanautiyal/environmental-pollution-49396262>
2. <https://www.slideshare.net/NayanVaghela/human-population-and-environment-chapter-2>
3. <https://www.slideshare.net/rajenderarutla1/biogeographical-classification-of-india>

SYLLABUS
SKILL ENHANCEMENT
COURSES

SOFT SKILL - I		L	T	P	Credits
		2	0	0	2

Course Objective:

- To enable participants Business Communication Skills
- To enhance participants E-mail writing skills
- To impart Leadership and Team Bonding skills

UNIT I: EFFECTIVE COMMUNICATION SKILLS 6

Talking about your company – Making Polite requests – Introducing yourself and others – Socialising with others – Talking about work activities – Talking about your job– Communication practice – Role plays

UNIT II: WRITTEN BUSINESS COMMUNICATION 6

Essential Email writing skills – Formal and Informal E-mails – Usage of formal language – Report Writing – Writing project reports – Extended writing practice – EmailEtiquette – Understanding Business E-mails

UNIT III: TELEPHONE ETIQUETTE 6

The basics of Telephone Etiquette – Customer Service – Being courteous – Makingarrangements – Giving clear and concise information – Tone and Rate of speech – Pronunciations – Summarisation – Mock Telephonic Conversations

UNIT IV: LEADERSHIP SKILLS 6

Essential Leadership Skills – Interpersonal Skills – Team Building – Team work –Do’s and Don’ts of Leadership skills – Importance of communication in Leadership –Delegating and Handling of Projects

UNIT V: LISTENING AND ANSWERING QUESTION 6

Listening for the main ideas – Listening for details – Listening for specific information – Predicting and listening for opinions – Recognising context – Listening for sequence – Understanding Pronunciation – Listening practice

TOTAL HOURS: 30

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: To enhance participant’s Business Communication Skills
- CO2: To enhance the participant’s Reading, Speaking, Listening and Writingcapabilities
- CO3: To engage in a conversation with others to exchange ideas
- CO4: To impart leadership qualities among the participants
- CO5: To express opinions to enhance their social skills

Books Prescribed

- Raman, M. & Sangeeta Sharma. Technical Communication.OUP.2008
- Taylor, Grant.English Conversation Practice. Tata McGraw Hill Education Pvt. Ltd. 2005
- Tiko, Champa & Jaya Sasikumar. Writing with a Purpose.OUP. New Delhi. 1979

Web Sources:

- <https://www.skillsyouneed.com/ips/communication-skills.html>
- <https://blog.smarp.com/top-5-communication-skills-and-how-to-improve-them>
- <https://blog.hubspot.com/service/phone-etiquette>

	SOFT SKILL - II	L	T	P	Credits
		2	0	0	2

Course Objective:

- To enable students to develop their communication skills effectively
- To enhance students Reading, Writing, Listening and Speaking skills
- To develop their self-confidence through communication

UNIT I: READING COMPREHENSION AND VOCABULARY

6

Reading Techniques – Types of Reading – Skimming – Scanning – Reading for detail – Identifying key words – Underlining unfamiliar key words – Vocabulary Building – Reading Comprehension practice

UNIT II: PRESENTATION SKILLS

6

Presentation Methods – Preparation and Practice – Organising content – Do's and Don'ts of a Presentation – Presentation Techniques – Mock Presentation

UNIT III: GROUP DISCUSSION

6

Introduction to Group Discussion – Preparation for GD – Structure of GD's – Do's and Don'ts – Tips and Strategies – Etiquette and Practice – Body Language and Posture – Sharing Ideas with respect – Understanding Opinions – Mock GD Practice

UNIT IV: CONVERSATIONAL SKILLS

6

Introduction to Small talk – How to start and end a conversation – Exchanging ideas – Expressing Interests – Giving Opinions – Social skills and Etiquette – Informal Conversations – Formal Meetings – Group Practice

UNIT V: SELF – INTRODUCTION AND ROLE PLAY

6

Introducing oneself – Exchange of Greetings – Appropriate Greetings – Usage of Vocabulary – Rapport Building – Handshakes and First Impressions – Basic Etiquette

TOTAL HOURS: 30

COURSE OUTCOME

At the end of this course the students will be able to,

CO1: To get students to understand the importance of communicating in English

CO2: To understand effective communication techniques

CO3: To increase self-confidence through regular practice

CO4: To encourage active participation in their regular class

CO5: To enable participants to face large group of audience with confidence

Books Prescribed:

- English for Competitive Examinations by R.P.Bhatnagar & Rajul Bhargava Macmillan India Ltd. Delhi.
- Carnegie, Dale. The Quick and Easy Way to Effective Speaking. New York: Pocket Books, 1977.
- Kalish, Karen. How to Give a Terrific Presentation. New York: AMACOM, 1996

Web Sources:

- <https://www.skillsyouneed.com/ips/communication-skills.html>
- <https://venngage.com/blog/presentation-skills/>
- <https://gdpi.hitbullseye.com/Group-Discussion.php>

	SOFT SKILL - III	L	T	P	Credits
		2	0	0	2

Course Objective:

- To enable students to develop their soft skills and Body Language
- To enhance students Reading, Writing, Listening and Speaking skills
- To develop their self-confidence to excel at Interviews

UNIT I: SKILL ENHANCEMENT

6

Time Management – Planning and Organisation – Scheduling – Prioritization – Delegation – Task Management – Stress Management – Overcoming anxiety – Confidence Building – Body Language

UNIT II: RESUME / COVER LETTER WRITING

6

SWOT Analysis – Details and Resume Writing – Resume Examples – Building Resume using SWOT – Writing Resume – Writing Cover Letter – Resume Correction – Resume Feedback

UNIT III: INTERVIEW SKILLS

6

Interview Do's and Don'ts – First Impression – Grooming – Body Language – Frequently asked questions – Useful Language – Mock Interview

UNIT IV: QUANTITATIVE ABILITY

6

Permutation & Combinations – Probability – Profit & Loss – Ratio Proportions & Variations – Cubes – Venn Diagrams – Logical Reasoning – Critical Reasoning

UNIT V: REVISIONARY MODULES

6

Group Discussions – HR Process – Interview Process – Mock Group Discussions

TOTAL HOURS: 30

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: To develop participants social and professional skills
- CO2: To help participants manage time effectively
- CO3: To build a strong resume to suit corporate requirements
- CO4: To face interviews confidently
- CO5: To enhance their aptitude abilities

Books Prescribed:

- Meena. K and V.Ayothi (2013) A Book on Development of Soft Skills (Soft Skills: A Road Map to Success) P.R. Publishers & Distributors.
- Soft Skills – Know Yourself & Know the World, S.Chand & Company LTD, Ram Nagar, NewDelhi
- Prasad, H. M. How to Prepare for Group Discussion and Interview. NewDelhi: Tata McGraw-Hill Publishing Company Limited, 2001.
- Pease, Allan. Body Language. Delhi: Sudha Publications, 1998.

Web Sources:

- <https://www.skillsyouneed.com/ips/communication-skills.html>
- <https://www.businessnewsdaily.com/5836-top-interviewing-skills.html>
- <https://gdpi.hitbullseye.com/Group-Discussion.php>

NATIONAL SERVICE SCHEME - I			L	T	P	Credits
			2	0	0	2

Course Objective: (Skill Development)

To aim of this course is to enable the students to utilize their knowledge in finding practical solutions to individual and community problems.

Unit -I: Introduction and Basic Concepts of NSS 6

- a) History, philosophy, aims & objectives of NSS
- b) Emblem, flag motto, song, badge etc.,
- c) Organizational structure, roles and responsibilities of various NSS Functionaries

Unit-II: NSS Programmes and Activities 6

- a) Concept of regular activities, special camping, Day Camps
- b) Basis of adoption of village/slums, Methodology of conducting Survey
- c) Financial pattern of the scheme
- d) Other youth prog./schemes of GOI
- e) Coordination with different agencies
- f) Maintenance of Diary

Unit-III: Understanding Youth 6

- a) Definition, profile of youth, categories of youth
- b) Issues, challenges and opportunities for youth
- c) Youth as an agent of social change

Unit-IV: Community Mobilization 6

- a) Mapping of community stakeholders
- b) Designing the message in the context of the problem and culture of the community
- c) Identifying methods of mobilization
- d) Youth – adult partnership

Unit -V: Volunteerism and Shramdan 6

- a) Indian Tradition of volunteerism
- b) Needs & Importance of volunteerism
- c) Motivation and Constraints of Volunteerism
- d) Shramdan as a part of volunteerism

TOTAL HOURS: 30

COURSE OUTCOME

At the end of this course the students will be able to,

CO1: Illustrate the community in which they work and their relation.

CO2: Demonstrate national integration and social harmony

CO3: Apply their knowledge in finding practical solutions to individual and community problems.

CO4: Identify the needs and problems of the community and involve them in problem-solving.

CO5: Develop capacity to meet emergencies and natural disasters.

Reference Books:

1. National Service Scheme Manual, Government of India.
2. Orientation Courses for N.S.S. Programme officers, TISS.
3. Case material as Training Aid for field workers, Gurmeet Hans.

Web Sources:

1. <http://www.igntu.ac.in/Download/aboutNSS.pdf>
2. <https://vikaspedia.in/education/childrens-corner/national-service-scheme>

	NATIONAL SERVICE SCHEME - II	L	T	P	Credits
		2	0	0	2

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

Unit-I: Importance and Role of Youth Leadership **6**

- a) Meaning and types of leadership
- b) Qualities of good leaders; traits of leadership
- c) Importance and role of youth leadership

Unit-II: Life Competencies **6**

- a) Definition and importance of life competencies
- b) Communication
- c) Inter Personal
- d) Problem – solving and decision-making

Unit-III: Social Harmony and National Integration **9**

- a) Indian history and culture
- b) Role of youth in peace-building and conflict resolution
- c) Role of youth in Nation building

Unit-IV: Youth Development Programmes in India **9**

- a) National Youth Policy
- b) Youth development Programmes at the National level, State Level and Voluntary sector
- c) Youth-focused and Youth –led organizations

Project work /Practical

Conducting Surveys on special theme and preparing a report thereof.

TOTAL HOURS: 30

COURSE OUTCOME

At the end of this course the students will be able to,

- CO1: Interpret the importance and role of youth leadership.
- CO2: Demonstrate national integration and social harmony
- CO3: Identify the approach of problem solving and decision making in a critical solution for an issue.
- CO4: Analyze the significance of national youth policy in India.
- CO5: Develop the knowledge about NSS and its role in the field of health so as to build a strong country.

Reference Books:

1. Training Programme on National Programme scheme, TISS.
2. National Service Scheme Manual, Government of India.
3. Orientation Courses for N.S.S. Programme officers, TISS.

Web Sources:

1. <http://www.igntu.ac.in/Download/aboutNSS.pdf>
2. <https://vikaspedia.in/education/childrens-corner/national-service-scheme>

	PHYSICS WORKSHOP SKILL	L	T	P	Credits
		3	0	0	3

Course Objective: The aim of this course is to enable the students to familiar and experience with various mechanical and electrical tools through hands-on mode

UNIT –I Introduction: Measuring units

9

Conversion to SI and CGS. Familiarization with meter scale, Vernier caliper, 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

9

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 - Cutting of a metal sheet using blade. Smoothing 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 –III Cathode Ray Oscilloscope

9

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 - Specifications of a CRO and their significance.

UNIT –IV Introduction to prime movers

9

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.

UNIT –V Electrical and Electronic Skill

9

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

TOTAL HOURS: 45

COURSE OUTCOME

At the end of this course the students will be able to,

CO1: Illustrate the various mechanical and electrical tools through hands-on mode.

CO2: Identify the functions of digital multimeter and CRO in the measurement of physical variables.

CO3: Demonstrate the use of different fitting tools like work holding, marking, cutting and miscellaneous.

CO4: Identify the use of safety equipment during workshop practice.

CO5: Demonstrate the basic concepts of timer circuit and electronic switch using transistor.

Reference Books:

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

Web Sources:

1. https://www.electronics-tutorials.ws/transistor/tran_4.html
2. <https://www.electricalengineeringinfo.com/2016/03/cathode-ray-oscilloscope-cro-construction-of-cathode-ray-oscilloscope-cro.html>

	PERSONALITY DEVELOPMENT	L	T	P	Credits
		2	0	0	2

Course Objective: To make the Aware about the importance of personality and Development in the Business world. To make the students follow the good personality and create a good relationship with others.

UNIT –I Personality Development – Introduction: 6

The concept personality – Dimensions of personality – Term personality Development – Significance.

The concept of success and failure What is success? – Hurdles in achieving success – Overcoming Hurdles – Factors responsible for success – What is failure – Causes of failure – Do’s and Don’ts Regarding success and failure.

UNIT – II Attitudes and Values 6

Attitude – Concept – Significance – Factors affecting attitudes – Positive Attitude – Advantages – Negative attitude – Disadvantages – Ways to develop positive attitude – Difference between personalities having positive and negative attitude.

UNIT – III Motivation 6

Concept of motivation – Significance – Internal and external motives – Importance of self – motivation – Factors leading to Demotivation – Theories to motivation.

UNIT – IV Self Esteem and Smart 6

Term self-Esteem – Symptoms – Advantages – Do’s and Don’ts to develop positive Self – Esteem- Low self Esteem – Symptom – Personality having low self esteem – Positive and negative self esteem. Interpersonal relationships – Teaming – Developing positive personality – Analysis of strengths and weakness. Concept of goal- setting – Importance of goals – Dream vs Goal – Why goal – Setting fails? – Smart (Specific, Measurable, Achievable, Realistic, Time - Bound) Goals – Art of prioritization.

UNIT – V Body Language, Stress Management & Time Management 6

Body language – Assertiveness – Problem – Solving – Conflict and stress Management – decision – Making Skills – Positive and creative thinking – Leadership and Qualities of successful leader – Character – building – Team- work – Lateral Thinking – Time management – Work Ethics – Management of change – Good manners And Etiquettes (Concept, Significance and skills to achieve should be studied)

Topics prescribed for Workshop / Skill lab: 12

- A) Group discussion
- B) Presentation Skill
- C) Problem- Solving
- D) Decision – Making
- E) Creativity
- F) Time management
- G) Body language

TOTAL HOURS: 30

COURSE OUTCOME

At the end of this course the students will be able to,

CO1: Illustrate the basic concepts of personality development.

CO2: Identify the factors acting attitudes and values.

CO3: Demonstrate the positive and negative esteem.

CO4: Analyze the important of self-motivation.

CO5: Develop the qualities of successful leader.

Text Books:

1. Organisational Behaviour – S.P. Robbins – prentice – Hall of India Pvt. Ltd., New Delhi – 15th Edition,2013.
2. Communicate to win – Richard Denny – Kogan page India private Ltd, New Delhi – 2009.
3. Essentials of business communication – Rajendra pal and J.S Korlhalli – Sultan Chand & Sons New Delhi, 1st edition, 2012

Reference Books:

1. Business Communication – K.K. Sinha – Galgotia Publishing Company, New Delhi. 4th edition,2012
2. Media and communication management – C.S. Himalaya publishing
3. Business Communication – Dr S.V. Kadvekar, Prin. Dr. C.N Rawal and Prof. Ravindra Kothavade- Diamond Publications, Pune.2009.
4. You can win – Shiv Khera – Macmillan India Ltd.2012.
5. Group discussion and public Speaking – K. Sankaran and Mahendra kumar- MI publications, Agra.2000.
6. Basic managerial Skills For all – Prentice – Hall of India Pvt. Ltd., New Delhi-2011 –E.H. McGrath
7. Habits – Stephen Covey – Simon & Shusker Publisher- 2007 edition.
8. Management thoughts – Pramod Batra- HPB Publisher- 1st edition-2006.
9. Produced By Prof. Rooshikumar Pandya – Creative Communication and Management Centre, Bombay-R & E Publisher kindle edition -2012.
 - A) Assertive Training: Four Cassettes – Hannah Richards 2012
 - B) Self Hypnosis For Goal Achievement: Four Cassettes-kindle edition –ryan cooper - 2012

Web Sources:

1. http://www.nicurriculum.org.uk/docs/key_stage_3/areas_of_learning/personal_development/ks3_pd_powerofteachers.pdf
2. <https://personalexcellence.co/blog/skills-development/>