V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM REGULATIONS AND SYLLABUS
(with effect from Academic Year 2020 - 2021)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 20 UG Programmes, 14 PG Programmes, 6 M.Phil. Programmes and 6 Ph.D. Programmes. The curricula for all these Programmes, except Ph.D. Programmes, have been framed as per the guidelines given by the University Grants Commission (UGC) & Tamil Nadu State Council for Higher Education (TANSCHE) under Choice Based Credit System (CBCS) and the guidelines for Outcome Based Education (OBE).

The Departments of Commerce, English, History, Mathematics, Biochemistry and Tamil upgraded as Research Centres offer Ph.D. Programmes as per the norms and regulations of Madurai Kamaraj University, Madurai and do not come under the purview of CBCS.

A. CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed Courses. The CBCS is followed as per the guidelines formulated by the UGC. The performance of students is evaluated based on the uniform grading system. Computation of the Cumulative Grade Point Average (CGPA) is made to ensure uniformity in evaluation system.

List of Programmes in which CBCS/Elective Course System is implemented

UG PROGRAMMES

Arts & Humanities	:	History (E.M. & T.M.), English, Tamil
Physical & Life Sciences	:	Mathematics, Zoology, Chemistry, Physics, Biochemistry, Home Science - Nutrition and Dietetics, Costume Design and Fashion, Microbiology, Biotechnology, Computer Science, Information Technology and Computer Applications.
Commerce & Management	:	Commerce, Commerce (Computer Applications), Commerce (Professional Accounting) Business Administration

PG PROGRAMMES

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Physics, Chemistry, Zoology, Biochemistry, Home Science - Nutrition and Dietetics, Computer Science, Information Technology, Computer Applications (MCA*)
Commerce & Management	:	Commerce, Business Administration (MBA*)

* AICTE approved Programmes

PRE-DOCTORAL PROGRAMMES (M.Phil.)

Arts & Humanities	:	History, English & Tamil
Physical & Life Sciences	:	Mathematics & Biochemistry
Commerce & Management	:	Commerce

OUTLINE OF CHOICE BASED CREDIT SYSTEM

1. Core Courses
2. Discipline Specific Elective Courses (DSEC)
3. Allied Courses
4. Skill Enhancement Courses (SEC)
5. Non Major Elective Courses (NMEC)
6. Ability Enhancement Compulsory Courses (AECC)
7. Generic Elective Courses (GEC)
8. Internship / Field Project
9. Self-Study Courses
10. Extra Credit Courses (optional)

List of Non Major Elective Courses (NMEC) Offered

UG PROGRAMMES

Name of the Course	Semester	Department
History of India upto A.D.1858	III	History(EM)
இந்திய வரலாறு கி.பி. 1858 வரை	III	History (TM)
Indian National Movement (A.D 1885-1947)	IV	History(EM)
இந்திய தேசிய இயக்கம் (கி.பி. 1885 – 1947)	IV	History(TM)
English for Professions I	III	English
English for Professions II	IV	
இக்கால நீதி இலக்கியம்	III	Tamil
உரைநடை இலக்கியம்	IV	
Basic Hindi – I	III	Hindi
Basic Hindi – II	IV	
Practical Banking	III	Commerce
Basic Accounting Principles	IV	
Business Management	III	Business Administration
Entrepreneurship	IV	
Quantitative Aptitude	III	Mathematics
Statistics and Operation Research	IV	
Physics in Everyday life	III	Physics
Fundamentals of Electronics	IV	
Industrial Chemistry	III	Chemistry
Drugs and Natural Products	IV	
Applied Zoology	III	Zoology
Animal Science	IV	
Basic Food Science	III	Home Science – Nutrition and Dietetics
Basic Nutrition and Dietetics	IV	
Women and Health	III	Biochemistry
Life style associated disorders	IV	
Medical Lab Technology	III	Microbiology
Applied Microbiology	IV	
Infectious Diseases	III	Biotechnology
Organic Farming	IV	
Basics of Fashion	III	Costume Design And Fashion
Interior Designing	IV	
Introduction to Computers and Office Automation	III	Computer Science
Introduction to Internet and HTML 5	IV	
MS Office	III	Information Technology
Introduction to HTML	IV	
Fundamentals of Computers	III	Computer Applications
Web Design with HTML	IV	
Horticulture – I	III	Botany
Horticulture – II	IV	
மருத்துவ தாவரவியல் - I	III	
மருத்துவ தாவரவியல் - II	IV	
Library and Information Science – I	III	Library Science
Library and Information Science – II	IV	

மேல்நிலை கல்வி வரை தமிழை முதன்மை பாடமாக எடுத்து படிக்காத மாணவிகள் கீழ்கண்ட பாடங்களை கட்டாயம் படிக்க வேண்டும்

1. அடிப்படைத் தமிழ் - எழுத்தறிதல்
2. அடிப்படைத் தமிழ் - மொழித்திறனறிதல்

List of Non Major Elective Courses (NMEC)

(2023-2024 onwards)

UG PROGRAMMES

Name of the Course	Semester	Department
History of India upto A.D.1858	III	History(EM)
இந்திய வரலாறு கி.பி. 1858 வரை	III	History (TM)
Indian National Movement (A.D 1885-1947)	IV	History(EM)
இந்திய தேசிய இயக்கம் (கி.பி. 1885 – 1947)	IV	History(TM)
English for Professions I	III	English
English for Professions II	IV	
இக்கால நீதி இலக்கியம்	III	Tamil
உரைநடை இலக்கியம்	IV	
Basic Hindi – I	III	Hindi
Basic Hindi – II	IV	
Fundamental Hindi – I	III	Hindi
Fundamental Hindi – II	IV	
Practical Banking	III	Commerce
Basic Accounting Principles	IV	
Financial Literacy I	III	
Financial Literacy II	IV	
Self-Employment And Start-Up Business	III	Commerce CA
Fundamentals Of Marketing	IV	
Women Protection Laws	III	Commerce (Professional Accounting)
Basic Labour Laws	IV	
Business Management	III	Business Administration
Entrepreneurship	IV	
Quantitative Aptitude I	III	Mathematics
Basic Statistics		
Quantitative Aptitude II	IV	
Operations Research		
Physics in Everyday life –I	III	Physics
Physics in Everyday life –II	IV	
Industrial Chemistry	III	Chemistry
Drugs and Natural Products	IV	
Applied Zoology	III	Zoology
Animal Science	IV	
Basic Food Science	III	Home Science – Nutrition and Dietetics
Basic Nutrition and Dietetics	IV	
Women and Health	III	Biochemistry
Lifestyle Associated Disorders	IV	
Medical Lab Technology	III	Microbiology
Applied Microbiology	IV	
Infectious Diseases	III	Biotechnology

Organic Farming	IV	
Basics of Fashion	III	Costume Design And Fashion
Interior Designing	IV	
Introduction to Computers and Office Automation	III	Computer Science
Introduction to Internet and HTML 5	IV	
MS Office	III	Information Technology
Introduction to HTML	IV	
Fundamentals of Computers	III	Computer Applications
Web Design with HTML	IV	
Horticulture – I	III	Botany
Horticulture – II	IV	
மருத்துவ தாவரவியல் - I	III	
மருத்துவ தாவரவியல் - II	IV	
Library and Information Science – I	III	Library Science
Library and Information Science - II	IV	
Cadet Corps for Career Development I	III	National Cadet Corps
Cadet Corps for Career Development II	IV	

மேல்நிலைக் கல்வி வரை தமிழை முதன்மைப் பாடமாக எடுத்துப் படிக்காத மாணவிகள் கீழ்க்கண்ட பாடங்களைக் கட்டாயம் படிக்க வேண்டும்

1. அடிப்படைத் தமிழ் - எழுத்தறிதல்
2. அடிப்படைத் தமிழ் - மொழித்ரதிறனறிதல்

List of Ability Enhancement Compulsory Courses (AECC) and

Generic Elective Courses (GEC) Offered

ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)

1. Value Education
2. Environmental Studies

GENERIC ELECTIVE COURSES 1

1. Human Rights
2. Women Studies

GENERIC ELECTIVE COURSES 2

1. Constitution of India
2. Modern Economics
3. Adolescent Psychology
4. Disaster Management

B. OUTCOME BASED EDUCATION (OBE) FRAMEWORK

The core philosophy of Outcome Based Education rests in employing a student - centric learning approach to measure the performance of students based on a set of pre- determined outcomes.

The significant advantage of OBE is that it enables a revamp of the curriculum based on the learning outcomes, upgradation of academic resources, quality enhancement in research and integration of technology in the teaching –learning process. It also helps in bringing clarity among students as to what is expected of them after completion of the Programme in general and the Course in particular. The OBE directs the teachers to channelize their teaching methodologies and evaluation strategies to attain the PEOs and fulfill the Vision and Mission of the Institution.

Vision of the Institution

The founding vision of the Institution is to impart Quality Education to the rural womenfolk and to empower them with knowledge and leadership quality.

Mission of the Institution

The mission of the Institution is to impart liberal education committed to quality and excellence. Its quest is to mould learners into globally competent individuals instilling in them life-oriented skills, personal integrity, leadership qualities and service mindedness.

B.1 Programme Educational Objectives, Programme Outcomes and ProgrammeSpecific Outcomes

It is imperative for the institution to set the Programme Educational Objectives (PEOs), Programme Outcomes (POs) and Course Outcomes (COs), consistent with its Vision and Mission statements. The PEOs and the POs should be driven by the mission of the institution and should provide distinctive paths to achieve the stated goals. The PEOs for each Programme have to fulfill the Vision and Mission of the Department offering the Programme.

Vision of the Department of Physics

To enrich the young minds with scientific temper, ethical responsibilities and professional values and make their contribution to the society.

Mission of the Department of Physics

- To impart quality education in Physics by strengthening the students conceptual knowledge
- To enhance their logical thinking, problem solving and communication skills for research and employability
- To develop globally competent, socially responsible and value driven citizens committed to sustainable development

B.1.1 Programme Educational Objectives (PEOs)

PEOs are broad statements that describe the career and professional achievements that the programme is preparing the graduates to achieve within the first few years after graduation. PEOs are framed for each programme and should be consistent with the mission of the Institution.

Programme Educational Objectives (PEOs) of B.Sc. Physics Programme

The students will be able to

- acquire comprehensive knowledge and sound understanding of concepts in various branches of Physics and exhibit their abilities and skills leading to professional development and lifelong learning
- be empowered with a successful career in academia, research and industry by developing their scientific temper and communication skills
- possess cultural, social and spiritual values, sense of responsibility and character integrity for better citizenship.

Key Components of the Mission Statement	P E	P E	P E
conceptual knowledge	√	√	-
logical thinking, problem solving, communication skills, research and employability	√	√	√
sustainable development	-	√	√

B.1.2 Programme Outcomes (POs)

POs shall be based on Graduates Attributes (GAs) of the programme. The GAs are the attributes expected of a graduate from a programme in terms of knowledge, skills, attitude and values. The Graduate Attributes include Disciplinary Knowledge, Communication Skills, Critical Thinking, Problem Solving, Analytical Reasoning, Research Related Skills, Co- operation/ Team Work, Scientific Reasoning, Reflective Thinking, Information/ Digital Literacy, Multi-cultural Competence, Moral and Ethical Awareness/ Reasoning, Leadership Qualities and Lifelong Learning.

On successful completion of the Programme, the students will be able to

1 apply effectively the acquired knowledge and skill in the field of Arts, Physical Science, Life Science, Computer Science, Commerce and Management for higher studies and employment. (*Disciplinary Knowledge*)

2 communicate proficiently and confidently with the ability to express original/complex ideas effectively in different situations. (*Communication Skills)*

3 identify, formulate and solve problems in real life situations scientifically / systematically by adapting updated skills in using modern tools and techniques. (*Scientific Reasoning and Problem Solving)*

4 critically analyse, synthesize and evaluate data, theories and ideas to provide valid suggestions for the betterment of the society. (*Critical Thinking and Analytical Reasoning)*

5 use ICT in a variety of self-directed lifelong learning activities to face career challenges

in the changing environment. (*Digital Literacy, Self - Directed and Lifelong Learning)*

6 self-manage and function efficiently as a member or a leader in diverse teams in a multicultural society for nation building. (*Co-operation/Team Work and Multi- Cultural Competence)*

7 uphold the imbibed ethical and moral values in personal, professional and social life for sustainable environment. (*Moral and Ethical Awareness)*

B.1.3 Programme Specific Outcomes (PSOs)

Based on the Programme Outcomes, Programme Specific Outcomes are framed for each UG Programme**.** Programme Specific Outcomes denote what the students would be able to do at the time of graduation. They are programme specific. It is mandatory that each PO should be mapped to the respective PSO.

On completion of B.Sc. Physics Programme, the students will be able to

PO1 - *Disciplinary Knowledge*

PSO 1.a : apply the acquired core knowledge in the concepts, principles and theories of fundamental and advanced Physics to pursue higher studies or employment.

PSO 1.b: be able to demonstrate their technical and observational skills in handling the equipments/instruments with precautions and to interpret the data

PO2 – *Communication Skills*

PSO 2: exhibit oral and written communication skills in presenting complex and technical concepts of Physics to wider group of audience such as academic experts, professionals and society.

PO3 – *Scientific Reasoning and Problem Solving*

PSO 3.a: determine the various parameters in Physics by appropriate experimental methods and thereby updating their knowledge and skills.

PSO 3.b: enrich their problem-solving skills that prepare them to meet the challenges in higher studies/career

PO4 – *Critical Thinking and Analytical Reasoning*

PSO 4.a: analyze the equations / theories /models in different branches of Physics and realize their significance in Science and technology and industry.

PSO 4.b: apply the principles of various fields of Physics/ Interdisciplinary areas to design innovative experiments and thereby developing their analytical skills.

PO5 – *Digital Literacy, Self - Directed and Lifelong Learning*

PSO 5: be capable of utilizing modern digital tools, pertaining to their field of interest that

enable them for self-directed lifelong learning.

PO6 – *Co-operation/Team Work and Multi-Cultural Competence*

PSO 6: build up their leadership qualities, team spirit and good interpersonal relations through their group practical, co-curricular and extra-curricular activities, internship and project work.

PO7 *–Moral and Ethical Awareness*

PSO 7: adhere the global standards of codes of conduct in Physics community and practice the imbibed moral values in their profession and society to attain sustainable environment

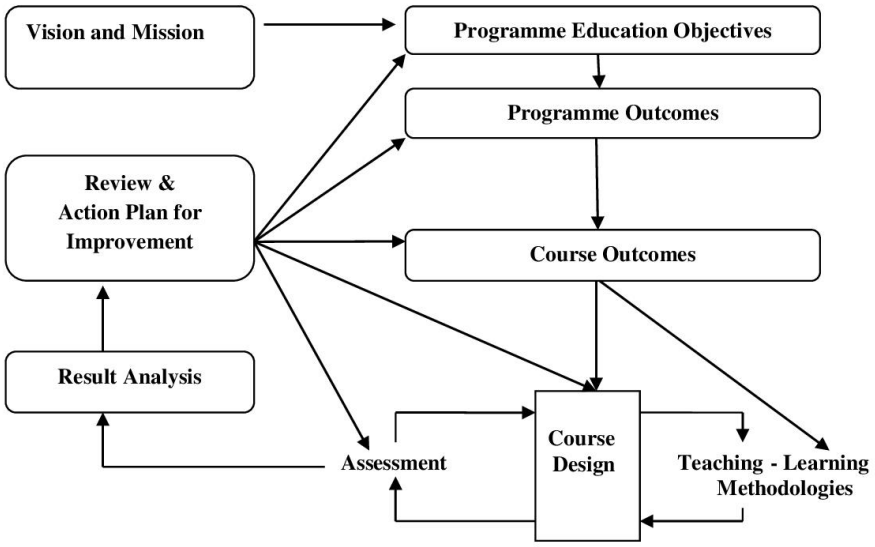
PO-PEO Mapping Matrix

Attainment of PEOs can be measured by a PO-PEO matrix. PEOs should evolve through constant feedback from alumnae, students, industry, management, *etc*. It is mandatory that each PEO should be mapped to at least one of the POs.

PEOs / POs/PSOs	PEO1	PEO2	PEO3
PO1/PSO1	✓	✓	✓
PO2/PSO2	✓	✓	-
PO3/PSO3	✓	✓	✓
PO4/PSO4	✓	✓	-
PO5/PSO5	✓	✓	✓
PO6/PSO6	✓	-	✓
PO7/PSO7	✓	-	✓

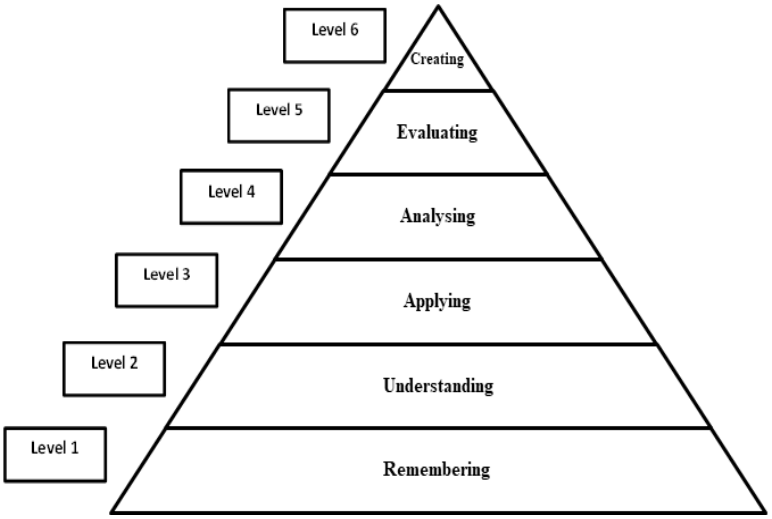
B.1.4 Course Outcomes (COs)

Course Outcomes are narrow statements restricted to the course contents given in five units. Course Outcomes describe what students would be capable of, after learning the contents of the course. They reflect the level of knowledge gained, skills acquired and attributes developed by the students after learning of course contents. COs are measurable, attainable and manageable in number. COs contribute to attain POs in such a way that each CO addresses at least one of the POs and also each PO is reasonably addressed by adequate number of COs.



It is important to determine the methods of assessment. A comprehensive assessment strategy may be outlined using the revised Bloom's Taxonomy levels.

BLOOM'STAXONOMY



CO – PO Mapping of Courses

After framing the CO statements, the COs framed for each course is mapped with POs based on the relationship that exists between them. The COs which are not related to any of the POs is indicated with (-), signifying Nil. Measurement Mapping is based on Four Points Scale [High (H), Medium (M), Low (L) and Nil (-)]. For calculating weighted percentage of contribution of each Course in the attainment of the respective POs, the weights assigned for H, M and L are 3, 2and 1 respectively.

CO-PO/PSO Mapping Table (Course Articulation Matrix)

PO/PSOs / COs	PO1/ PSO1	PO2/ PSO2	PO3/ PSO3	PO4/ PSO4	PO5/ PSO5	PO6/ PSO6	PO7/ PSO7
CO1							
CO2							
CO3							
CO4							
CO5							

ELIGIBILITY FOR ADMISSION

The candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Tamil Nadu or any other equivalent examination accepted by the Academic Council with Mathematics as one of the subjects in Higher Secondary Course.

DURATION OF THE PROGRAMME

The candidates shall undergo the prescribed Programme of study for a period of three academic years (six semesters).

MEDIUM OF INSTRUCTION

English

COURSES OFFERED

Part I	:	Tamil/Hindi/Alternate Course
Part II	:	English
Part III	:	Core Courses
	:	Allied Courses
	:	Elective Courses: Discipline Specific Elective Courses
	:	Self-Study Course
Part IV	:	Skill Enhancement Courses (SEC)
	:	Field Project/Internship
	:	Non-Major Elective Courses (NMEC)
	:	Ability Enhancement Compulsory Courses (AECC)
	:	Generic Elective Courses (GEC)
	:	Self-Study Course
Part V	:	National Service Scheme/ Physical Education/ Youth Red Cross Society/ Red Ribbon Club/ Science Forum/ Eco Club/ Library and Information Science/ Consumer Club/ Health and Fitness Club and National Cadet Corps/ Rotaract club

B.2. EVALUATION SCHEME

B.2.1 PART II

Components	Internal Assessment Marks	External ExaminationMarks	Total Marks
Theory	15	75	100
Practical	5+5	-	

INTERNAL ASSESSMENT
Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	15
Practical	:	10
Total	**:**	**25**

Three Periodic Tests - Average of the best two will be considered

B.2.1.1 PART II (II UG – 2023-2024 onwards)

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Test	15	60	100
Practical	10	15	

INTERNAL ASSESSMENT
Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	15
Practical	:	10
Total	**:**	**25**

Three Periodic Tests - Average of the best two will be considered

EXTERNAL ASSESSMENT
Distribution of Marks

Mode of Evaluation		Marks
Theory	:	60
Practical	:	15
Total	**:**	**75**

B.2.1 PART I PART III - Core Courses, Discipline Specific Elective Courses & Allied Courses

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	25	75	100
Practical	40	60	100
Project	100	-	100

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation			Marks
Periodic Test		:	15
Assignment	Core:I UG-K4 Level, II & III UG – K5 Level	:	5
	Part I & Allied: K4 Level		
	DSEC:K5 Level		
Quiz	K2:Level	:	5
Total		**:**	**25**

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

Practical

Mode of Evaluation		Marks
Test	:	15
Model Examination		15
Performance	:	10
Total	**:**	**40**

Test- Better of the two will be considered

Model Examination - Better of the two will be considered

Performance - Attendance and Record

Question Pattern for Periodic Tests **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 4)	Multiple Choice	4	4	1	4
B Q. No.(5- 7)	Internal Choice - Either Or Type	3	3	7	21
C Q. No.(8-9)	Internal Choice - Either Or Type	2	2	10	20
				Total	**45***

*The total marks obtained in the Periodic Test will be calculated for 15 marks

EXTERNAL EXAMINATION

Question Pattern **Duration: 3 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 10)	Multiple Choice	10	10	1	10
B Q. No.(11 -15)	Internal Choice – Either Or Type	5	5	7	35
C Q. No.(16-18)	Internal Choice – Either Or Type	3	3	10	30
				Total	**75**

PROJECT

Assessment by Internal Examiner only

Internal Assessment

Distribution of Marks

Mode of Evaluation		Marks
Project Work and Report	:	60
Presentation and Viva –Voce	:	40
Total	**:**	**100**

B. 2. 2 SELF STUDY COURSE

Core Courses Quiz - Online

Assessment by Internal Examiner only

- Question Bank is prepared by the Faculty Members of the Departments.
- No. of Questions to be taken 700.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in VI Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	40
Model Examination	:	60
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B. 2.3 PART IV - Skill Enhancement Courses & Non Major Elective Courses

INTERNAL ASSESSMENT Distribution of Marks

Theory

Mode of Evaluation			Marks
Periodic Test		:	25
Assignment	SEC:K4 Level	:	10
	NMEC:K3 Level		
Quiz	K2 Level	:	5
Total		**:**	**40**

Three Periodic tests - Average of the best two will be considered
Two Assignments - Better of the two will be considered
Three Quiz Tests - Best of the three will be considered

Practical

Mode of Evaluation		Marks
Test	:	15
Model Examination		15
Performance	:	10
Total	**:**	**40**

Test- Better of the two will be considered
Model Examination - Better of the two will be considered
Performance - Attendance and Record

Question Pattern **Duration: 1 Hour**

Section	Types of Question	No. of Questions	No. of Questions	Marks for each Question	Total Marks
A Q. No. (1- 3)	Internal Choice - Either Or Type	3	3	5	15
B Q. No. (4)	Internal Choice - Either Or Type	1	1	10	10
				Total	**25**

EXTERNAL EXAMINATION

Question Pattern **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No. (1- 6)	Internal Choice - Either Or Type	6	6	5	30
B Q. No. (7- 9)	Internal Choice - Either Or Type	3	3	10	30
				Total	**60**

B.2. 4 PART IV- Ability Enhancement Compulsory Courses (AECC) & Generic Elective Courses (GEC)

Assessment by Internal Examiner only

- Model Examination is conducted after two periodic tests.
- Book and Study Material prepared by the Faculty Members of the respective departments will be prescribed.

ASSESSMENT PATTERN

Mode of Evaluation			Marks
Periodic Test		:	30
Assignment	K2 Level	:	10
Model Examination		:	60
Total		**:**	**100**

Two Periodic tests - Better of the two will be considered

Two Assignments - Better of the two will be considered

Question Pattern for Periodic Test **Duration: 1 Hour**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 3)	Internal Choice - Either Or Type	3	3	6	18
B Q.No.(4)	Internal Choice - Either Or Type	1	1	12	12
				Total	**30**

Question Pattern for Model Examination **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 5)	Internal Choice - Either Or Type	5	5	6	30
B Q. No.(6- 8)	Internal Choice - Either Or Type	3	3	10	30
				Total	**60**

B. 2. 5 PART IV- Internship / Field Project

Internship / Field Project is compulsory for II year UG Science Students

- **Internship:** A designated activity that carries one credit involving not less than 15 days of working in an organization under the guidance of an identified mentor
- **Field Project:** Students comprising of maximum 5 members in a team need to undertake project that involve conducting surveys inside/outside the college premises and collection of data from designated communities or natural places.
- Assessment by Internal Examiner only

Mode of Evaluation		Marks
Onsite Learning/Survey	:	50
Report	:	25
Viva-Voce	:	25
Total		**100**

SELF STUDY COURSE

Practice For Competitive Examinations - Online

Assessment by Internal Examiner only

- Question Bank prepared by the Faculty Members of the respective Departments will be followed
- Multiple Choice Question pattern is followed
- Online Test will be in V Semester for 100 Marks
- Model Examination is conducted after two periodic tests

Subject wise Allotment of Marks

Subject		**Marks**
Tamil	:	10
English		10
History		10
Mathematics		10
Current affairs		10
Commerce, Law & Economics		10
Physical Sciences		10
Life Sciences		15
Computer Science		5
Food and Nutrition		5
Sports and Games		5
Total		**100**

Distribution of Marks

Mode of Evaluation		**Marks**
Periodic Test	:	40
Model Examination	:	60
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B. 2.6 PART V - Extension Activities

Assessment by Internal Examiner only

Mode of Evaluation		**Marks**
Attendance	:	5
Performance	:	10
Report/Assignment/Project/Camp/Practical		10
Total	**:**	**25***

*The marks obtained will be calculated for 100 marks

EXTRA CREDIT COURSES (OPTIONAL)

Assessment by Internal Examiner only

Distribution of Marks

Question Pattern **Duration: 3 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 10)	Multiple Choice	10	10	1	10
B Q. No.(11 -15)	Internal Choice – Either or Type	5	5	9	45
C Q. No.(16-20)	Open Choice	5	3	15	45
				Total	**100**

ELIGIBILITY FOR THE DEGREE

The candidate will not be eligible for the Degree without completing the prescribed Courses of study, lab work, *etc.*, and a minimum Pass marks in all the Courses.

- No Pass minimum for Internal Assessment.
- Pass minimum for External Examination is 27 marks out of 75 for Core Courses, Discipline Specific Elective Courses and Allied Courses.
- Pass minimum for External Examination is 21 marks out of 60 for Skill Enhancement Courses and Non Major Elective Courses.
- The aggregate minimum pass percentage is 40
- Pass minimum for External Practical Examination is 21 marks out of 60 marks.
- Pass minimum for Ability Enhancement Compulsory Course and Generic Elective Course is 40.
- Pass minimum for Self Study Courses is 40.

ATTENDANCE

(a) The students who have attended the classes for 76 days (85%) and above are permitted to appear for the Summative Examinations without any condition.

(b) The students who have only 60-75 days (66%-84%) of attendance are permitted to appear for the Summative Examinations after paying the required fine amount and fulfilling other conditions according to the respective cases.

(c) The students who have attended the classes for 59 days and less – upto 45 days (50%-65%) can appear for the Summative Examinations only after getting special permission from

the Principal.

(d) The students who have attended the classes for 44 days or less (50%) cannot appear for the Summative Examinations and have to repeat the whole semester.

- These rules are applicable to UG, PG and M.Phil. Programmes and come into effect from 2020-2021 onwards.
- For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

B.3 ASSESSMENT MANAGEMENT PLAN

An Assessment Management Plan that details the assessment strategy both at the Programme and the Course levels is prepared. The continuous assessment is implemented using an assessment rubric to interpret and grade students.

B.3.1 Assessment Process for CO Attainment

Assessment is one or more processes carried out by the institution that identify, collect and prepare data to evaluate the achievement of Course Outcomes and Programme Outcomes. Course Outcome is evaluated based on the performance of students in the Continuous Internal Assessments and in End Semester Examination of a course. Target levels of attainment shall be fixed by the Course teacher and Heads of the respective departments.

Direct Assessment (rubric based)-Conventional assessment tools such as Term Test, Assignment, Quiz and End Semester Summative Examination are used.

Indirect Assessment – Done through Course Exit Survey.

CO Assessment Rubrics

For the evaluation and assessment of COs and POs, rubrics are used. Internal assessment contributes 40% and End Semester assessment contributes 60% to the total attainment of a CO for the theory courses. For the practical courses, internal assessment contributes 50% and Semester assessment contributes 50% to the total attainment of a CO. Once the Course Outcome is measured, the PO can be measured using a CO-PO matrix.

CO Attainment

Direct CO Attainment

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

Attainment Levels of COs

Assessment Methods	Attainment Levels	
Internal Assessment	Level 1	50% of students scoring more than average marks or set target marks in Internal Assessment tools
	Level 2	55% of students scoring more than average marks or set target marks in Internal Assessment tools
	Level 3	60% of students scoring more than average marks or set target marks in internal Assessment tools
End Semester Summative Examination	Level 1	50% of students scoring more than average marks or set target marks in End Semester Summative Examination
	Level 2	55% of students scoring more than average marks or set target marks in End Semester Summative Examination
	Level 3	60% of students scoring more than average marks or set target marks in End Semester Summative Examination

Target Setting for Assessment Method

For setting up the target of internal assessment tools, 55% of the maximum mark is fixed as target. For setting up the target of End Semester Examination, the average mark of the class shall be set as target.

Formula for Attainment for each CO

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

$$\text{Percentage of Attainment} = \frac{\text{Number of Students who Scored more than the Target}}{\text{Total Number of Student}} \times 100$$

Indirect CO Attainment

At the end of each course, an exit survey is conducted to collect the opinion of the students on attainment of Course Outcomes. A questionnaire is designed to reflect the views of the students about the attainment of course outcomes.

Overall CO Attainment= 75% of Direct CO Attainment + 25 % of Indirect CO Attainment

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

For continuous improvement, if the target is reached, the course teacher can set the target as a value greater than the CO attainment of the previous year.

B.3.2 Assessment Process for Overall PO Attainment

With the help of CO against PO mapping, the PO attainment is calculated. PO assessment is done by giving 75% weightage to direct assessment and 25% weightage to indirect assessment. Direct assessment is based on CO attainment, where 75% weightage is given to attainment through End Semester examination and 25% weightage is given to attainment through internal assessments. Indirect assessment is done through Graduate Exit Survey and participation of students in Co-curricular/Extra-curricular activities.

PO Assessment Tools

Mode of Assessment	Assessment Tool	Description
Direct Attainment (Weightage -75%)	CO Assessment	This is computed from the calculated CO Attainment value for each Course
Indirect Attainment (Weightage - 25%)	Graduate Exit Survey 10%	At the end of the programme, Graduate Exit Survey is collected from the graduates and it gives the opinion of the graduates on attainment
	Co-curricular / Extracurricular	For participation in Co-curricular / Extracurricular activities during the period of

Programme Articulation Matrix (PAM)

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Average Direct PO Attainment									
Direct PO Attainment in percentage									

Indirect Attainment of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Graduate Exit Survey								
Indirect PO Attainment								

Attainments of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Direct Attainment (Weightage - 75%)								
Indirect Attainment (Weightage - 25%)								
Overall PO Attainment								

Overall PO Attainment= [75% of Direct PO Attainment +
25% of Indirect PO Attainment (Graduate Exit Survey
& Participation in Co- curricular and
Extracurricular Activities)]

Expected Level of Attainment for each of the Programme Outcomes

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

Level of PO attainment

Graduation Batch	Overall PO Attainment (in percentage)	Whether Expected Level of PO is Achieved? (Yes/No)

B.3.3 Assessment Process for PEOs

The curriculum is designed so that all the courses contribute to the achievement of PEOs. The attainment of PEOs is measured after 5 years / 3 years of completion of the programme only through Indirect methods.

Target for PEO Attainment

Assessment Criteria	Target (UG)	Target (PG)
Record of Employment	25% of the class strength	30% of the class strength
Progression to Higher Education	40% of the class strength	5% of the class strength
Record of Entrepreneurship	2% of the class strength	5% of the class strength

Attainment of PEOs

Assessment Criteria & Tool	Weightage
Record of Employment	10
Progression to Higher Education	20
Record of Entrepreneurship	10
Feedback from Alumnae	30
Feedback from Parents	10
Feedback from Employers	20
Total Attainment	**100**

$$\text{Percentage of PEO Attainment from Employment} = \frac{\text{Number of Students who have got Employment}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Higher Education} = \frac{\text{Number of Students who pursue Higher Education}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Entrepreneurship} = \frac{\text{Number of Students who have become Entrepreneurs}}{\text{Target}} \times 100$$

Expected Level of Attainment for each of the Programme Educational Objectives

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

Level of PEO Attainment

Graduation Batch	Overall PEO Attainment (in percentage)	Whether Expected Level of PEO is Achieved? (Yes/No)

C. PROCESS OF REDEFINING THE PROGRMME EDUCATIONAL OBJECTIVES

The college has always been involving the key stake holders in collecting information and suggestions with regard to curriculum development and curriculum revision. Based on the information collected the objectives of the programme are defined, refined and are inscribed in the form of PEOs. The level of attainment of PEOs defined earlier will be analyzed and will identify the need for redefining PEOs. Based on identified changes in terms of curriculum, regulations and PEOs, the administrative system like Board of Studies, Academic Council and Governing Body may recommend appropriate actions. As per the Outcome Based Education Framework implemented from the Academic Year 2020 -2021, the following are the Programme Structure, the Programme Contents and the Course Contents of B.Sc. Physics Programme.

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BACHELOR OF SCIENCE PHYSICS (2016)

Outcome Based Education with Choice Based Credit System

Programme Structure - Allotment of Hours and Credits

For those who join in the Academic Year 2020-2021

Components	Semester						Total Number of Hours (Credits)
	I	II	III	IV	V	VI	
Part I : Tamil /Hindi	6 (3)	6 (3)	6 (3)	6 (3)	-	-	24 (12)
Part II : English	6 (3)	6(3)	6 (3)	6 (3)	-	-	24 (12)
Part III : Core Courses, Discipline Specific Elective Courses and Allied Courses							
Core Course	4 (4)	4 (4)	5 (5)	5 (5)	4 (4)	5 (4)	27 (26)
Core Course	4 (4)	4 (4)	-	-	4 (4)	5 (4)	17 (16)
Core Course	-	-	-	-	4 (4)	5 (4)	9 (8)
Core Course Practical	2(0)	2(2)	2(0)	2(2)	3 (0) 3 (0) 2 (0)	3 (3) 3 (3) 2 (2)	14 (7) 6 (3) 4 (2)
DSEC	-	-	-	-	4 (4)	5 (4)	9 (8)
Project					0(1)	-	0(1)
Allied Course I	6 (4)	3 (3) 3 (3)	-	-	-	-	9 (7) 3 (3)
Allied Course II	-	-	4 (4)	4 (4)	-	-	8 (8)
Allied Course Practical	-	-	2 (0)	2 (2)	-	-	4 (2)
Self-Study Course	-	-	-	-		0 (1)	0 (1)
Part IV: Skill Enhancement Courses, Non Major Elective Courses, Ability Enhancement Compulsory Courses, Generic Elective Courses and Internship/ Field Project							
SEC	-	2 (2)	2 (2)	2 (2)	2 (2)	2 (2)	10 (10)
SEC	-	-	-	-	2 (2)	-	2 (2)
Non Major Elective Course	-	-	2 (2)	2 (2)	-	-	4 (4)
AECC-Value Education	2 (2)	-	-	-	-	-	2 (2)
AECC-Environmental Studies	-	-	-	-	2(1)	-	2 (1)
GEC	-	-	1 (1)	-	-	-	1 (1)
GEC	-	-	-	1 (1)	-	-	1 (1)
Self-Study Course					0(1)	-	0 (1)
Internship/ Field Project	-	-	-	0 (1)	-	-	0 (1)
Part V: Extension Activities	-	-	-	0 (1)	-	-	0 (1)
Total	**30 (20)**	**30 (24)**	**30 (20)**	**30 (26)**	**30 (23)**	**30(27)**	**180 (140)**
Extra Credit Course			0 (2)		0 (2)		0 (4)

DSEC: Discipline Specific Elective Course; SEC– Skill Enhancement Course

AECC-Ability Enhancement Compulsory Courses; GEC- Generic Elective Courses

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PART I -TAMIL

S. No.	Sem.	Code	Title ofthe Course	Credits	Marks
1.	I	20UTAG11	பொதுத்தமிழ் தாள் I	3	100
2.	II	20UTAG21	பொதுத்தமிழ் தாள் II	3	100
3.	III	20UTAG31	பொதுத்தமிழ் தாள் III	3	100
4.	IV	20UTAG41	பொதுத்தமிழ் தாள் IV	3	100
	TOTAL			**12**	**400**

PART I -HINDI

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UHDG11 22UHDG11	Hindi - Paper I Prose – I & II, Ancient Stories - I, General Essays, Functional Hindi – I & Grammar General Hindi – I	3	100
2.	II	20UHDG21 22UHDG21	Hindi - Paper II Drama, One Act Play, Letter, Correspondence, Functional Hindi – II & Grammar General Hindi – II	3	100
3.	III	20UHDG31 22UHDG31	Hindi - Paper III Ancient Poetry, Drama, Indian History, Hindi Grammar & Functional Hindi III Advanced Hindi – I	3	100
4.	IV	20UHDG41 22UHDG41	Hindi - Paper IV Modern Poetry, Hindi Literary Essays, Letter Correspondence, Conversation & Functional Hindi IV Advanced Hindi - II	3	100
	TOTAL			**12**	**400**

PART II-ENGLISH

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I		English – Paper I	3	100
		20UENG11A	English for Advanced Learners I		
		20UENG11B	English for Career Guidance - I		
		20UENG11C	English for Communicative Competence-I		
2.	II		English – Paper II	3	100
		20UENG21A	English for Advanced Learners II		
		20UENG21B	English for Career Guidance - II		
		20UENG21C	English for Communicative Competence - II		

3.	III	20UENG31A 20UENG31B 20UENG31C 22UENG31	English – Paper III English for Advanced Learners III English for Career Guidance – III English for Communicative Competence – III Communicative English – I	3	100
4.	IV	20UENG41A 20UENG41B 20UENG41C 22UENG41	English – Paper IV English for Advanced Learners IV English for Career Guidance – IV English for Communicative Competence – IV Communicative English – II	3	100
	TOTAL			**12**	**400**

PART III – CORE, DISCIPLINE SPECIFIC ELECTIVE COURSES

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1	I	20UPHC11/ 20UPHC11N	Mechanics and Properties of matter	4	100
2	I	20UPHC12	Electricity	4	100
3	II	20UPHC21	Electromagnetism	4	100
4	II	20UPHC22	Heat and Thermodynamics	4	100
5	II	20UPHC21P	Core Course Practical I General Physics Practical I	2	100
6	III	20UPHC31/ 20UPHC31N	Optics	5	100
7	IV	20UPHC41	Mathematical Physics	5	100
8	IV	20UPHC41P	Core Course Practical II General Physics Practical II	2	100
9	V	20UPHC51	Classical and Statistical Mechanics	4	100
10	V	20UPHC52	Modern Physics	4	100
11	V	20UPHC53/ 22UPHC53	Solid State Physics/ Analog Electronics	4	100
12	V	20UCHE51/ 20UPHE52/ 20UPHE53	Discipline Specific Elective Course 1 (DSEC 1) 1.Analytical Instrumentation and ChemDraw 2. Nanoscience 3. Spectroscopy	4	100
13	V	20UPHC5PR	Project	1	100
14	VI	20UPHC61/ 22UPHC61	Analog Electronics/ Solid State Physics	4	100
15	VI	20UPHC62	Nuclear and Particle Physics	4	100
16	VI	20UPHC63	Digital Electronics	4	100

17	VI	20UPHE61/ 20UPHE62/ 20UCHE63	Discipline Specific Elective Course 2 (DSEC 2) 1. Material Science 2. Medical Physics 3. Medicinal Chemistry	4	100

18	VI	20UPHQ61	Core Courses Quiz - Online	1	100
19	VI	20UPHC61P	Core Course Practical III General Physics Practical III	3	100
20	VI	20UPHC62P	Core Course Practical IV Electronics Practical	3	100
21	VI	20UPHC63P	Core Course Practical V Digital Electronics Practical	2	100
			Total	**72**	**2100**

PART III – ALLIED COURSE I- MATHEMATICS

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UMTA11	**Allied Course I** Allied Mathematics I	4	100
2.	II	20UMTA21 20UMTA22	**Allied Course I** Allied Mathematics II Allied Mathematics III	3 3	100 100
			Total	**10**	**300**

PART III -ALLIED COURSE II-APPLIED ELECTRONICS AND INSTRUMENTATION

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	20UEIA31	**Allied Course II** Basic Electronics	4	100
2.	IV	20UEIA41	**Allied Course II** Electronic Devices and Instrumentation	4	100
3.	IV	20UEIA41P	**Allied Course Practical** Applied Electronics Practical	2	100
			Total	**10**	**300**

PART III - ALLIED COURSE II- CHEMISTRY

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	20UCHA31	**Allied Course II** General Chemistry - I	4	100
2.	IV	20UCHA41	**Allied Course II** General Chemistry - II	4	100
3.	IV	20UCHA41P	**Allied Course II Practical** Volumetric Analysis	2	100
			Total	**10**	**300**

PART IV -SKILL ENHANCEMENT COURSES

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	II	20UPHS21	Programming in C	2	100
2.	III	20UPHS31	Solar Energy	2	100
3.	IV	20UPHS41	Astrophysics	2	100
4.	V	20UPHS51	Microprocessor	2	100
5.	V	20UPHS52P	Practical-Programming in C	2	100
6.	VI	20UPHS61P	Practical-Microprocessor	2	100
			Total	**12**	**600**

T* -Tutorial Hour

PART IV – NON MAJOR ELECTIVE COURSES

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	20UPHN31/ 22UPHN31	Physics in Everyday life / Physics in Everyday life - I	2	100
2.	IV	20UPHN41/ 20UPHN41N/ 22UPHN41	Fundamentals of Electronics/ Physics in Every day Life – II	2	100
			Total	**4**	**200**

PART IV-ABILITY ENHANCEMENT COMPULSORY COURSES, GENERIC ELECTIVECOURSESAND INTERNSHIP /FIELD PROJECT

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UGVE11	Value Education	2	100
2.	V	20UGES51	Environmental Studies	1	100
3	III	20UGEH31 20UGEW32	Human Rights/ Women Studies	1	100
4.	IV	20UGEC41	Constitution of India/	1	100
		20UGEM42	Modern Economics/		
		20UGEA43	Adolescent Psychology/		
		20UGED44	Disaster Management		
		20UPHI41G	Internship/Field Project	1	100
5.	V	20UGCE51	Practice for Competitive Examinations – Online	1	100
			Total	**7**	**600**

PARTV-EXTENSIONACTIVITIES

S. No.	Sem.	Code	Title of the Course	Credit
1	I,II, III &IV	20UVNS1, 20UVNS2	National Service Scheme	1
2		20UVPE1	Physical Education	
3		20UVYR1 20UVYR2	Youth Red Cross Society	
4		20UVRR1	Red Ribbon Club	
5		20UVSF1	Science Forum	
6		20UVEC1	Eco Club	
7		20UVLI1	Library and Information Science	
8		20UVCC1	Consumer Club	
9		20UVHF1	Health and Fitness Club	
10		20UVNC1 20UVNC2	National Cadet Corps	
11		20UVRO1	Rotaract Club	

PART III – ALLIED COURSE I PHYSICS FOR MATHEMATICS

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UPMA11	**Allied Course I** Properties of Matter, Heat and Electricity	4	100
2.	II	20UPMA21/ 20UPMA21N	**Allied Course I** Electromagnetism, Optics and Electronics	4	100
3.	II	20UPMA21P/ 20UPMA21PN	**Allied Course I Practical** General Physics Practical	2	100
			Total	**10**	**300**

PART III – ALLIED COURSE II PHYSICS FOR CHEMISTRY

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	20UPCA31	**Allied Course II** Properties of Matter and Heat	4	100
2.	IV	20UPCA41	**Allied Course II** Optics, Electricity & Electromagnetism and Electronics	4	100
3.	IV	20UPCA41P	**Allied Course II Practical** General Physics Practical	2	100
			Total	**10**	**300**

EXTRACREDIT COURSES (Optional)

S. No.	Sem.	Code	Title of the Course	Credits	Total Marks
1.	III	20UPHO31	Introduction to Electronics	2	100
2.	V	20UPHO51	Biophysics	2	100

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BACHELOR OF PHYSICS
PROGRAMME CONTENT

Programme Code – 201

Semester		Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
I	Part I	20UTAG11	Tamil Paper I	6	3	3	25	75	100
		20UHDG11	Hindi Paper I						
	Part II	20UENG11A/ 20UENG11B/ 20UENG11C	English Paper I	6	3	3	25	75	100
	Part III	20UPHC11	**Core Course1** Mechanics and Properties of matter	4	4	3	25	75	100
		20UPHC12	**Core Course2** Electricity	4	4	3	25	75	100
		20UPHC21P	**Core Course Practical I** General Physics Practical-I	2	-	3	-	-	-
		20UMTA11	**Allied Course I** Mathematics I	6	4	3	25	75	100
	Part IV	20UGVE11	Value Education	2	2	-	100	-	100
			TOTAL	**30**	**20**				**600**

Semester		Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
II	Part I	20UTAG21	Tamil Paper II	6	3	3	25	75	100
		20UHDG21	Hindi Paper II						
	Part II	20UENG21A/ 20UENG21B/ 20UENG21C	English Paper II	6	3	3	25	75	100
	Part III	20UPHC21	**Core Course 3** Electromagnetism	4	4	3	25	75	100
		20UPHC22	**Core Course 4** Heat and Thermodynamics	4	4	3	25	75	100
		20UPHC21P	**Core Course Practical I** General PhysicsPractical- I	2	2	3	40	60	100
		20UMTA21 20UMTA22	**Allied Course I** Mathematics II Mathematics III	3 3	3 3	3 3	25 25	75 75	100 100
	Part IV	20UPHS21	**Skill enhancement Course 1 (SEC 1)** Programming in C	2	2	2	40	60	100
		TOTAL		**30**	**24**				**800**

Semester		Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
III	Part I	20UTAG31	Tamil Paper III	6	3	3	25	75	100
		20UHDG31	Hindi Paper III						
	Part II	20UENG31A/ 20UENG31B/ 20UENG31C	English Paper III	6	3	3	25	75	100
	Part III	20UPHC31	**Core Course 5** Optics	5	5	3	25	75	100
		20UPHC41P	**Core Course Practical II** General Physics Practical- II	2	-	3	-	-	-
		20UEIA31/ 20UCHA31	**Allied-Course II** Basic Electronics/ General Chemistry - I	4	4	3	25	75	100
		20UEIA41P/ 20UCHA41P	**Allied Course II Practical** Applied Electronics & Instrumentation/ Volumetric Analysis	2	-	3	-	-	-
	Part IV	20UPHS31	**Skill Enhancement Course 2 (SEC 2)** Solar Energy	2	2	2	40	60	100
		20UPHN31	**NMEC 1** Physics in Everyday life	2	2	2	40	60	100
		20UGEH31 20UGEW32	**GEC 1** 1.Human Rights/ 2. Women Studies	1	1	2	100	-	100
			TOTAL	**30**	**20**				**700**

Semester		Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
IV	Part I	20UTAG41	Tamil Paper IV	6	3	3	25	75	100
		20UHDG41	Hindi Paper IV						
	Part II	20UENG41A/ 20UENG41B/ 20UENG41C	English Paper IV	6	3	3	25	75	100
	Part III	20UPHC41	**Core Course 6** Mathematical Physics	5	5	3	25	75	100
		20UPHC41P	**Core Course Practical II** General Physics II	2	2	3	40	60	100
		20UEIA41/ 20UCHA41	**Allied Course II** Electronic Devices and Instrumentation/ General Chemistry - II	4	4	3	25	75	100
		20UEIA41P/ 20UCHA41P	**Allied Course II Practical** Applied Electronics & Instrumentation/ Volumetric Analysis	2	2	3	40	60	100
	Part IV	20UPHS41	**Skill Enhancement Course 3 (SEC 3)** Astrophysics	2	2	2	40	60	100
		20UPHN41	**NMEC 2** Fundamentals of Electronics	2	2	2	40	60	100
		20UPHI41G	Internship/Field Project	0	1	-	100	-	100
		20UGEC41/ 20UGEM42/ 20UGEA43/ 20UGED44	**GEC 2** Constitution of India/ Modern Economics/ Adolescent Psychology/ Disaster Management	1	1	2	100	-	100
	Part V	-	Extension Activities	-	1		100	-	100
			TOTAL	**30**	**26**				**1100**

Semester		Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks		
							Int.	Ext	Total
V	Part III	20UPHC51	**Core Course 7** Classical and Statistical Mechanics	4	4	3	25	75	100
		20UPHC52	**Core Course 8** Modern Physics	4	4	3	25	75	100
			Core Course 9 Solid State Physics	4	4	3	25	75	100
		20UPHC61P	**Core Course Practical III** General Physics Practical- III	3	-	3	-	-	-
		20UPHC62P	**Core Course Practical IV** Electronics Practical	3	-	3	-	-	-
		20UPHC63P	**Core Course Practical V** Digital Electronics Practical	2	-	3	-	-	-
		20UCHE51 20UPHE52 20UPHE53	**Discipline Specific Elective Course1 (DSEC 1)** Analytical Instrumentation and ChemDraw Nanoscience Spectroscopy	4	4	3	25	75	100
		20UPHC5PR	**Core Course 10** Project	0	1	-	100		100
	Part IV	20UPHS51	**Skill EnhancementCourse4 (SEC 4)** Microprocessor	2	2	2	40	60	100
		20UPHS52P	**Skill EnhancementCourse5 (SEC 5)Practical I** Programming in C	2 [1 T*+1 P]	2	2	40	60	100
		20UGCE51	**Self-Study Course** Practice for Competitive Examinations - Online	-	1	-	100		100
		20UGES51	Environmental Studies	2	1	2	100		100
			TOTAL	**30**	**23**				**900**

Semester		Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
VI	Part III	20UPHC61	**Core Course 11** Analog Electronics	5	4	3	25	75	100
		20UPHC62	**Core Course 12** Nuclear and Particle Physics	5	4	3	25	75	100
		20UPHC63	**Core Course 13** Digital Electronics	5	4	3	25	75	100
		20UPHC61P	**Core Course Practical III** General Physics Practical- III	3	3	3	40	60	100
		20UPHC62P	**Core Course Practical IV** Electronics Practical	3	3	3	40	60	100
		20UPHC63P	**Core Course Practical V** Digital Electronics Practical	2	2	3	40	60	100
		20UPHE61/ 20UPHE62/ 20UCHE63	**Discipline Specific Elective Course 2 (DSEC 2)** Material Science Medical Physics Medicinal Chemistry	5	4	3	25	75	100
		20UPHQ61	**Self-Study Course** Core Courses Quiz - Online	-	1	-	100		100
	Part IV	20UPHS61P	**Skill Enhancement Course 6 (SEC 6)** **Practical II** Microprocessor	2 [1 T* +1 P]	2	2	40	60	100
TOTAL				**30**	**27**				**900**

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VIRUDHUNAGAR - 626 001

BACHELOR OF PHYSICS (2016)
Programme Code
REVISED PROGRAMME CONTENT

Semester		**Course Code**	**Courses**	**Hours per week**	**Credits**	**Exam Hours**	**Total Marks**	
							Int.	**Ext.**
I	Part III	20UPHC11N	**Core Course 1** Mechanics and Properties of Matter	4	4	3	25	75
		20UPHC12	**Core Course 2** Electricity	4	4	3	25	75
		20UPHC21P	**Core Course Practical I** General Physics practical I	2	-	3	-	-
		20UMTA11	**Allied Course I** Mathematics I	6	4	3	25	75
	Part IV	20UGVE11	Value Education	2	2	-	10	-
			TOTAL	**30**	**20**		**600**	

Semester		Course Code	Courses	Hours per week	Credits	Exam Hours	Total Marks	
							Int.	Ext.
II	Part III	20UPHC21	**Core Course 3** Electromagnetism	4	4	3	25	75
		20UPHC22	**Core Course 4** Heat and Thermodynamics	4	4	3	25	75
		20UPHC21P	**Core Course Practical I** General Physics Practical I	2	2	3	40	60
		20UMTA21 20UMTA22	**Allied Course I** Mathematics II Mathematics III	3 3	3 3	3 3	25 25	75 75
	Part IV	20UPHS21	**Skill enhancement Course 1 (SEC 1)** Programming in C	2	2	1	40	60
		TOTAL		**30**	**24**		**800**	

Semester		Course Code	Courses	Hours per week	Credits	Exam. Hours	Total Marks	
							Int.	Ext.
III	Part III	20UPHC31N	**Core Course 5** Optics	5	5	3	25	75
		20UPHC41P	**Core Course Practical II** General Physics Practical II	2	-	3	-	-
		20UEIA31	**Allied-Course II** Basic Electronics	4	4	3	25	75
		20UEIA41P	**Allied Course II Practical** Applied Electronics & Instrumentation Practical	2	-	3	-	-
	Part IV	20UPHS31	**Skill Enhancement Course 2 (SEC 2)** Solar Energy	2	2	2	40	60
		22UPHN31	**NMEC 1** Physics in Everyday Life – I	2	2	2	40	60
		20UGEH31 20UGEW32	**GEC 1** 1.Human Rights/ 2. Women Studies	1	1	2	100	-
			TOTAL	**30**	**20**		**700**	

Semester		Course Code	Courses	Hours per week	Credits	Exam. Hours	Total Marks	
							Int.	Ext.
IV	Part III	20UPHC41	**Core Course 6** Mathematical Physics	5	5	3	25	75
		20UPHC41P	**Core Course Practical II** General Physics II	2	2	3	40	60
		20UEIA41	**Allied Course II** Electronic Devices and Instrumentation	4	4	3	25	75
		20UEIA41P	**Allied Course II Practical** Applied Electronics & Instrumentation Practical	2	2	3	40	60
	Part IV	20UPHS41	**Skill Enhancement Course 3 (SEC 3)** Astrophysics	2	2	2	40	60
		20UPHN41N/ 22UPHN41	**NMEC 2** Fundamentals of Electronics/ Physics in Everyday Life – II	2	2	2	40	60
				2	2	2	40	60
		20UPHI41G	Internship/Field Project	0	1	-	100	-
		20UGEC41/ 20UGEM42/ 20UGEA43/ 20UGED44	**GEC 2** Constitution of India/ Modern Economics/ Adolescent Psychology/ Disaster Management	1	1	2	100	-
	Part V	-	Extension Activities	-	1	-	100	
			TOTAL	**30**	**26**		**1100**	

Semester		Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
V	Part III	20UPHC51	**Core Course 7** Classical and Statistical Mechanics	4	4	3	25	75	100
		20UPHC52	**Core Course 8** Modern Physics	4	4	3	25	75	100
		22UPHC53	**Core Course 9** Analog Electronics	4	4	3	25	75	100
		20UPHC61P	**Core Course Practical III** General Physics III	3	-	3	-	-	-
		20UPHC62P	**Core Course Practical IV** Electronics	3	-	3	-	-	-
		20UPHC63P	**Core Course Practical V** Digital Electronics	2	-	3	-	-	-
		20UCHE51 20UPHE52 20UPHE53	**Discipline Specific Elective Course1 (DSEC 1)** Analytical Instrumentation and ChemDraw Nanoscience Spectroscopy	4	4	3	25	75	100
		20UPHC5PR	**Core Course 10** Project	0	1	-	100		100
	Part IV	20UPHS51	**SkillEnhancementCourse4 (SEC 4)** Microprocessor	2	2	2	40	60	100
		20UPHS52P	**SkillEnhancementCourse5 (SEC 5)Practical I** Programming in C	2 [1 T*+1 P]	2	2	40	60	100
		20UGCE51	**Self-Study Course** Practice for Competitive Examinations – Online	-	1	-	100		100
		20UGES51	Environmental Studies	2	1	2	100		100
			TOTAL	**30**	**23**				**900**

Semester		Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
VI	Part III	22UPHC61	**Core Course 11** Solid State Physics	5	4	3	25	75	100
		20UPHC62	**Core Course 12** Nuclear and Particle Physics	5	4	3	25	75	100
		20UPHC63	**Core Course 13** Digital Electronics	5	4	3	25	75	100
		20UPHC61P	**Core Course Practical III** General Physics III	3	3	3	40	60	100
		20UPHC62P	**Core Course Practical IV** Electronics Practical	3	3	3	40	60	100
		20UPHC63P	**Core Course Practical V** Digital Electronics Practical	2	2	3	40	60	100
		20UPHE61/ 20UPHE62/ 20UCHE63	**Discipline Specific Elective Course 2 (DSEC 2)** Material Science Medical Physics Medicinal Chemistry	5	4	3	25	75	100
		20UPHQ61	**Self-Study Course** Core Courses Quiz - Online	-	1	-	100		100
	Part IV	20UPHS61P	**Skill Enhancement Course 6 (SEC 6) Practical II** Microprocessor	2 [1 T*+1 P]	2	2	40	60	100
			TOTAL	**30**	**27**				**900**

T* - Tutorial

PART III – ALLIED COURSE I PHYSICS FOR MATHEMATICS

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UPMA11	**Allied Course I** Properties of Matter, Heat and	4	100
2.	II	20UPMA21N	**Allied Course I** Electromagnetism, Optics and Electronics	4	100
3.	II	20UPMA21PN	**Allied Course I Practical** General Physics Practical	2	100
			Total	**10**	**300**

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B.Sc. PHYSICS
(2020 - 2021 onwards)

Semester I	**MECHANICS AND PROPERTIES OF MATTER**	Hours/Week: 4	
Core Course 1		Credits: 4	
Course Code **20UPHC11**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the laws, concepts and theorems in Mechanics and Properties of Matter. [K1]

CO2: derive mathematical relations involved in Mechanics, Gravitation and Properties of matter by applying the concepts. [K2]

CO3: discuss the experimental methods to determine the various physical parameters related to Gravitation and Properties of Matter. [K2]

CO4: use the learned concepts to solve problems in Mechanics and Properties of Matter. [K3]

CO5: analyze the applications of laws and concepts in Mechanics and Properties of matter. [K4]

UNIT I

Mechanics of a particle – conservation of linear momentum – conservation of angular momentum - energy conservation principle –Central force – central orbit – characteristics of motion under central force – center of mass – velocity and acceleration of center of mass during motion – center of mass of two particles – reduced mass – collision (Elastic and inelastic) – Laboratory frame and center of mass frame – perfectly elastic collision in one dimension – final velocity after collision in one dimension – coefficient of restitution. (12 Hours)

UNIT II

Moment of inertia: perpendicular axes theorem - parallel axes theorem – Moment of inertia of a circular ring, circular disc, cylinder, hollow cylinder, solid sphere, hollow sphere – determination of moment of inertia of a fly wheel – moment of inertia of a uniform rod, rectangular lamina,

annular ring, spherical shell – kinetic energy of a rotating body – torque – angular momentum – relation between torque and angular momentum – angular momentum of system of particles – conservation of angular momentum. (12 Hours)

UNIT III

Newton's law of gravitation – Kepler's law of planetary motion – determination of G – Boy's experiment – gravitational field and potential - gravitational field and potential due to spherical shell, solid sphere – variation of g with latitude, altitude and depth – compound pendulum. (12 Hours)

UNIT IV

Elasticity – different moduli of elasticity – relation between the elastic moduli – determination of Poisson's ratio of rubber-Torsion – expression for a torque per unit twist – work done in twisting a wire – Torsional oscillations of a body – rigidity modulus by Torsion pendulum - Bending of beams – expression for the bending moment — measurement of E (using microscope) – depression at the mid-point of a beam loaded at the middle – uniform bending of a beam – measurement of Young's modulus by bending of a beam. (12 Hours)

UNIT V

Viscosity– streamline flow and turbulent flow – Poiseuille's formula for the flow of a liquid through a capillary tube – determination of coefficient of viscosity of a liquid – terminal velocity and Stokes' formula – Stokes' method for the determination of coefficient of viscosity of a viscous liquid- Surface Tension – explanation of surface tension on Kinetic theory – work done in blowing a bubble – forms of liquid drops – angle of contact – pressure difference across a liquid surface – excess Pressure inside a curved liquid surface – Jaegar's Method - Equation of continuity – Energy of a liquid - Bernoulli's theorem – Application of Bernoulli's theorem (Torricelli's theorem, Venturimeter). (12 Hours)

Books for study:

Book 1: Gupta, A.B., (2011) Revised edition. *College Physics* (Volume 1), Calcutta: Books and Allied Pvt. Ltd.

UNIT 1: Sections - 3.1(3.1.1, 3.1.2, 3.1.3),

Sections - 8.1(8.1.1), 8.2, 8.4, 8.6

Sections - 9.1, 9.2, 9.3, 9.4, 9.6 - 9.11

Book 2: Murugesan, R. (2016) Revised edition. *Properties of Matter*, New Delhi: Sultan Chand & Company Private Ltd.

UNIT 2 : Sections – 7.1 -7.11, 10.1- 10.5, 10.7-10.11

UNIT 3 : Sections - 6.1 - 6.10

UNIT 4 : Sections – 1.1, 1.2, 1.7, 1.8, 1.9, 1.12, 1.13

Sections – 1.14 - 1.15, 1.19 - 1.21

UNIT 5 : Sections – 2.1- 2.3, 2.5, 2.8 - 2.10

Sections – 3.1, 3.2, 3.4, 3.5, 3.6, 3.8, 3.9, 3.11

Sections – 4.1, 4.2, 4.4

BOOKS FOR REFERENCE:

1. Mathur, D.S., (2012). Revised Edition. *Mechanics*, New Delhi: Sultan Chand & Company Private Ltd.
2. Murugesan, R., (2012). Revised Edition. *Properties of Matter*, New Delhi: Sultan Chand & Company Private Ltd.
3. Gupta, A.B., (2009). Revised Edition. *Classical Mechanics and Properties of Matter*, Calcutta: Books and Allied Pvt. Ltd.
4. Mathur, D.S., (2008). Revised edition. *Elements of Properties of Matter*, New Delhi: Sultan Chand & Company Private Ltd.
5. Haliday Resnick., and Walker, J., 6thedition, *Fundamentals of Physics*, New York, USA: Wiley Publications.
6. Brijlal and N. Subramanyam, (2016). Revised edition. *Properties of Matter*, New Delhi: Sultan Chand & Company Private Ltd.

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B.Sc. PHYSICS
(2023 - 2024 onwards)

Semester I	**MECHANICS AND PROPERTIES OF MATTER**	**Hours/Week: 4**	
Core Course 1		**Credits: 4**	
Course Code **20UPHC11N**		**Internal** 25	**External** 75

COURSE OUTCOMES

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

CO1: explain the laws, concepts and theorems in Mechanics and Properties of Matter. [K1]

CO2: derive mathematical relations involved in Mechanics, Gravitation and Properties of matter by applying the concepts. [K2]

CO3: discuss the experimental methods to determine the various physical parameters related to Gravitation and Properties of Matter. [K2]

CO4: illustrate the applications of basic laws/theories related to properties of matter and to solve simple problems. [K3]

CO5: analyze the variation of physical parameters related to mechanics and properties of matter. [K4]

UNIT I

Angular Momentum:

Torque – angular momentum – relation between torque and angular momentum – angular momentum of a system of particles – conservation of angular momentum.

Collision:

Impulse of a force –direct impact of two smooth spheres – loss of K.E due to direct impact of two smooth spheres – oblique impact of a smooth sphere on a fixed smooth plane –oblique impact of two smooth spheres – loss of K.E due to oblique impact.

Projectile Motion:

Range on an inclined plane - range and time of flight down an inclined plane – directions of projection for the maximum range - two body problem and the reduced mass– determination of M.I of a rectangular block. (12 Hours)

UNIT II

Moment of inertia:

Moment of inertia: perpendicular axes theorem - parallel axes theorem – Moment of inertia of a circular ring, circular disc, cylinder, hollow cylinder, solid sphere, hollow sphere – moment of inertia of a uniform rod, rectangular lamina, annular ring, spherical shell – kinetic energy of a rotating body- Bifilar pendulum- parallel thread. (12 Hours)

UNIT III

Gravitation:

Newton's law of gravitation – Kepler's law of planetary motion – determination of G – Boy's experiment – gravitational field and potential - gravitational field and potential due to spherical shell, solid sphere – variation of g with latitude, altitude and depth – theory and experimental determination of compound pendulum. (12 Hours)

UNIT IV

Elasticity:

Elasticity – different moduli of elasticity – relation between the elastic moduli – determination of Poisson's ratio of rubber-Torsion – Torsion of a body – work done in twisting a wire - Torsional oscillations of a body – rigidity modulus by Torsion pendulum - Bending of beams – expression for the bending moment — cantilever depression – depression at the mid-point of a beam loaded at the middle – uniform bending of a beam – measurement of Young's modulus by bending of a beam. (12 Hours)

UNIT V

Viscosity and Surface Tension:

Viscosity– streamline flow and turbulent flow – Poiseuille's formula for the flow of a liquid through a capillary tube – Poiseuille's method for determining coefficient of viscosity of a liquid – terminal velocity and Stokes' formula – Stokes' method for the coefficient of viscosity of a viscous liquid- Surface Tension – explanation of surface tension on the basis of Kinetic theory – work done in blowing a bubble – forms of liquid drops – angle of contact – pressure difference

across a liquid surface – excess Pressure inside a curved liquid surface – Jaegar's Method - Equation of continuity – Energy of a liquid - Bernoulli's theorem – Application of Bernoulli's theorem (Torricelli's theorem, Venturimeter). (12 Hours)

Books for study:

Book: Murugesan, R. (2016) Revised edition. *Properties of Matter*, New Delhi: Sultan Chand & Company Private Ltd.

UNIT 1 : Sections - 10.7-10.11, 8.1 – 8.7, 9.1 – 9.4, 9.6

UNIT 2 : Sections – 7.1 -7.10, 10.1- 10.5, 9.5.

UNIT 3 : Sections - 6.1 - 6.10

UNIT 4 : Sections – 1.1, 1.2, 1.7, 1.8, 1.9, 1.12, 1.13

Sections – 1.14 - 1.15, 1.17, 1.19 - 1.21

UNIT 5 : Sections – 2.1- 2.3, 2.5, 2.8, 2.9

Sections – 3.1, 3.2, 3.4, 3.5, 3.6, 3.8, 3.9, 3.11

Sections – 4.1, 4.2, 4.4

BOOKS FOR REFERENCE:

1. Mathur, D.S., (2012). Revised Edition. *Mechanics*, New Delhi: Sultan Chand & Company Private Ltd.
2. Murugesan, R., (2012). Revised Edition. *Properties of Matter*, New Delhi: Sultan Chand & Company Private Ltd.
3. Gupta, A.B., (2009). Revised Edition. *Classical Mechanics and Properties of Matter*, Calcutta: Books and Allied Pvt. Ltd.
4. Mathur, D.S., (2008). Revised edition. *Elements of Properties of Matter*, New Delhi: Sultan Chand & Company Private Ltd.
5. Haliday Resnick., and Walker, J., 6thedition, *Fundamentals of Physics*, New York, USA: Wiley Publications.
6. Brijlal and N. Subramanyam, (2016). Revised edition. *Properties of Matter*, New Delhi: Sultan Chand & Company Private Ltd.

Course Code 20UPHC11N	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO 1	H	-	H	-	-	L	-	-	-	M
CO 2	H	-	H	-	M	M	-	-	-	-
CO 3	H	M	H	M	-	M	M	M	-	-
CO 4	H	-	M	-	H	H	-	-	M	-
CO 5	H	L	M	-	H	H	-	H	-	-

Dr.A. Azhagu Parvathi
Head of the Department

Dr. S. Thenmozhi
Course Designer

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B.Sc. PHYSICS
(2020 - 2021 onwards)

Semester I	**ELECTRICITY**	Hours/Week: 4	
Core Course 2		Credits: 4	
Course Code		Internal	External
20UPHC12		25	75

COURSE OUTCOMES

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

CO1: state the laws of electricity and magnetic effects of current. [K1]

CO2: derive the mathematical expression for electric field & potential in various charge distribution, capacitance of capacitors, sensitivity of bridge, thermodynamics of thermocouple and magnetic field due to current in different dimension. [K2]

CO3: explain the experimental methods for the determination of parameters related to electrostatics, current electricity, thermal and magnetic effects of current. [K2]

CO4: solve problems using the concepts learned in electricity. [K3]

CO5: analyze the capacitors of different configurations & combinations to determine the capacitance and to compute electrical parameters in current and thermoelectricity. [K4]

UNIT I

Electro Static Fields:

Charges and Fields: Basic concepts - Columb's law - Superposition principle – Electric field. Gauss law and its applications: Flux of the electric field - Gauss's law - Electric field due to a uniformly charged sphere - Electric field due to an infinite line of charge - Electric field due to an infinite plane sheet of charge - Coulomb's theorem - Mechanical force experienced by unit area of a charged conductor - Energy stored per unit volume in the medium surrounding the charged conductor. (12 Hours)

UNIT II

Electric Potential:

Potential difference - Electric potential as line integral of electric field - Potential at a point due to a point charge - Relation between electric field and electric potential - Potential at appoint due to a uniformly charged conducting sphere.

Capacitors: Capacitance of a conductor - Principle of a capacitor - Capacitance of a spherical capacitor (outer and inner sphere earthed) - Capacitance of a cylindrical capacitor - Capacitance of a parallel plate capacitor - Effect of a dielectric - Capacitance of a parallel plate capacitor partly filled with a dielectric slab - Capacitors in series and parallel - Energy stored in a charged capacitor - Loss of energy on sharing of charges between two capacitors. (12 Hours)

UNIT III

Current Electricity:

Current and resistance: Current and current density - Expression for current density - Ohm's law and electrical conductivity - Kirchoff's law – Application of Kirchoff's law to wheatstone's bridge – Sensitivity of wheatstone's bridge.

Electrical Measurements: Carey Foster bridge - Determination of temperature coefficient of resistance - Potentiometer - Calibration of ammeter - Calibration of voltmeter (low and high range). (12 Hours)

UNIT IV

Thermo Electricity:

Seebeck effect - Laws of thermo e.m.f - Measurement of thermo e.m.f using potentiometer - Peltier effect - Comparison between Peltier and Joules effect - Demonstration of peltier effect (S.G starling method) - Thomson effect - Thomson coefficient - Demonstration of Thomson effect - Thermodynamics of thermocouple - Expression for peltier and Thomson coefficient. Thermo Electric Diagram – Uses of Thermo electric diagram – Determination of total emf and Thomson emf. (12 Hours)

UNIT V

Magnetic effect of electric current:

Biot-Savart law - Magnetic induction at a point due to a straight conductor carrying current - Magnetic induction at a point on the axis of a circular coil carrying current - Magnetic induction at any point on the axis of a solenoid - Force on a current carrying conductor in a magnetic field - Force between two parallel current carrying conductor - Force experienced by an electron moving in a magnetic field - Torque on a current loop in a uniform magnetic field -

Moving coil ballistic galvanometer - Correction for damping in ballistic galvanometer - Current and voltage sensitivities of a moving coil galvanometer - Measurement of charge sensitiveness - Comparison of two capacitances using B.G - Comparison of emf's of two cells using B.G. (12 Hours)

Books for study:

Murugessan, R. (2011). *Electricity and Magnetism*, New Delhi: S. Chand Company Private limited, Revised Edition.

UNIT I: Sections – 1.1 - 1.4, 2.1, 2.2, 2.5, 2.7, 2.9, 2.11 - 2.13

UNIT II: Sections – 3.1 - 3.5, 4.1 - 4.9, 4.11

UNIT III: Sections – 6.1, 6.2, 6.4, 6.6, 7.1, 7.2

UNIT IV: Sections – 8.1 – 8.8

UNIT V: Sections–10.1 - 10.4, 10.6 - 10.13, 10.15, 10.16

REFERENCE BOOKS

1. Edward, M., Purcell. (2008). *Electricity and Magnetism*, New Delhi: Tata McGraw-Hill Publishing Company Ltd.
2. Tiwari, K.K., (2011). *Electricity and Magnetism*, New Delhi: Sultan Chand & Company Private Ltd.
3. Murugesan, R. (2011). *Electricity and Magnetism*, New Delhi: Sultan Chand & Company Private Ltd.
4. Jose Robin, G., and Ubald Raj, A. (2013). *Electricity and Magnetism*, Marthandam: Indira Publication.

Course Code 20UPHC12	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	-	H	L	-	L	-	-	-	H
CO2	H	M	H	M	-	-	-	-	M	-
CO3	H	H	H	-	M	M	-	M	-	H
CO4	H	H	H	H	-	M	-	H	-	-
CO5	H	-	M	-	H	H	M	-	-	-

Dr.K.Uma Maheswari
Head of the Department

Dr.T.Vasantha Malliga
Course Designer

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B.Sc. PHYSICS AND CHEMISTRY

(2020 - 21 onwards)

Semester I	**ALLIED MATHEMATICS – I**	Hours/Week: 6	
Allied Course-I		Credits: 4	
Course Code **20UMTA11**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: retrieve the fundamental principles, concepts in the areas of differential calculus, Integral calculus, differential equations and Algebra. [K1]

CO2: explain curvature & evolute of a curve, method of solving exact differential equations and linear differential equations with constant coefficients. [K2]

CO3: find the derivative and partial derivative of a given function, solution of simultaneous linear equations, eigen values and eigen vectors of a given matrix and double &triple integrals. [K2]

CO4: apply the knowledge gained in calculus, differential equations and algebra to other fields. [K3]

CO5: analyse the challenging problems in calculus, differential equations and algebra. [K4]

UNIT I

Differential Calculus

Derivatives of some standard functions without proof – The chain rule for differentiation – Differentiation of inverse function – Differentiation by transformation - n^{th} derivative of some standard function – Leibnitz theorem. (18 Hours)

UNIT II

Differential Calculus Continued

Partial differentiation – Curvature - Evolutes. (17 Hours)

UNIT III

Integral Calculus

Double integrals – Evaluation of double integrals – Triple integrals. (20 Hours)

UNIT IV

Differential equations

Exact Differential equations –Integrating factors- Linear Equations with constant coefficients-Methods of finding complementary functions – Methods of finding Particular integrals. (20 Hours)

UNIT V

Algebra

Matrices -Simultaneous linear equations - Cayley Hamilton Theorem (statement only) – Problems-Eigen values and Eigen vectors. (15 Hours)

TEXT BOOKS

1. Arumugam. S. and Thangapandi Isaac. A.(2011). *Calculus*, New Gamma Publishing House.
2. Arumugam. S. and Thangapandi Isaac. A.(2012). *Allied Mathematics Paper III*, New Gamma Publishing House.
3. Arumugam. S. and Thangapandi Isaac. A.(2011).*Allied Mathematics Paper II*, New Gamma Publishing House.

Unit	Chapter	Section
Text Book 1		
I	Part I – 2	2.3 , 2.4 , 2.5 , 2.6 2.12 , 2.13
II	Part I – 2 Part I – 3	2.14 3.4 , 3.5
III	Part II – 3	3.1 , 3.2 , 3.3
Text Book 2		
IV	1 2	1.3,1.4 2.1,2.2,2.3
Text Book 3		
V	3	3.1, 3.2, 3.3, 3.4

Course Code 20UMTA11	PO1	PO 2	PO3	PO4	PO5	PO6	PO 7
CO1	H	M	H	M	L	M	-
CO2	H	M	H	M	L	M	-
CO3	M	M	H	M	L	M	-
CO4	H	H	H	H	L	M	-
CO5	H	M	H	M	L	H	-

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VIRUDHUNAGAR - 626 001

B.Sc. PHYSICS

(2020 -2021onwards)

Semester II	**ELECTROMAGNETISM**	Hours/Week: 4	
Core Course 3		Credits: 4	
Course Code **20UPHC21**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the concepts and principles in electromagnetism. [K1]

CO2: discuss the theories and experiments related to electromagnetism, principle of ac induction motor, ac circuits & ac bridges and magnetic materials. [K2]

CO3: derive the expressions related to transient response current and Maxwell's equations. [K2]

CO4: apply the learnt concepts and principles to solve problems in electromagnetism. [K3]

CO5: analyze the transient current in simple electronic circuits, ac circuits with LCR series & parallel, transformers and magnetic properties of materials. [K4]

UNIT I

Electromagnetic Induction

Faraday's laws of electromagnetic induction – self-inductance -self-inductance of a long solenoid -determination of L by Rayleigh's method & Anderson's method -mutual inductance- mutual inductance between coaxial solenoids– experimental determination of Mutual inductance – coefficient of coupling – determination of ballistic constant using solenoid inductor – Eddy currents. (12 Hours)

UNIT II

Three phase AC generators

Three phase AC generators – distribution of three phase AC – Rotating magnetic field- Single Phase Induction motor.

Transient Currents

Growth and decay of current in RL circuit – charge and discharge of a capacitor through a resistor - measurement of high resistance by leakage – growth of a charge in a circuit with L, C and R – discharge of a capacitor through L & R series. (12 Hours)

UNIT III

Alternating Current

EMF induced in a coil rotating in a magnetic field - ac circuit containing LCR in series (exclude j operator method) and parallel resonance circuit – power in a circuit containing L, C and R- wattles current- choke coil-Transformers.

AC bridges

AC bridges – Owen's bridge – Anderson's bridge - Maxwell's bridge. (12 Hours)

UNIT IV

Magnetic Properties of Materials

Magnetic induction – magnetization – magnetic susceptibility – magnetic permeability- properties of dia, para and ferro magnetic materials – anti-ferro magnetism and ferri magnetism – electron theory of magnetism – Langevin's theory of diamagnetism and paramagnetism – Weiss theory of ferromagnetism – experiment to draw M-H curve – energy loss due to hysteresis – importance of hysteresis curve – determination of susceptibility (Curie balance method). (12 Hours)

UNIT V

Maxwell's Equations and Electromagnetic Waves

Introduction - displacement current- Maxwell's equations in material media – plane electromagnetic waves in free space- Poynting vector

Scalar and vector potentials –monochromatic plane waves in vacuum – energy and momentum of electromagnetic waves – propagation through linear media. (12 Hours)

TEXT BOOKS

1. Murugesan, R. (2016). *Electricity and Magnetism*, New Delhi: Sultan Chand & Company Private Ltd.
2. Murugesan, R. (2007). *Electricity and Electromagnetism*, Madurai: Vivekananda Press.

BOOK 1

UNIT I : Sections – 11.1, 11.3-11.10, 11.13, 11.16

UNIT II : Sections – 12.1 – 12.6

UNIT III : Sections – 13.1 – 13.8

Sections – 19.1-19.3

UNIT IV : Sections-15.1- 15.14, 15.16 – 15.18

UNIT V : Sections- 16.1 – 16.5

Sections –28.1, 28.6, 28.7, 28.9, 28.10

BOOK2

UNIT II : Sections -13.10,13.16

REFERENCE BOOKS

1. Jose Robin, G., and Ubald Raj, A. (2013). *Electricity and Magnetism*, Marthandam: Indira Publication.
2. Edward, M., Purcell. (2008). *Electricity and Magnetism*, New Delhi: Tata McGraw-Hill. Publishing Company Ltd.
3. Sehgal Chopra Sehgal. (2004). *Electricity and Magnetism*, New Delhi: Sultan Chand & Sons.
4. Tiwari, K.K.., (2011). *Electricity and Magnetism*, New Delhi: Sultan Chand & Company Private Ltd.

Course Code 20UPHC21	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	L	L	L	-	-	-	M
CO2	H	H	H	M	M	M	-	-	-	-
CO3	H	L	H	M	M	M	-	H	-	-
CO4	H	L	M	M	H	H	-	-	L	-
CO5	H	M	M	M	H	H	-	H	-	-

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester II	**HEAT AND THERMODYNAMICS**	Hours/Week: 4	
Core Course 4		Credits: 4	
Course Code **20UPHC22**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain laws, concepts and physical parameters related to Heat &thermodynamics. [K1]

CO2: describe experimental methods related to calorimetry, heat transfer process and liquefaction of gases. [K2]

CO3: derive the expressions for laws, physical parameters related to Heat & Thermodynamics and liquefaction of gases. [K2]

CO4: apply the learned concepts to solve the problems in Heat and Thermodynamics. [K3]

CO5: analyse variation of specific heat capacity with temperature, isothermal & adiabatic processes, change of entropy, applications of laws of thermodynamics and heat transfer process. [K4]

UNIT I

Thermometry and Calorimetry

Platinum resistance thermometer – thermistor-specific heat capacity- Dulong and Petit's law –variation of specific heat capacity and atomic heat capacity with temperature-calorimetry-principle of calorimetry or method of mixtures-Barton's correction-experiment to determine the specific heat capacity of a liquid -the two specific heat capacities of a gas-Difference between the two specific heat capacities-Joly's differential steam calorimeter for finding C_V -Regnault's method to find C_P -Callendar and Barnes' continuous flow method -variation of specific heat capacity of diatomic gases-thermoelectric thermometer-Newton's law of cooling-specific heat capacity of a liquid. (12 Hours)

UNIT II

Kinetic Theory of gases

Isothermal and adiabatic process-work done during isothermal and adiabatic process-gas equation – Clement and Desormes' method to find γ.

Introduction- derivation of ideal gas equation-degrees of freedom- equipartition of energy-atomicity of gases-Maxwell's law of distribution of molar velocities-expressions for mean velocity, mean square velocity and the most probable velocity-experimental verification-– mean free path of a molecule-expression for the mean free path- transport phenomena-expression for the viscosity of a gas-thermal conductivity of gases-expression for the coefficient of diffusion on the basis of kinetic theory of gases. (12 Hours)

UNIT III

Thermodynamics and Thermodynamic Relations

Zeroth law of thermodynamics-first law of thermodynamics-heat engine-expression for the efficiency of a Carnot's engine-Carnot's cycle as a refrigerator-Carnot's theorem - reversible process-second law of thermodynamics-thermodynamic (or sbsolute or work) scale of temperature-entropy-change of entropy in a reversible process (Carnot's cycle)-change in entropy in an irreversible process-temperature-entropy diagram-third law of thermodynamics

Thermodynamic potentials-derivation of Maxell's four thermodynamic relations from the thermodynamic potentials U,H,F and G-Alternative derivation of Maxwell's thermodynamical relations- applications of Maxwell's Thermodynamic relations. (12 Hours)

UNIT IV

Conduction and Radiation

Introduction- coefficient of thermal conductivity- steady state – Lee's disc method of determining the thermal conductivity of a bad conductor-conduction along a uniform bar – rectilinear flow of heat- experimental determination of thermal conductivity- Searle's method.

Thermal radiation- introduction- Fery's black body- Wien's .black body – energy distribution in black body radiation- Planck's hypothesis – Planck's law of radiation-derivation of Planck's law –Stefan's law –Derivation of Stefan Boltzman law of radiation- determination of Stefan's constant –Solar constant – Angstrom's pyrheliometer. (12 Hours)

UNIT V

Liquefaction of gases

Different methods of liquefaction of gases – methods of freezing mixture– cooling by evaporation under reduced pressure – cooling by adiabatic expansion – Joule-Thomson expansion – liquefaction of gases – principle of regenerative cooling – liquefaction of air- Linde's Process – liquefaction of Helium(K.Onnes Method) – Helium I and Helium II – some peculiar properties of Helium II – production of low temperatures – adiabatic demagnetization

(12 Hours)

TEXT BOOKS

1. Murugesan, R., and Kiruthiga Sivaprasath. (Reprint 2016). *Thermal Physics,* New Delhi: Sultan Chand & Company Private Ltd.
2. Subramaniyan, Brjlal N., and Hemne, P.S. (2014). *Heat, Thermodynamics and Statistical Physics,* New Delhi: Sultan Chand & Company Private Ltd.

Book 1

UNIT I: Sections –1.1 – 1.15, 6.1-6.2, 12.1

UNIT II: Sections-13.1 – 13.6, 7.1 – 7.8, 7.11– 7.16

UNIT III: Sections- 2.1-2.6, 2.9-2.17, 9.1-9.3

UNIT IV: Sections- 4.1 – 4.10, 4.15 -4.16, 4.18, 4.20, 4.25, 4.27, 10.1, 10.7

Book 2

UNIT V: Sections- 7.1 – 7.8, 7.11 – 7.13, 7.15, 7.16.

REFERENCE BOOKS

1. Mark W. Zemansky, and Richard Dittman, H. (2011). *Heat and Thermodynamics,* 8th Edition, New Delhi: Tata Mc-Graw Hill.
2. Kakani, S.L. (2009). *Heat, Thermodynamics and* Statistical *Physics*, New Delhi: Sultan Chand & company Private Ltd.
3. Mathur, D.S. (2001). *Heat and Thermodynamics*, 4th Edition, New Delhi: S.Chand & Sons.

Course Code 20UPHC22	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	-	H	-	L	L	-	-	-	M
CO2	H	H	H	H	M	M	L	-	-	-
CO3	H	-	H	L	M	M	-	-	-	L
CO4	H	-	M	-	H	H	-	-	-	-
CO5	H	M	M	M	H	H	M	H	-	-

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester I/II	**GENERAL PHYSICS PRACTICAL - I**	Hours/Week: 2	
Core Course Practical I		Credits: 2	
Course Code **20UPHC21P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: apply the theoretical concepts in Properties of matter, Heat & Thermodynamics, electricity and Electromagnetism related experiments. [K3]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required physical parameters. [K3]

CO3: execute the technical skills in handling the equipment and observe the required measurements related to the experiment. [K3]

CO4: calculate the necessary parameters using the formula/graph and complete the record Work. [K3]

CO5: analyze the accuracy of the results obtained and compare it with the theoretical value. [K4]

List of Experiments: Any Sixteen

1. Young's Modulus by uniform bending using Microscope
2. Young's Modulus by non-uniform bending using Telescope
3. Young's Modulus of cantilever using Telescope
4. Rigidity Modulus by Torsion pendulum
5. Determination of 'g' using compound pendulum
6. Surface Tension by Drop weight method
7. Viscosity of liquid by Stokes's method
8. A.C. Frequency by Sonometer
9. M_1 / M_2 using deflection magnetometer

10. Comparison of EMF using potentiometer
11. Calibration of low range voltmeter using potentiometer
12. Calibration of ammeter using potentiometer
13. Resistance and resistivity using Carey Foster's bridge
14. Thermal conductivity of bad conductor by Lee's Disc method
15. Callender Barnes specific heat capacity of liquid
16. Thermal conductivity of a metal
17. Newton's law of cooling
18. Voltage and current sensitivity of galvanometer

Course Code 20UPHC21P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	M	L	H	-	-	L	-	-	M
CO2	H	H	H	H	-	M	-	-	-	L
CO3	H	H	H	H	-	M	-	L	H	-
CO4	H	H	H	-	H	M	-	L	M	H
CO5	M	M	M	M	H	H	M	M	M	H

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B.Sc. PHYSICS AND CHEMISTRY

(2020 -21 onwards)

Semester II	**ALLIED MATHEMATICS - II**	Hours/Week: 3	
Allied Course-I		Credits: 3	
Course Code **20UMTA21**		Internal 25	External 75

COURSE OUTCOMES

On completion of this course, students will be able to

CO1: retrieve the basic concepts in differentiation, integration, algebraic equations and trigonometric functions. [K1]

CO2: explain the concepts in Algebra, Vector Calculus and Trigonometry. [K2]

CO3: apply vector differentiation, vector integration and trigonometric functions in various fields. [K3]

CO4: find approximate solutions, establish the relation between roots and coefficients of an equation. [K3]

CO5: analyze the challenging problems in Vector Calculus, Algebra and Trigonometry. [K4]

UNIT I

Vector Differentiation

Differentiation of Vectors – Gradient- Velocity and Acceleration –Divergence and Curl (Simple Theorems only) - Problems. (9 Hours)

UNIT II

Vector Integration

Line integrals – Surface integrals- Theorems of Green, Gauss and Stokes (Statements only) – Problems. (9 Hours)

UNIT III

Algebra

Formation of Equations – Relation between roots and coefficients. (9 Hours)

UNIT IV

Algebra Continued

Transformation of Equations –Approximate solutions of numerical equations. (9 Hours)

UNIT V

Trigonometry

Expansion of sinθ, cosθ , tanθ in powers of θ – Hyperbolic Functions. (9 Hours)

TEXT BOOKS

1. Arumugam. S. and Thangapandi Isaac. A. (2004). *Ancillary Mathematics Paper II (Revised)*, New Gamma Publishing House.
2. Arumugam. S. and Thangapandi Isaac. A. (2014).*Allied Mathematics Paper I* , New Gamma Publishing House.

Unit	Chapter	Section
Text Book 1		
I	1	1.2 – 1.5
II	2	2.1,2.2,2.3
Text Book 2		
III	Part 1 - Chapter 1	1.1 , 1.2
IV	Part 1 - Chapter 1	1.4 , 1.5
V	Part 3- Chapter 1 Chapter 2	 1.3 2.1

Course Code 20UMTA21	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	H	M	M	-	-
CO2	H	L	H	M	M	L	-
CO3	H	M	H	M	M	L	-
CO4	M	M	L	M	M	-	-
CO5	H	L	L	M	M	L	-

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B.Sc. PHYSICS AND CHEMISTRY

(2020 -21 onwards)

Semester II	**ALLIED MATHEMATICS - III**	Hours/Week: 3	
Allied Course-I		Credits: 3	
Course Code		Internal	External
20UMTA22		25	75

COURSE OUTCOMES

On completion of this course, students will be able to

CO1: retrieve the basic concepts in Statistics and Operations Research. [K1]

CO2: explain the techniques used to solve the problems in Statistics and Operations research. [K2]

CO3: calculate some statistical constants to get statistical inference and O.R techniques to solve real life problems.[K3]

CO4: examine the statistical data to draw conclusion in Correlation and Regression. [K4]

CO5: analyze the challenging problems in real life to get solutions. [K4]

UNIT I

Statistics

Correlation

Correlation -Problems-Rank correlation. (9 Hours)

UNIT II

Regression

Regression - Properties of Regression coefficients – Problems. (9 Hours)

UNIT III

Operations Research

Formulation of Linear Programming Problem – Mathematical formulation of a Linear Programming Problem - Graphical method. (9 Hours)

UNIT IV

Operations Research Continued:

Mathematical formulation of Transportation Problems – Initial Basic Feasible Solutions (Method 1, Method 2, Method 3, Method 4). (9 Hours)

UNIT V

Operations Research Continued:

Introduction - Mathematical formulation of an Assignment problem – Solution to Assignment problem-Hungarian Algorithm (balanced minimization problems only). (9 Hours)

TEXT BOOKS

1. Arumugam. S and Thangapandi Isaac. A. (2011). *Statistics* , New Gamma Publishing House.
2. Arumugam. S and Thangapandi Isaac. A.(2015).*Topics in Operations Research Linear Programming*, New Gamma Publishing house.

Unit	Chapter	Section
Text Book1		
I	6	6.0, 6.1, 6.2
II	6	6.3
Text Book 2		
III	3	3.1, 3.2, 3.4
IV	4	4.1
V	5	5.0, 5.1, 5.2

Course Code 20UMTA22	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	H	H	H	H	-
CO2	H	M	H	H	H	M	-
CO3	H	H	H	H	H	H	-
CO4	H	M	H	H	H	H	-
CO5	H	M	H	H	H	H	

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester II	**PROGRAMMING IN C**	Hours/Week: 2	
SEC1		Credits: 2	
Course Code		Internal	External
20UPHS21		40	60

COURSE OUTCOMES

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

CO1: write the basics of 'C' fundamentals. [K1]

CO2: explain the functions of structures, arrays, and unions. [K2]

CO3: describe how to use functions, category of functions and nesting functions. [K2]

CO4: demonstrate a program by applying syntax in C language. [K3]

CO5: illustrate the concepts behind constants, variables, data types, control statements, functions, arrays and structure. [K4]

UNIT I

Constants, Variables and Data Types: Character set, C tokens, keywords and identifiers – constants - variables - data types –declaration of variables – C operators – formatted input: inputting integer numbers – formatted output: output of integer numbers. (6 Hours)

UNIT II

Decision making with if statement - simple if statement –the if-else statement- nesting of if - else statement – else-if ladder – switch statement - goto statement - the while statement – the do–while statement- the for statement. (6 Hours)

UNIT III

Data structures - one dimensional arrays – declaration of one dimensional arrays initialization of one dimensional arrays - two dimensional arrays - initialization of two dimensional arrays –understanding pointers – accessing the address of a variable. (6 Hours)

UNIT IV

Defining a structure – declaring structure variables – accessing structure members – structure initialization - arrays of structures – arrays within structures – Unions – size of structures – bit fields. (6 Hours)

UNIT V

Definition of functions –return values and their types – function calls – function declaration - category of functions – nesting of functions– recursion. (6 Hours)

TEXT BOOK

1. E.Balagurusamy, (Sixth edition) *Programming in ANSI C*, Tata Mc Graw Hill Education Private Limited.

   UNIT I: Chapter 2: 2.1 – 2.8

   Chapter 3: 3.1 – 3.9

   Chapter 4: 4.4 – 4.5

   UNIT II: Chapter 5: 5.1 –5.7, 5.9

   Chapter 6: 6.2 – 6.4

   UNIT III: Chapter 7: 7.1 – 7.6

   Chapter : 11.1 – 11.3

   UNIT IV: Chapter :10.1 – 10.5, 10.8, 10.9, 10.12 – 10.14

   UNIT V: Chapter : 9.5 - 9.16

REFERENCE BOOKS

1. Ramasamy, S, and Radhaganesan, P, (2005), *Programming in C*, Scitech Publications India Private Limited, Chennai & Hyderabad.
2. Schaum's outline series & Gottfried. (2006). *Programming with C*, Tata Mc GrawHill publishing company Ltd., New Delhi.

Course Code 20UPHS21	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	-	L	L	-	L	-	M
CO2	H	-	H	-	L	L	-	M	-	M
CO3	H	-	M	L	L	L	-	M	-	M
CO4	H	H	M	H	H	H	M	H	L	-
CO5	H	M	M	H	H	H	H	H	-	-

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester III	**OPTICS**	Hours/Week: 5	
Core Course5		Credits: 5	
Course Code **20UPHC31**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the principles and concepts in geometrical, physical optics and optical fibers. [K1]

CO2: derive the expressions and discuss experimental methods related to geometrical & physical optics, propagation of light through optical fiber. [K2]

CO3: apply the concepts to solve related problems in geometrical & physical optics and fiber optics. [K3]

CO4: analyse the concepts regarding aberration in lens systems, factors influencing interference, diffraction & polarization of light, losses in optical fibers and solve related problems [K4]

CO5: Correlate optical phenomena with real life situation and apply learnt concepts to solve related problems. [K5]

UNIT I

Geometrical Optics:

Refraction through a thin lens-equivalent focal length of two thin lenses separated by a distance –dispersion through a prism-Cauchy's formula-achromatism in prisms-dispersion without deviation-direct vision spectroscope-aberrations- spherical aberration in a lens-methods of minimizing spherical aberration-conditions for minimizing spherical aberration of two thin lenses separated by a distance-aplanatic lens-chromatic aberration in a lens- condition for a chromatism of two thin lenses placed in contact and separated by a finite distance-Huygen's eyepiece-Ramsden's eyepiece-comparison of eyepieces. (15 Hours)

UNIT II

Interference:

Theory of interference fringes-Fresnel's biprism- displacement of fringes-colours of thin films-production of colours in thin films-wedge-shaped film-Newton's rings-determination of wavelength of sodium light by Newton's rings-determination of refractive index of a liquid by Newton's rings-Michelson's Interferometer-uses of Michelson's Interferometer- Jamin's Interferometer-construction and working of Fabry.-Perot interferometer- formation of circular fringes-determination of wavelength. (15 Hours)

UNIT III

Diffraction:

Fresnel's explanation of rectilinear propagation of light-zone plate-multiple foci in a zone plate-comparison of a zone plate with a convex lens- diffraction at a straightedge-Fraunhofer diffraction at a single slit-plane transmission diffraction grating-dispersive power of a grating-grating at oblique incidence-determination of wavelength (normal incidence)-resolving power of optical instruments-resolving power of a prism-resolving power of a plane diffraction grating-comparison of prism and grating spectra. (15 Hours)

UNIT IV

Polarization:

Polarisation of light- polarization by reflection-pile of plates-Double refraction-Huygens' theory of double refraction in uniaxial crystals-Huygens' construction for double refraction in uniaxial crystals- Nicol prism- plane, circularly and elliptically polarized light-Theory of production of elliptically and circularly polarized light-quarter wave plate-half wave plate- production and detection of plane, circularly and elliptically polarized light-optical activity- Biot's laws for rotatory polarization- Fresnel's theory of optical rotations-specific rotation- Laurent's half shade polarimeter-determination of specific rotation of sugar solution.

(15 Hours)

UNITV

Optical Fibre and its Losses:

Optical fiber communication system-different generations in optical fiber communication-Advantages of optical fiber communication-different types of fiber- step index fiber, Graded index fiber, single mode fiber and multimode fiber-Ray theory of step index fiber-Total internal reflection light propagation through step index fibers-Fiber materials-fiber fabrication-Modified Chemical Vapor deposition– Plasma activated Chemical Vapor deposition–Comparison between CVD and PCVD-Fiber cables-Attenuation- Absorption-Scattering losses-Linear Scattering losses-Bending losses. (15 Hours)

TEXT BOOKS

1. Murugesan, R. & Kiruthiga Sivaprasath. (2014). *Optics and Spectroscopy,* 17th Revised Edition. New Delhi: S.Chand & Company Pvt Ltd.
2. Dr.M.Arumugam. (2002).Optical Fiber Communication and Sensors, Chennai: Sankar Printers Pvt.Ltd.

BOOK 1

UNIT – I Chapter1- Sections: 1.3, 1.4, 1.7 -1.11, 1.15-1.22, 1.25-1.28.

UNIT - II Chapter 2 – Sections: 2.1- 2.13, 2.18-2.20.

UNIT - III Chapter 3 - Sections: 3.1-3.5, 3.7, 3.10, 3.12, 3.14, 3.16-3.17, 3.19, 3.23-3.25.

UNIT –IV Chapter 4 -Sections: 4.1, 4.2, 4.3, 4.5-4.8, 4.10-4.17, 4.19-4.21

BOOK 2

UNIT –V Chapter 1 - Sections: 1.6, 1.7, 1.8
Chapter 2 - Sections: 2.2, 2.2.1, 2.3-2.3.1, 2.3.2
Chapter 3 - Sections: 3.1, 3.2, 3.3, 3.4, 3.4.4, 3.4.5, 3.4.6, 3.5
Chapter 4 - Sections: 4.1, 4.2, 4.3, 4.4-4.4.1, 4.4.3

REFERENCE BOOKS

1. Ajoy Ghatak.(2005). *Optics*, 3rd Edition, New Delhi: McGraw Hill Company.
2. Subramanyam Brijlal, N. & Avadhanulu, M. N. (2012). *Optics*, 24th Revised Edition. New Delhi: S.Chand Company Ltd.
3. John M.Senior (1992). *Optical Fiber Communication: Principles and Practice*,5th print 2nd edition,NewDelhi: Prentice – Hall of India Private Limited.

Course Code 20UPHC31	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	-	M	M	-	H	-	M
CO2	H	H	H	M	-	M	M	-	-	H
CO3	H	-	M	L	H	H	L	-	-	-
CO4	H	-	M	M	H	H	L	M	-	-
CO5	H	M	M	H	H	H	H	H	-	L

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VIRUDHUNAGAR - 626 001

B.Sc. PHYSICS

(2023 -2024 onwards)

Semester III	**OPTICS**	Hours/Week: 5	
Core Course5		Credits: 5	
Course Code **20UPHC31N**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the principles and concepts in geometrical, physical optics and optical fibers. [K1]

CO2: derive the expressions and discuss experimental methods related to geometrical & physical optics, propagation of light through optical fiber. [K2]

CO3: illustrate the applications of optical phenomena in various systems. [K3]

CO4: analyze the concepts regarding aberration in lens systems, factors influencing interference, diffraction & polarization of light, losses in optical fibers [K4]

CO5: Correlate optical phenomena with real life situation and apply learnt concepts to solve the problems [K5]

UNITI

Geometrical Optics:

Refraction through a thin lens-equivalent focal length of two thin lenses separated by a distance –dispersion through a prism-Cauchy's formula-achromatism in prisms-dispersion without deviation-direct vision spectroscope-aberrations- spherical aberration in a lens-methods of minimizing spherical aberration-conditions for minimizing spherical aberration of two thin lenses separated by a distance-aplanatic lens-chromatic aberration in a lens- condition for a chromatism of two thin lenses placed in contact and separated by a finite distance-Huygen's eyepiece-Ramsden's eyepiece-comparison of eyepieces. (15 Hours)

UNIT II

Interference:

Theory of interference fringes-Fresnel's biprism- displacement of fringes-colours of thin films-production of colours in thin films-wedge-shaped film-Newton's rings-determination of wavelength of sodium light -determination of refractive index of a liquid -

Michelson's Interferometer-uses of Michelson's Interferometer- Jamin's Interferometer-construction and working of Fabry.-Perot interferometer- -determination of wavelength.

(15 Hours)

UNIT III

Diffraction:

Fresnel's explanation of rectilinear propagation of light-zone plate-multiple foci in a zone plate-comparison of a zone plate with a convex lens- diffraction at a straight edge-Fraunhofer diffraction at a single slit-plane transmission diffraction grating-dispersive power of a grating-grating at oblique incidence-determination of wavelength (normal incidence)-resolving power of optical instruments-resolving power of a prism-resolving power of a plane diffraction grating-comparison of prism and grating spectra. (15 Hours)

UNIT IV

Polarization:

Polarisation of light- polarization by reflection-pile of plates-Double refraction-Huygens' theory of double refraction in uniaxial crystals-Huygens' construction for double refraction in uniaxial crystals- Nicolprism- -Theory of production of elliptically and circularly polarized light-quarter wave plate-half wave plate- production and detection of plane, circularly and elliptically polarized light-optical activity- Biot's laws for rotatory polarization-Fresnel's theory of optical rotations-specific rotation- Laurent's half shade polarimeter-determination of specific rotation of sugar solution. (15 Hours)

UNIT V

Fibre Optics:

Introduction – optical fibre – optical fibre system- optical fibre cable - total internal reflection – propagation of light through an optical fibre – acceptance angle - fractional refractive index change – numerical aperture – modes of propagation – types of rays – classification of optical fibres –types of fibres – materials – fabrication – losses in optical fibre – attenuation – different mechanism of attenuation - distortion – intermodal dispersion (Qualitative) – intramodal dispersion - applications – fibre optic communication systems.

(15 Hours)

TEXT BOOKS

1. Murugesan, R. & KiruthigaSivaprasath. (2014). *Optics and Spectroscopy,* 17th Revised Edition. New Delhi: S.Chand & Company Pvt Ltd.
2. Dr. N. Subrahmanyam, Brij Lal & Dr. M.N. Avadhanulu. (2012). *A Textbook of Optics* 24th Revised Edition S. Chand & Company Ltd.

BOOK 1

UNIT – I Chapter1- Sections: 1.3, 1.4, 1.7 -1.11, 1.15-1.22, 1.25-1.28.
UNIT - II Chapter 2 – Sections: 2.1- 2.13, 2.18-2.20.
UNIT - III Chapter 3 - Sections: 3.1-3.5, 3.7, 3.10, 3.12, 3.14, 3.16-3.17, 3.19, 3.23-3.25.
UNIT –IV Chapter 4 -Sections: 4.1, 4.2, 4.3, 4.5-4.8, 4.10-4.17, 4.19-4.21

BOOK 2

UNIT –V Chapter 24 - Sections: 24.1, -24.4, 24.4.2-24.6, 24.8-24.12, 24.14, -24.15.2, 24.16, 24.16.1, 24.16.2, 24.20, 24.21

REFERENCE BOOKS

1. Ajoy Ghatak.(2005). *Optics*, 3rd Edition, New Delhi: McGraw Hill Company.
2. Subramanyam Brijlal, N. & Avadhanulu, M. N. (2012). *Optics*, 24th Revised Edition. New Delhi: S.Chand Company Ltd.
3. John M.Senior (1992). *Optical Fiber Communication: Principles and Practice*,5th print 2nd edition, NewDelhi: Prentice – Hall of India Private Limited.

Course Code 20UPHC31N	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO 1	H	-	M	-	M	M	-	H	-	M
CO 2	H	H	H	M	-	M	M	-	-	H
CO 3	H	-	M	L	H	H	L	-	-	-
CO 4	H	-	M	M	H	H	L	M	-	-
CO 5	H	M	M	H	H	H	H	H	-	L

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester III	**BASIC ELECTRONICS**	Hours/Week: 4	
Allied Course II		Credits: 4	
Course Code **20UEIA31**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the basic concepts of passive circuit elements, semiconductor elements, network theorems and transistor amplifiers. [K1]

CO2: derive expressions involved in semiconductor elements, network theorems, biasing of transistor and transistor amplifiers. [K2]

CO3: describe the working of active and passive circuit elements and semiconductor components, biasing of transistor and transistor amplifiers. [K2]

CO4: apply the concepts to solve related problems of passive circuit elements, semiconductor components, circuit theorems, biasing of transistor and transistor amplifiers. [K3]

CO5: analyze the operation of semiconductor components, network theorems, biasing of transistor and transistor amplifiers. [K4]

UNIT I

Passive Circuit Elements:

Resistors, resistor types - wire wound resistors, carbon composition resistors, metal film resistors, variable resistors, potentiometer and rheostats, color-code resistors - Thermistor inductor - inductance of an inductor, mutual inductance, variable inductors, reactance and impedance offered by a wire, Q - of a coil, capacitors - capacitance - types of capacitors, fixed, variable capacitors. (12 Hours)

UNIT II

Semiconducting Devices:

Types of semiconductors - intrinsic, extrinsic semiconductors - PN junction diode - construction, working, V-I - characteristics - Zener diode - Rectifiers - half wave rectifier - full wave rectifier - bridge rectifier - filters - π filters - LC-filter. (12 Hours)

UNIT III

Transistor and Transistor Biasing:

Transistor - Transistor action- transistor connections & characteristics - common base - common emitter - common collector - load line analysis - operating point - methods of transistor biasing - base resistor - emitter bias - biasing with collector feedback - voltage divider bias. (12 Hours)

UNIT IV

Network Theorems:

Super position theorem - Thevenin's theorem - Norton's theorem- h-parameters – Filters – Filter definitions - types of filters - low pass filter - high pass filter - band pass filter - band stop filter – Multisection Filter Circuit- Uses of Filters. (12 Hours)

UNIT V

Transistor Amplifiers:

Transistor amplifier-C.E mode - analysis of a transistor CE amplifier using h-parameters - power amplifier - classification of power amplifier - single ended class - A power amplifier - Push Pull amplifier (class B power amplifier) - cross - over distortion.

(12 Hours)

TEXT BOOKS

1. Theraja, B.L. (2014). *Basic Electronics*, New Delhi: S.Chand & Company Ltd.
2. Mehta, V. K. & Rohit Mehta (2013). *Principles of Electronics*, New Delhi: S.Chand & Company Ltd.

BOOK 1:

UNIT I: Chapter 5 – Sections: 5.1- 5.12, 5.14, 5.15, 5.19 - 5.21, 5.23, 5.25, 5.32-5.35, 5.37, 5.39 - 5.41

UNIT II: Chapter 12 - Sections: 12.23-12.25.

Chapter 14 - Sections: 14.1

Chapter 15 - Sections: 15.1, 15.2

Chapter 17 - Sections: 17.5-17.9, 17.13, 17.14

UNIT IV: Chapter 4 – Sections: 4.2, 4.5-4.8

Chapter 21 – Sections: 21.14.

Chapter 11 – Sections: 11.13-11.21

Chapter 15– Sections: 15.12

BOOK 2:

UNIT III: Chapter 8 – Sections: 8.4, 8.5, 8.7-8.10, 8.12, 8.13, 8.16-8.18

Chapter 9 – Sections: 9.2, 9.7-9.12

UNIT V: Study Material

Course Code 20UEIA31	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	L	-	L	-	-	-	-
CO2	H	-	M	-	M	M	L	-	-	M
CO3	H	M	H	M	-	L	-	M	-	M
CO4	H	-	M	-	H	H	-	-	-	-
CO5	H	-	M	-	H	H	-	H	-	-

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ALLIED COURSE II CHEMISTRY FOR PHYSICS (SF)
(2020-2021 Onwards)

Semester III	**GENERAL CHEMISTRY-I**	Hours/Week: 4	
Allied Course-II		Credits: 4	
Course Code **20UCHA31**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students shall be able to

CO1: describe the terminologies involved in periodic table, reagents, adsorption, catalysis, colloids, purification of organic compounds, types of reagents, reactions and pollution. [K1]

CO2: infer about the periodic properties, different grades, reagents in laboratory, concentration of solution, types of adsorption, catalysis and colloids, types of purification , organic reactions electrophiles and nucleophiles and types of pollution. [K2]

CO3: explain the periodicity of elements, preparation of reagents, different units of concentration of solution, methods of purification of organic compounds,sources and control of pollution. [K2]

CO4: interperet the elements with respect to properties, chemicals with respect to grades, concentration with respect to molarity, molality and molar mass, catalyst, colloids with respect to their characteristics along with their applications and types, techniques of purification, reagents used for the reaction ,causes and effects of pollution. [K3]

CO5: analyze the various trends of the periodic table, purity of chemicals, reagents with various concentration, catalyst used in the reaction, sols, gels, emulsion, methods of purification of organic compounds, characteristics of adsorption, preventive measures and effects of pollution. [K4]

UNIT I

Periodic Table and Periodic Properties:

Long form of periodic table – characteristics - classification of elements on the basis of electronic configuration – periodicity of properties – causes of periodicity – factors affecting the magnitude of periodic properties – atomic, covalent and ionic radii – electron affinity – ionization energy – electro negativity – Pauling and Mulliken scale – Alfred and Rochow's scale – applications of electronegativity. (12 Hours)

UNIT II

Laboratory chemicals and reagents

a) Laboratory chemicals and reagents – different grades – commercial, LR, GR, AR, Chromatographic pure and spectral pure.

b) Preparation of reagents in the laboratory – Tollen's reagent – neutral $FeCl_3$ – Borsche's reagent – Schiff's reagent – Fehling solution A & B.

c) Units of concentration of solution – Normality, Molarity, Molality, Mole fraction, Mass percentage and Volume percentage – Simple problems dealing with the preparation of reagents. (12 Hours)

UNIT III

Adsorption, Catalysis and Colloids

a) Adsorption – Characteristics – Types of adsorption – Applications of adsorption.

b) Catalysts – characteristics – different types with examples – catalytic poisoning – catalytic promoters with example.

c) Colloids – definition and classification - Sols – different types – examples – Emulsion – Types of emulsion – examples - Gels – Types of gels – examples. (12 Hours)

UNIT IV

Purification and Classification of Organic reagents and reactions

a)Purification of organic compounds – Distillation – fractional distillation – distillation under reduced pressure – steam distillation – Crystallization – fractional crystallization – sublimation – chromatographic techniques – column and thin layer chromatography (brief study)

b) Classification of organic reagents: Electrophiles – nucleophiles – free radicals – examples – Reactions: Addition – substitution – elimination – polymerization – rearrangement with an example for each. (12 Hours)

UNIT V

Pollution:

a) Air Pollution: Definition – air pollutants – sources – effects of air pollutants – Ozone layer formation and depletion – green house effect – acid rain – preventive measures of air pollution.

b) Water pollution: sources – waste water (sewage) treatment – industrial and municipal water treatment.

c) Radioactive pollution: sources – nuclear waste disposal – Effects of radiations.

d) Soil pollution – sources and control. (12 Hours)

TEXT BOOKS

1. Satya Prakash, Tuli, G.D. Basu, Madan, R.D. (2011). *Advanced Inorganic Chemistry*, Vol-1,1st Edition. New Delhi: S.Chand & Company. Ltd.
2. ArunBahl&Bahl B.S. (2012). *Advanced Organic Chemistry*, 19th Edition. New Delhi: S.Chand& Company Ltd.
3. Soni, P.L. (2008). *Text Book of Physical Chemistry*, 2nd Edition.New Delhi: Sultan Chand & Sons.

REFERENCE BOOKS

1. Puri, Sharma, Kalia, (2008). *Principles of Inorganic Chemistry*, 2nd Edition. New Delhi: Milestone Publishers.
2. Jalandhar, Soni, P.L. (2008). *A Text book of Inorganic Chemistry*, 2ndEdition.New Delhi: Sultan Chand & Sons.
3. Madan, R.D. (1986). *Modern Inorganic Chemistry*, 1st Edition.New Delhi: S.Chand& Company Ltd.
4. Tewari, K.S. &.Vishnoi, N.K. (2006). *A Text book of Organic Chemistry*, 3rd Edition.New Delhi: Vikas Publishing House Pvt. Ltd.
5. Negi, A.S. &Anand S.C.,(2008), *A Text Book of Physical Chemistry*, 2nd Edition. New Delhi: New Age International Publishers.
6. Puri, Sharma, Pathania (2016), *Elements of Physical Chemistry*, Jalandhar, 4th Edition. Delhi: Vishal Publishing & Co.

Course Code 20UCHA31	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	H	M	M	L	H
CO2	H	M	H	M	M	L	H
CO3	H	M	H	M	M	L	H
CO4	H	M	H	M	M	L	H
CO5	H	M	H	M	M	L	H

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester III	**SOLAR ENERGY**	Hours/Week: 2	
SEC 2		Credits: 2	
Course Code **20UPHS31**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: explain the concepts of non-conventional energy, principles and types of solar thermal gadgets and solar cells. [K1]

CO2: discuss the construction and working of solar thermal gadgets. [K2]

CO3: describe the construction and working of PV cell and module. [K2]

CO4: apply the learned concepts to calculate the efficiency of solar thermal devices and reveal the applications of PV module. [K3]

CO5: analyze the models of cookers, and collectors, for various applications. [K4]

UNIT I

Solar Energy Basics:

Classification of energy resources - importance of non – conventional energy source - salient features - solar energy basics - the sun as a source of energy - extraterrestrial and terrestrial radiations - spectral energy distribution of solar radiation - depletion of solar radiations (no derivation) – measurements – Pyranometer - Pyrheliometer - sunshine recorder - solar radiation geometry. (6 Hours)

UNIT II

Solar Thermal System:

Solar collectors - classification - comparison of concentrating and non -concentrating types (flat –plate type) - performance indices - liquid flat-plate collector -Flat-plate air heating collector - evacuated tube collector - modified flat plate collector - Compound Parabolic Concentrator (CPC) – cylindrical parabolic concentrator. (6 Hours)

UNIT III

Solar Thermal Gadgets:

Solar water heater - solar cooker - box-type solar cooker - paraboloidal dish-type solar cooker - community solar cooker - advanced solar cooker – solar dryer - solar distillation.

(6 Hours)

UNIT IV

Solar Cell Fundamental:

Solar photovoltaic systems - photo conduction - solar cell - I-V characteristics - energy losses and efficiency - maximizing the performances - cell size - energy payback period (EPP) – solar cell classification - on the basics of thickness of active material - on the basics of junction structure – on the basis of type of active material. (6 Hours)

UNIT V

Solar PV Panel and Applications:

Solar cell - Solar PV Module - Solar PV Panel - Solar PV array - Solar PV classification – Solar PV applications - water pumping – lighting - medical refrigeration - Telecommunication and signaling. (6 Hours)

TEXT BOOK

Khan, B.H. (2009).*Non – Conventional Energy Resources,* Third Reprint. New Delhi: Tata McGraw-Hill Education Private Limited.

UNIT –I Chapter 1 - Sections: 1.3, 1.5, 1.9, 4, 4.1, 4.4, 4.5, 4.6, 4.7, 4.7.1,4.7.2,4.7.3,4.10.

UNIT –II Chapter 5 - Sections: 5.1, - 5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.1.6, 5.1.7, 5.1.8, 5.1.9, 5.1.10

UNIT –III Chapter 5- Sections: 5.2, 5.6, 5.6.1, 5.6.2, 5.6.3, 5.6.4, 5.9, 5.10

UNIT –IV Chapter 6- Sections: 6, 6.1.4, 6.2, 6.2.4, 6.2.5, 6.2.6, 6.2.7, 6.3, 6.3.1, 6.3.2, 6.3.3

UNIT –V Chapter 6 - Sections: 6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.8, 6.9.2, 6.9.3, 6.9.4, 6.9.6

REFERENCE BOOKS

1. Rai, G.D. (2004). *Solar Energy Utilization*, Delhi: Khanna Publications.
2. Sukhatme, S.P. (1998). *Solar Energy*, Delhi: Tata McGraw Hill.
3. Tiwari, G.N. (2006). *Solar Energy Fundamentals, Design, Modelling and Applications*, New Delhi: Narosa Publishing House

Course Code 20UPHS31	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	-	-	M	-	-	-	L
CO2	H	M	H	H	M	M	-	-	-	-
CO3	H	M	H	H	M	M	M	-	-	-
CO4	H	L	M	M	H	H	H	-	L	-
CO5	H	M	M	M	H	H	H	H	L	-

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester III	**Introduction to Electronics**	Hours/Week
Extra Credit Course-1		Credits: 2
Course Code **20UPHO31**		Internal 100

COURSE OUTCOMES

On completion of the course students will be able to

CO1 : identify the terminals of various electronic components

CO2 : understand the principle of electronic components such as resistor, inductor, diodes transistors, FET and UJT

CO3 : describe the working of various electronic components

CO4 : explain linear and non-linear circuit elements and their sources

CO5 : apply relevant theorems to simplify electronic circuits

UNIT- I

Resistor and Inductor

Resistor-type of Resistors -fixed resistors- variable resistors - colour coding of resistors-Inductor- types of inductors-fixed inductors-variable inductors.

UNIT – II

Diodes:

p-n junction diode-Biasing a p-n junction: Forward bias-Reverse bias-Energy band diagram for p-n junction diode-p-n junction diode action (rectifier action)-Experiment to study the volt-ampere characteristics of a p-n junction diode-Zener diode-I-V characteristics of zener diode-power supply-zener diode as voltage regulator.

UNIT- III

Transistors:

Junction transistor-biasing the transistor for active region-transistor action-relation connecting α and β of a transistor–three modes of transistor action- transistor characteristics in the common emitter mode.

UNIT - IV

Linear circuits:

Electric current- linear and nonlinear circuit elements-electric power- active and passive elements-constant voltage source-constant current source-Thevenin's theorem-Norton's theorem.

UNIT – V

FET &UJT:

Field effect transistor-structure of a JFET-principle and working of a JFET-experiment to draw JFET characteristics (in the common source configuration) and to determine the FET parameters-comparison between junction transistor and JFET-Uni- junction transistor (UJT)-characteristics of UJT.

Text books:

1. Basic electronics- G.Jose Robin &A.Ubald Raj- First edition –June 2014.
2. Electronics one - S.Rajasekar.

   Unit - I: Book 2: Page No. - 1-1.9,1.14- 1.17

   Unit - II: Book 1: Page No. - 53-73

   Unit -III: Book 1: Page No. – 80-86, 90-94

   Unit -IV: Book 1: Page No. – 1- 6, 11-13, 23 - 26 and Page No. 26 Summary

   Unit - V: Book 1: Page No. – 1-93 ,195-201, 211-215

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester IV	**MATHEMATICAL PHYSICS**	Hours/Week : 5	
Core Course - 6		Credits : 5	
Course Code **20UPHC41**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain basic concepts in vector calculus, types of matrices, special functions and Fourierseries. [K1]

CO2: derive the theorems in vector calculus, properties of matrices, beta and gamma functionand Fourier series in different intervals. [K2]

CO3: solve the problems in vector calculus, matrices, beta and gamma function and Fourier series. [K3]

CO4: demonstrate the applications of vector calculus, matrices, beta and gamma function and Fourier series in different branches of Physics. [K4]

CO5: apply MATLAB software to solve the problems in matrices and Fourier series. [K5]

UNIT I

Vector Analysis:

Gradient of a scalar field - line, surface and volume integrals - divergence of a vector function - expression for divergence in cartesian coordinates - curl of a vector function - expression for curl in cartesian coordinates - physical significance of curl - Gauss divergence theorem - Stoke's theorem - Green's theorem - application of vectors to hydrodynamics - equation of continuity - the equation of heat flow in solids: Fourier's heat flow equation, Poisson's equation.

(15 Hours)

UNIT II

Vector Analysis:

Orthogonal curvilinear coordinates – differential operators in terms of orthogonal curvilinear coordinates (Gradient, Divergence, Laplacian, Curl) - spherical polar coordinates (r, θ, φ) and differential operators (Gradient, Divergence, Laplacian, Curl) – cylindrical coordinates and differential operators (Gradient, Divergence, Laplacian, Curl) – unit vectors in cylindrical and spherical coordinates – expressions for velocity and acceleration in cylindrical and spherical co-ordinates - problems. (15 Hours)

UNIT III

Matrices:

Special types of matrices - transpose of matrix - the conjugate of matrix - the conjugate transpose (or the transposed conjugate) of a matrix - symmetric and anti-symmetric matrices - Hermitian and skew - Hermitian matrices - singular and non-singular matrices - orthogonal matrices - unitary matrices - solution of linear equations - eigen values, eigen vectors: characteristic equation of a matrix - matrices in Physics - the rotation matrix - Pauli spin matrices.

(15 Hours)

UNIT IV

The Beta, Gamma and Error Functions:

Definitions - symmetry property of beta function - evaluation of beta function - transformation of beta function (other forms of beta function) - evaluation of gamma function - transformation of gamma function (other forms of gamma function) - relation between beta and gamma functions - miscellaneous important prepositions - graph of gamma function.

(15 Hours)

UNIT V

Fourier Series and Integrals:

Fourier Series - half range series in interval 0 to π - change of interval from (-π, π) to $(-l, l)$ - complex form of Fourier series - Fourier series in the interval (0, T) – uses of Fourier Series - physical examples of Fourier series - half wave rectifier - full wave rectifier - a saw tooth wave - problems. (15 Hours)

TEXT BOOK

1. Satya Prakash (Reprint 2014). *Mathematical Physics with Classical Mechanics*, New Delhi: Sultan Chand & Sons.

   UNIT I - Chapter 1 - Sections: 1.2 -1.5, 1.7, 1.9, 1.11, 1.19 (a), 1.19.(a).1, 1.19 (b), 1.19 (c).2

   UNIT II - Chapter1- Sections:1.15, 1.15 (b), (c), (d), 1.16, 1.17

   UNIT III - Chapter2 - Sections: 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.14, 2.17, 2.18, 2.27, 2.31, 2.39 (i), (ii)

   UNIT IV - Chapter 4 -Sections: 4.1 - 4.7, 4.9, 4.10.

   UNIT V - Chapter 8 - Sections: 8.1, 8.3 - 8.6, 8.8, 8.9 (1), 8.9 (2), 8.9 (4)

Course Code 20UPHC41	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	-	H	-	L	L	-	-	-	M
CO2	H	-	H	L	M	M	-	M	-	-
CO3	H	-	H	-	H	M	-	M	-	-
CO4	H	-	M	-	H	H	L	-	-	-
CO5	M	M	L	M	M	M	L	H	M	-

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester III/IV	**GENERAL PHYSICS PRACTICAL - II**	Hours/Week: 2	
Core Course Practical II		Credits: 2	
Course Code **20UPHC41P**		Internal 40	External 60

COURSE OUTCOMES

On completion of the practical, the students will be able to

CO1: apply the theoretical concepts in Electricity, Electromagnetism, Heat & Thermodynamics and Optics related experiments. [K3]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required physical parameters. [K3]

CO3: execute the technical skills in handling the equipment and observe the required measurements related to the experiment. [K3]

CO4: calculate the necessary parameters using the formula/graph and complete the record work [K3]

CO5: analyze the accuracy of the results obtained and compare it with the theoretical value. [K4]

List of Experiments: Any Sixteen

1. Determination of specific rotatory power using polarimeter
2. Determination of resistance & resistivity using potentiometer
3. Calibration of high range voltmeter using potentiometer
4. Conversion of galvanometer into ammeter using spot galvanometer
5. Determination of charge sensitiveness using spot galvanometer
6. Determination of L by Owens' bridge
7. Comparison of capacitances by Desauty's bridge
8. Determination of dispersive power of the prism using spectrometer
9. Determination of refractive index of a liquid using hollow prism by spectrometer
10. Determination of N and λ of grating by spectrometer
11. Determination of refractive index of a small angled prism by spectrometer

12. Determination of thickness of a wire by Air wedge.
13. Determination of wavelength of sodium light by Newton's rings method.
14. Determination of specific heat capacity of water using Joules Calorimeter.
15. Determination of ece of copper using copper voltameter.
16. Determination of impedance and power factor of LR circuit.
17. Determination of Charactersistics of Solar cell
18. Determination of acceptance angle and numerical aperture using Fiber optic cable

Course Code 20UPHC41P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	M	L	H	-	-	L	-	-	M
CO2	H	H	H	H	-	M	-	-	-	L
CO3	H	H	H	H	-	M	-	L	H	-
CO4	H	H	H	-	H	M	-	L	M	H
CO5	M	M	M	M	H	H	M	M	M	H

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester IV	**ELECTRONIC DEVICES AND INSTRUMENTATION**	Hours/Week: 4	
Allied Course II		Credits: 4	
Course Code **20UEIA41**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the basic concepts involved in performance characteristics of the instruments, measuring meters, cathode ray oscilloscope, power electronics and transducers. [K1]

CO2: discuss the construction and working of electronic measuring meters and cathode ray oscilloscopes. [K2]

CO3: describe the working and characteristics of power electronic devices and transducers. [K2]

CO4: demonstrate the applications of electronic, cathode ray oscilloscope, power electronic devices and transducers. [K3]

CO5: analyze the operation of CRO, power electronic devices and transducers. [K4]

UNIT I

Performance Characteristics:

Functional elements of an instrument –performance characteristics – static characteristics – accuracy – precision – sensitivity – resolution – threshold –linearity – dynamic characteristics – instrument classification – sources of errors – types of errors – gross – systematic – random errors – statistical analysis. (12 Hours)

UNIT II

Electronic Devices:

Electronic multimeter – uses of multimeter – d.c. voltage – an ammeter – a.c. voltage – resistance measurements – advantages and disadvantages – magnetic measurements – flux meter – measurements of flux density – electronic voltmeter – Vacuum Tube Voltmeter (VTVM) - applications of VTVM – merits and demerits of VTVM. (12 Hours)

UNIT III
Oscilloscope:

Cathode Ray Tube (CRT) – basic principle of signal display – block diagram of simple oscilloscope – front panel controls of simple CRO - CRO measurements – voltage – current – period and frequency – need of CRO in electronic practicals – Lissajous figures – measurement of phase difference and frequency. (12 Hours)

UNIT IV
Power Electronics:

SCR – construction, working, equivalent circuit, VI characteristics – half wave and full wave rectifiers using SCR - Diac – construction, operational characteristics and applications (lamp dimmer, heat control) – Triac – construction, operational characteristics and applications (High power lamp switch, Electronic changeover of transformer)– UJT – applications – relaxation oscillator using UJT. (12 Hours)

UNIT V
Transducer:

Classification of transducers – active and passive transducers – characteristics of transducers – passive transducers – resistive transducer – Linear Variable Differential Transducer (LVDT) – capacitive pressure transducer – active transducer – piezoelectric transducer.

(12 Hours)

TEXT BOOKS

1. Bakshi, U.A., & Bakshi, A.V. (2013). *Measurements & Instrumentation*, Fifth Revised Edition, Technical Publications.

   UNIT I – Chapter 1 – Sections: 1.1, 1.2, 1.3, 1.4, 1.4.1, 1.4.2, 1.4.4 – 1.4.7, 1.5, 1.12, 1.17, 1.18 – 1.18.2, 1.18.3, 1.19

   UNIT II–Chapter 2 -Sections: 2.36, 2.38 - 2.40

   UNIT III–Chapter 5- Sections: 5.9 – 5.13, 5.22 - 5.23

   UNIT V–Chapter 6 -Sections: 6.1- 6.3, 6.5 – 6.7, 6.12, 6.13.3, 6.14, 6.16

2. Mehta, V.K. (2008).*Principles of Electronics*, S.Chand & Company Ltd.

   UNIT II –Chapter 22 - Sections: 22.7 – 22.10

   UNIT IV– Chapter 20 - Sections:20.1- 20.3,20.5 20.9, 20.10

   Chapter 21 - Sections: 21.1 – 21.3, 21.5, 21.6, 21.8 - 21.15

REFERENCE BOOKS

1. Theraja, B.L. (2014).*Basic Electronics Solid State*, Revised Edition, S.Chand& Company Ltd.
2. Ubald Raj, A., &Jose Robin, G. (1997).*Basic Electronics*, Edition, Indira Publications.
3. Sedha, R.S. (2008).*A Text book of Applied Electronics*, Revised Edition, S.Chand& Company Ltd.

Course Code 20UEIA41	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	L	M	L	-	-	-	M
CO2	H	M	H	M	-	M	M	-	-	-
CO3	H	M	H	M	-	M	M	M	-	M
CO4	H	-	M	-	M	M	L	-	-	-
CO5	M	-	M	-	M	H	-	H	-	-

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ALLIED COURSE II CHEMISTRY FOR PHYSICS (SF)

(2020 - 2021 onwards)

Semester IV	**GENERAL CHEMISTRY-II**	Hours/Week: 4	
Allied Course-II		Credits: 4	
Course Code **20UCHA41**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: recognize the biomolecules, ores, minerals, soaps, detergents, oils, fats, water, fuels, fertilizer and principles of spectroscopy. [K1]

CO2: describe the concept of carbohydrates, amino acids, proteins, nucleic acids, metallurgical process, soaps, detergents, hardness of water, fuels, fertilizers and UV, IR, NMR spectroscopy. [K2]

CO3:explain the classification of carbohydrates, amino acids, proteins, nucleic acids, methods of extraction of metals, soaps, detergents, hardness of water, fuels, fertilizers and illustrate the theory of different spectroscopic techniques. [K2]

CO4: apply the chemistry of biomolecules in daily life along with their functions, metallurgical process in metal extraction, oils in soap and detergent preparation, hardness removal in water, constituents of fuels, fertilizers in plants growth, spectroscopy in compounds interpretation. [K3]

CO5: analyze the structure and synthesis of biomolecules, techniques of extraction of metalloids, quality of oils used in soaps and detergents, purity of water, percentage of constituents in gaseous fuels, composition of elements in fertilizers, spectral data of UV, IR and NMR. [K4]

UNIT I

Chemistry of Biomolecules:

Carbohydrates – classification – Monosaccharide – Glucose – fructose – difference between them – Inter conversion of glucose and fructose – Haworth structure of glucose and fructose – properties and structure of starch and cellulose – Derivatives of cellulose and their uses

a) Amino acids – classification – preparation – properties – Zwitter ion – isoelectric point – Test for amino acids
b) Proteins – classification – biological function – colour reaction of proteins
c) Nucleic acids – RNA and DNA – Biological function (Elementary idea only)

(12 Hours)

UNIT II

Metallurgy:

Ores, Minerals – various steps in the metallurgical process – Froth floatation –Calcination – roasting – Leaching – Smelting – Mond's process – van Arkel-de Boer's process – Zone refining – Electrolytic refining –Extraction of Titaniun. (12 Hours)

UNIT III

Oils, Fats, Soaps, Detergents and Water technology

a) Oils & fats: Definition - Differences between oils & fats – Saponification value – Iodine value – Determination of saponification and iodine value – uses of oils & fats.
b) Soaps and Detergents: Soap – definition – different types – manufacture of soap by Kettle process – cleansing action of soap. Detergents – definition – synthetic detergent – example of cationic and anionic detergents – Distinction between soaps and detergents.
c) Hardness of water – types of hardness – Removal of hardness: Permutit method and Ion-exchange process. (12 Hours)

UNIT IV

Fuels and Fertilizers

a) Fuels – classification – advantages of gaseous fuels – constituents and uses of water gas, producer gas, LPG, gobar gas and natural gas.
b) Fertilizers – classification – macro and micro nutrients – functions of nutrients – Preparation and uses of Urea, ammonium sulphate, Super phosphate, Triple super phosphate, Potassium nitrate and NPK. (12 Hours)

UNIT V

Basic principles of spectroscopy

a) Basic principles of UV, IR and NMR spectroscopy.
b) Identification of ethanol and diethyl ether by IR spectroscopy.
c) Identification of 1,3-butadiene and benzene by UV spectroscopy.
d) NMR – chemical shift – reference standard – TMS – NMR spectrum of ethanol.

(12 Hours)

TEXT BOOKS

1. Satya Prakash, Tuli, G.D. Basu, Madan, R.D. (2011). *Advanced Inorganic Chemistry*, Vol II,1st Edition. New Delhi: S.Chand& CompanyLtd.
2. ArunBahl & Bahl, B.S. (2014). *Advanced Organic Chemistry*, 19th edition. New Delhi: S.Chand& Company Ltd.
3. Soni, P.L. (2008). *Text Book of Physical Chemistry*,2nd Edition. New Delhi: Sultan Chand & Sons.

REFERENCE BOOKS

1. Puri, Sharma, Kalia, (2017). *Principles of Inorganic Chemistry*,33rd Edition. New Delhi:Vishal Publishers.
2. Soni P.L. (2008). *A Text Book of Inorganic Chemistry*,2nd Edition. New Delhi: Sultan Chand & Sons.
3. Madan, R.D. (2013). *Modern Inorganic Chemistry*,3rd Edition. New Delhi: S.Chand & Company Ltd.
4. Tewari, K.S. &Vishnoi, N.K. (2006). *A Text book of Organic Chemistry*,3rd Edition. New Delhi:Vikas Publishing House Pvt. Ltd.
5. Negi, A.S. &Anand, S.C. (2008). *A text book of Physical Chemistry*,2nd Edition.New Delhi: A New age International Publishers.
6. Puri, Sharma, Pathania,(2016). *Elements of Physical Chemistry*, 4th Edition.Jalandhar, Delhi: Vishal Publishing & Co.
7. Sharma, Y.R. (2007).*Elementary Organic Spectroscopy*,4th Edition.New Delhi: S.Chand

Course Code 20UCHA41	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	M	H	M	L	L
CO2	H	H	M	H	M	L	L
CO3	H	H	M	H	L	L	L
CO4	H	H	L	H	M	L	L
CO5	H	H	M	H	M	L	L

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester III/IV	**APPLIED ELECTRONICS & INSTRUMENTATION PRACTICAL**	Hours/Week: 2	
Allied Course II Practical		Credits: 2	
Course Code **20UEIA41P**		Internal 40	External 60

COURSE OUTCOMES

On completion of the practical, the students will be able to

CO1: apply the theoretical concepts in passive, active elements and semiconductor devices and its related experiments. [K3]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and formula to calculate the necessary electrical parameters. [K3]

CO3: develop technical skills in handling the equipment and components and observe required measurements related to the experiment. [K3]

CO4: calculate the necessary parameters using the formula/graph and complete the record work [K3]

CO5: analyze the accuracy of the results obtained and compare theoretical value with the measured value. [K4]

List of Experiments:

1. Measurement of R, L and C using multimeter
2. V-I characteristics of P-N junction diode
3. Zener diode characteristics
4. Thermistor characteristics
5. Halfwave and Fullwave rectification
6. Study of output voltages of Bridge rectifier
7. Measurements of AC/DC voltages & Frequency using CRO
8. Wave shaping circuits using Diode
9. UJT relaxation oscillator
10. Transistor characteristics –CE mode
11. Logic gates using discrete components

12. Emitter follower
13. Integrator and differentiator using discrete components
14. Verification of Kirchhoff's laws
15. SCR characteristics
16. Measurement of Strain using Strain gauge transducer

Course Code 20UEIA41P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	M	M	M	-	H	-	M
CO2	-	H	H	M	M	H	M	-	-	-
CO3	-	H	M	H	-	M	M	-	H	M
CO4	-	H	H	H	M	M	L	-	-	M
CO5	-	H	H	H	M	M	M	M	M	M

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ALLIED COURSE II CHEMISTRY FOR PHYSICS (SF)
(2020 - 2021 onwards)

Semester IV	**VOLUMETRIC ANALYSIS**	Hours/Week: 2	
Allied Course II Practical		Credits: 2	
Course Code **20UCHA41P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: apply the principles involved in the volumetric analysis [K3]

CO2: find out the strength of standard solutions [K3]

CO3: estimate the amount of the substance present in the given solution by volumetric analysis [K3]

CO4: determine the concentration of the unknown solutions. [K4]

CO5: analyse and evaluate the accuracy of the results. [K4]

A double titration involving making up of the solution to be estimated or single titration involving making up of the solution to be estimated and the preparation of a primary standard

a. Acidimetry and Alkalimetry:

1. Titration between a strong acid and strong base
2. Titration between a strong acid and weak base.
3. Titration between a weak acid and strong base

b.Permanganimetry:

Titration between potassium permanganate and

i) oxalic acid ii) ferrous sulphate and iii) ferrous ammonium sulphate (Mohr's salt)

c.Iodometry:

Titration between sodium thiosulphate and i) potassium permanganate and ii) potassium dichromate.

Course Code 20UCHA41P	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	H	M	L	L	M
CO2	M	M	H	M	M	M	H
CO3	M	M	H	M	M	M	H
CO4	H	M	H	M	L	M	H
CO5	H	M	H	M	L	M	H

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester IV	**ASTROPHYSICS**	Hours/Week: 2	
SEC 3		Credits: 2	
Course Code **20UPHS41**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: describe the properties of sun, chemical composition of stars, cosmological models, galaxies and astronomical instruments. [K1]

CO2: understand the physical process that governs the universe, its constituents, and their origin using different theories. [K2]

CO3: discuss the structure of sun, star, galaxy and various astronomical instruments. [K2]

CO4: apply relevant theories to unravel the properties of astronomical matters. [K3]

CO5: infer the facts about perception of universe. [K4]

UNIT I

The Sun:

Simple Spectroscopy – analysing Sun Light – the Conservation of Energy - electromagnetic spectrum – Sun – ordinary gases – Sun's continuous spectrum – solar absorption line spectrum – physical properties of the sun – structure of the sun – solar atmosphere – active sun – Sunspots – Sunspot Cycle – butterfly diagram – solar wind – Auroras – Coronal Mass ejections – Solar flares. (6 Hours)

UNIT II

The Universe of Stars:

Birth of stars – chemical composition and energy generation of the stars – Hertzsprung – Russell diagram – Stellar evolution and H R Diagram – luminosity of a star –star models - theoretical evolution of stars – supernova explosion – observational evidence of stellar evaluation – white dwarfs – black holes – neutron stars – pulsars. (6 Hours)

UNIT III

Galaxies:

Classification of galaxies – milky way galaxy – galactic clusters – differential galactic rotation – rotation and mass distribution - rotation curve and Doppler shift – spiral structure in the milky way – optical tracers of spiral structure – radio tracers of spiral structure – galactic center – distribution of material near the center – a massive black hole. (6 Hours)

UNIT IV

Cosmology:

Cosmological methods – big bang theory – steady state theory – Hubble's Law – Olber's Paradox – interstellar extinction – dark matter. (6 Hours)

UNIT V

Astronomical Instruments:

Telescopes: an introduction – elements of telescope – properties of the image – kinds of optical telescopes – refracting telescope – reflecting telescope – difference between reflecting and refracting telescopes – radio telescope – spectrograph – photographic photometry – photoelectric photometry – spectrophotometry – detectors and image processing. (6 Hours)

TEXT BOOK

Mujiber Rahman, A. (2018). *Concepts of Astrophysics*, India: Scitech Publications Pvt. Ltd.

Unit I – Chapter 1 - Sections: 1.4 - 1.7

Chapter 2 – Sections: 2.1 - 2.6, 2.8 - 2.12, 2.14, 2.15

Unit II – Chapter 3 – Sections: 3.1 - 3.4, 3.6 - 3.12

Unit III – Chapter 5 – Sections: 5.1 - 5.7, 5.9 – 5.12

Unit IV – Chapter 6 – Sections: 6.1 - 6.8

Unit V– Chapter 7 – Sections: 7.1 - 7.11

REFERENCE BOOKS

1. Kumaravelu, Susheela kumaravelu, S. (2009). *Astronomy,* Sivakasi: A. Bhaskara Selvan Printers.
2. William Kaufmann, (1999). *Astronomy: The Structure of the Universe*, NewYork: Mac Millan Publishing Co.inc.
3. Thiruvenkatacharya, V. (1972). *A Text Book of Astronomy*, New Delhi: S. Chand and Co., Pvt Ltd.
4. Abhyankar, K.D., (1989). *Astrophysics, Stars and Galaxies*, New Delhi: Tata Mc Graw Hill Publications.
5. Nick Kaiser, (2002). *Elements of Astrophysics* (online version)

Course Code 20UPHS41	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	L	-	-	L	-	-	M
CO2	H	-	H	L	L	M	-	-	-	-
CO3	H	L	H	H	M	M	-	M	-	-
CO4	H	-	M	L	M	H	-		-	-
CO5	H	-	L	M	-	M	-	H	-	-

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Semester IV	**Internship / Field Project (2020 -21 onwards)**	Hours/Week: 0
PART IV		Credit: 1
Course Code **20UPHI41G**		Internal 100

COURSE OUTCOMES

On completion of the Internship/Field Project, students will be able to

CO1: relate their theoretical insights with hands-on experience. [K3]

CO2: develop technical skills to their respective field of study. [K3]

CO3: demonstrate the attributes such as observational skills, team spirit and inter personal skills built through site visits. [K3]

CO4: exhibit the written communication skills acquired through internship/field project. [K3]

CO5: analyze the observations and results and communicate their academic and technological knowledge appropriately oral means. [K4]

GENERAL INSTRUCTIONS:

- **Internship:** A designated activity that carries one credit involving not less than 15 days of working in an organization under the guidance of an identified mentor
- **Field Project:** Students comprising of maximum 5 members in a team need to undertake a project that involves conducting surveys inside/outside the college premises and collection of data from designated communities or natural places.
- Internal Assessment only.

Course Code 20UPHI41G	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	M	M	M	H	-
CO2	H	M	M	M	M	H	
CO3	H	M	-	-	-	H	
CO4	H	H	M	M	-	M	H
CO5	H	M	H	H	M	-	

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester V	**CLASSICAL AND STATISTICAL MECHANICS**	Hours/Week: 4	
Core Course-7		Credits: 4	
Course Code **20UPHC51**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : explain the concept of Newtonian, Lagrangian, Hamiltonian approach, laws in statistical mechanics and distribution laws. [K1]

CO2 : derive the conservation theorems based on Newtonian mechanics, equations of motion for mechanical systems using Lagrangian, Hamiltonian and the distribution laws in classical and quantum statistics. [K2]

CO3 : find the equations of motion for different mechanical systems by applying Newtonian, Lagrangian, Hamiltonian approach in classical mechanics and the parameters in statistical basis, energy level of various systems in classical & quantum statistics. [K3]

CO4 : adopt the learned concepts to solve problems in classical and statistical mechanics. [K4]

CO5 : predict the applications of Newtonian mechanics in inclined plane, Lagrangian in electrical circuits and classical statistics in Doppler effect. [K5]

UNIT I

Newtonian Mechanics:

Inertial frames – mechanics of a particle: conservation laws - conservation of linear momentum – conservation of angular momentum – conservation of energy - mechanics of system of particles : external and internal forces – center of mass – conservation of linear momentum – centre of mass-frame of reference - conservation of angular momentum – conservation of energy - degrees of freedom – constraints — holonomic constraints – non-holonomic constraints – examples of holonomic and non-holonomic constraints – forces of constraints – difficulties introduced by the constraints and their removal – generalized co-ordinates. (12 Hours)

UNIT II

Lagrangian dynamics:

Hamilton's variational principle – deduction of Lagrange's equations of motion from Hamilton's principle – deduction of Lagrange's equation by differential method - D'Alembert's principle – deduction of Hamilton's principle from D'Alembert's principle – deduction of Newton's second law of motion from Hamilton's principle - deduction of Lagrange's equation using variational principle for system involving forces not derivable from potential function – Applications: linear harmonic oscillator - simple pendulum - particle moving on the surface of earth - compound pendulum - Atwood's machine – bead sliding on a uniformly rotating wire in force free space - superiority of Lagrangian approach over Newton's approach.

(12 Hours)

UNIT III

Hamiltonian dynamics:

Phase space and motion of system – Hamiltonian - Hamilton's canonical equations of motion - physical significance of H – advantage of Hamiltonian approach - deduction of canonical equations from variational principle - Hamilton's canonical equations of motion in different co-ordinate systems (cylindrical and spherical co-ordinate) – Applications: simple pendulum - compound pendulum - linear harmonic oscillator - particle moving near the surface of earth – particle in a central field of force. (12 Hours)

UNIT IV

Statistical Basis:

Statistical basis – macrostate and microstate – constraints on a system – static and dynamic systems - most probable state – concept of cell in a compartment.

Universal Laws in Statistical Mechanics:

Degrees of freedom – position and momentum space – phase space – the mu-space and gamma space – applications: one-dimensional harmonic oscillator, a free particle – fundamental postulates of statistical mechanics – density of quantum states of energy of a particle - statistical ensembles – comparison of ensembles – entropy and probability (12 Hours)

UNIT V

Maxwell-Boltzmann Statistics:

Three kinds of particles – M.B. statistics applicable to ideal gas – Maxwell-Boltzmann energy distribution law – applications of M.B distribution law.

Quantum Statistics:

Development of quantum statistics – Bose-Einstein distribution law – photon gas – Planck's radiation law –Fermi-Dirac distribution law – free electrons in metals: Electron gas – Fermi level and Fermi energy – E_F for electrons in a metal - applications to liquid helium – comparison of three statistics – difference between classical and quantum statistics. (12 Hours)

TEXT BOOKS

1. Upadhaya J.C. (2012). *Classical Mechanics.* Second Edition, Mumbai: Himalaya Publishing House. Pvt. Ltd.
2. Gupta, Kumar & Sharma. (2019). *Classical Mechanics*. Thirtieth Edition, Meerut: Pragati Prakashan.
3. Brijlal, Subramanyam, N. & Hemne, P.S. (2019). *Heat, Thermodynamics and Statistical Physics*. New Delhi: S.Chand & Company Pvt. Ltd.

BOOK 1

UNIT I: Chapter 1 - Sections: 1.4, 1.6 – 1.7.5, 1.7.8

Chapter 2 - Sections: 2.2 (2), 2.3, 2.4

BOOK 2

UNIT II: Chapter 2- Sections: 2.3-2.5, 2.7-1, 2.7-2, 2.8, 2.9-1, 2.9-2, 2.9-6, 2.9-9, 2.9-10, 2.17

UNIT III: Chapter 3 - Sections: 3.1- 3.8, 3.9-1, 3.9-2, 3.9-4, 3.9-5, 3.9-6

BOOK 3

UNIT IV: Chapter 9 - Sections: 9.1, 9.7, 9.10 – 9.12, 9.14

Chapter 10 - Sections: 10.1 – 10.5, 10.7 – 10.11, 10.15

UNIT V: Chapter 11 - Sections: 11.1 – 11.3 (P. No: 417, 419-422), 11.4 (1, 2)

Chapter 12 - Sections: 12.2, 12.5 – 12.11, 12.14 – 12.16

REFERENCE BOOKS

1. Goldstein. (1980). *Classical Mechanics*. 2nd Edition. Mumbai: Narosa Publishing House.
2. Gupta, B.D., & SathyaPrakash. (2003).*Classical Mechanics.* Meerut: Kedarnath Ramnath.
3. Takwale, R.G., & Puranik, P.S. (1993). *Introduction to Classical Mechanics.* New Delhi: Tata McGraw-Hill Publishing Company Limited.
4. Chattopadhyay, D and Rakshit, P.C., (2017). *Quantum Mechanics, Statistical Mechanics and Solid State Physics*. S.Chand and Company Limited, New Delhi.

Course Code 20UPHC51	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	-	H	-	-	-	-	H	-	H
CO2	H	-	H	-	H	M	-	-	-	M
CO3	H	-	H	-	H	H	-	-	-	-
CO4	H	-	M	H	H	H	-	M	-	-
CO5	H	-	M	M	H	H	-	H	-	-

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VIRUDHUNAGAR - 626 001

B.Sc. PHYSICS

(2023 -2024 onwards)

Semester V	**CLASSICAL AND STATISTICAL MECHANICS**	Hours/Week: 4	
Core Course-7		Credits: 4	
Course Code **20UPHC51N**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : explain the concept of Newtonian, Lagrangian, Hamiltonian approach, laws in statistical mechanics and distribution laws. [K1]

CO2 : derive the conservation theorems based on Newtonian mechanics, equations of motion for mechanical systems using Lagrangian, Hamiltonian and the distribution laws in classical and quantum statistics. [K2]

CO3 : find the equations of motion for different mechanical systems by applying Newtonian, Lagrangian, Hamiltonian approach in classical mechanics and the parameters in statistical basis, energy level of various systems in classical & quantum statistics. [K3]

CO4 : adopt the learned concepts to solve simple problems in classical and statistical mechanics. [K4]

CO5 : predict the applications of Newtonian mechanics in inclined plane, Lagrangian in electrical circuits and classical statistics in Doppler effect. [K5]

UNIT I

Newtonian Mechanics:

Inertial frames – mechanics of a particle: conservation laws - mechanics of system of particles : external and internal forces – center of mass – frame of reference - conservation laws - degrees of freedom – constraints - holonomic constraints – non-holonomic constraints – examples of holonomic and non-holonomic constraints – forces of constraints – difficulties and removal.

(12 Hours)

UNIT II

Lagrangian dynamics:

Generalized co-ordinates – principle of virtual work - D'Alembert's principle – Lagrange's equation from D'Alembert's principle for conservative and non-conservative systems.

Applications: Newton's equations of motion – simple pendulum – Atwood's machine – compound pendulum – motion under central force – bead sliding on a uniformly rotating wire in force free space - Lagrangian mechanics verses Newton's approach. (12Hours)

UNIT III

Hamiltonian dynamics:

Generalized momentum - cyclic coordinates – Hamiltonian function H and conservation of energy - Jacobi's integral – physical significance – Hamilton's equations – Hamilton's equations in different coordinate systems.

Applications: Harmonic oscillator – motion of a particle in a central force field – charged particle moving in an electromagnetic field – two dimensional harmonic oscillator – simple pendulum – ideal spring mass arrangement - compound pendulum. (12 Hours)

UNIT IV

Formulation of Statistical Mechanics:

Statistical basis – macrostate and microstate – constraints on a system – static and dynamic systems - most probable state – concept of cell in a compartment.

Degrees of freedom – position and momentum space – phase space – the mu-space and gamma space – applications: one-dimensional harmonic oscillator, a free particle – fundamental postulates of statistical mechanics – density of quantum states of energy of a particle - statistical ensembles – comparison of ensembles – entropy and probability. (12 Hours)

UNIT V

Classical and Quantum Statistics:

Three kinds of particles – M.B. statistics applicable to ideal gas – Maxwell-Boltzmann energy distribution law – applications of M.B distribution law.

Development of quantum statistics – Bose-Einstein distribution law – photon gas – Planck's radiation law –Fermi-Dirac distribution law – free electrons in metals: Electron gas – Fermi level and Fermi energy – E_F for electrons in a metal - applications to liquid helium – comparison of three statistics – difference between classical and quantum statistics.

(12 Hours)

TEXT BOOKS

1.Upadhaya J.C. (2012). *Classical Mechanics.* Second Edition, Mumbai: Himalaya Publishing House. Pvt. Ltd.

2. Brijlal, Subramanyam, N. & Hemne, P.S. (2019). *Heat, Thermodynamics and Statistical Physics*. New Delhi: S.Chand & Company Pvt. Ltd.

BOOK 1

UNIT I: Chapter 1 - Sections: 1.4, 1.6 – 1.7.5, 1.7.8

Chapter 2 - Sections: 2.2 (2), 2.3

UNIT II: Chapter 2 - Sections: 2.4 – 2.7, 2.9

UNIT III: Chapter 3 - Sections: 3.2, 3.4 – 3.7

BOOK 2

UNIT IV: Chapter 9 - Sections: 9.1, 9.7, 9.10 – 9.12, 9.14

Chapter 10 - Sections: 10.1 – 10.5, 10.7 – 10.11, 10.15

UNIT V: Chapter 11 - Sections: 11.1 – 11.3 (P. No: 417, 419-422), 11.4 (1, 2)

Chapter 12 - Sections: 12.2, 12.5 – 12.11, 12.14 – 12.16

REFERENCE BOOKS

1. Gupta, Kumar & Sharma. (2019). *Classical Mechanics*. Thirtieth Edition, Meerut: Pragati Prakashan.
2. Goldstein. (1980). *Classical Mechanics*. 2nd Edition. Mumbai: Narosa Publishing House.
3. Gupta, B.D., & SathyaPrakash. (2003).*Classical Mechanics.* Meerut: Kedarnath Ramnath.
4. Chattopadhyay, D and Rakshit, P.C., (2017). *Quantum Mechanics, Statistical Mechanics and Solid State Physics*. S.Chand and Company Limited, New Delhi.

Course Code 20UPHC51N	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO 1	H	-	H	-	-	-	-	H	-	H
CO 2	H	-	H	-	H	M	-	-	-	M
CO 3	H	-	H	-	H	H	-	-	-	-
CO 4	H	-	M	H	H	H	-	M	-	-
CO 5	H	-	M	M	H	H	-	H	-	-

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester V	**MODERN PHYSICS**	Hours/Week: 4	
Core Course-8		Credits: 4	
Course Code **20UPHC52**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : explain concepts, principles, postulates and operators in atomic physics, quantum mechanics and relativity. [K1]

CO2 : discuss various atom models, optical & X-ray spectra, Einstein's theory of photoelectric effect and derive the equations & theorems related to atomic physics, quantum mechanics and relativity. [K2]

CO3 : apply learnt concepts to solve problems in atomic physics, wave mechanics, operators in quantum mechanics and relativity. [K3]

CO4 : analyze the relativistic variations of physical quantities and solve Schrodinger equation for various potential functions. [K4]

CO5 : Assess the impact of Compton effect, photoelectric effect, and pair production in Medical Physics. [K5]

UNIT I

Structure of Atom:

Critical potentials - atomic excitation -experimental determination of critical potential - Davis' and Goucher's method – Drawbacks of Bohr atom model - Sommerfeld relativistic atom model - vector atom model - quantum numbers associated with vector atom model - coupling schemes - Pauli's exclusion principle - periodic classification of elements - magnetic dipole moment due to orbital motion and spin of the electron - Stern and Gerlach experiment.

(12 Hours)

UNIT II

X-rays:

Optical spectra – fine structure of H_α line - Zeeman Effect - Larmor's theorem - quantum mechanical explanation of the normal Zeeman Effect - anomalous Zeeman effect - Paschen Back effect - Stark effect.

Production of X-rays - Bragg's law - Bragg X-ray spectrometer - X-ray spectra - Characteristic X-ray spectrum - Mosley's law - Compton scattering.

Photoelectric effect – Richardson's and Compton experiment - experimental investigation on the photoelectric effect - Einstein's photoelectric equations - photoelectric cells.

(12 Hours)

UNIT III

Wave Mechanics:

Inadequacy of Classical Mechanics-matter waves – expression for de-Broglie wavelength- phase velocity-group velocity-expression for group velocity - experimental study of matter waves - Heisenberg's uncertainty principle – applications of uncertainty principle - derivation of time dependent form of Schrodinger equation - properties of the wave function – the free particle - the particle in a box :infinite square well potential. (12 Hours)

UNIT IV

Quantum Mechanics:

Potential step - barrier penetration problem - postulates of quantum mechanics –operators in quantum mechanics (operator for momentum, kinetic energy, total energy, orbital angular momentum) – commuting operators (commutator algebra, Hermitian operator) - probability density- probability current density- wave packets - Ehrenfest's theorem. (12 Hours)

UNIT V

Relativity:

Frames of reference – Newtonian principle of relativity - Galilean transformations equation – ether hypothesis – the Michelson Morley experiment - special theory of relativity - Lorentz transformation equations - length contraction - time dilation – relativity of simultaneity - addition of velocities - variation of mass with velocity - mass energy equivalence - general theory of relativity - predictions of general relativity – photons and gravity – gravitational red shift.

(12 Hours)

TEXT BOOK

Murugeshan, R.and Kiruthiga Sivaprasath, (2018).*Modern Physics*, 18th Revised Edition. New Delhi: S.Chand & Company Pvt Ltd.

UNIT I -Chapter 4 - Sections: 4.7, 4.8, 4.9. (2), 4.10 – 4.20

UNIT II - Chapter 4 – Sections: 4.21 – 4.28

Chapter 5 – Sections: 5.1, 5.3 – 5.6, 5.9, 5.13

Chapter 6 – Sections: 6.1, 6.3 – 6.6

UNIT III - Chapter 7- Sections: 7.1-7.3, 7.5, 7.5.1, 7.5.2

Chapter 8- Sections: 8.1-8.3

UNIT IV - Chapter 8-Sections: 8.7, 8.8

Chapter 10-Sections:10.1,10.1.1,10.1.2,10.1.3,10.1.5,10.2(10.2.3(a,b,c,d),10.2.4,10.2.6, 10.2.7, 10.3

UNIT V - Chapter 1 - Sections: 1.1 – 1.14, 1.16 – 1.19

REFERENCE BOOKS

1. Arthur Beiser, (1983). *Concepts of Modern Physics,* 3rd Edition. New Delhi: McGraw – Hill International Book Company,
2. Chattopadthyay, D. and Rakshit, P.C. (2008). *Quantum Mechanics Statistical Mechanics & Solid State Physics,* 8th Revised Edition. New Delhi: S. Chand & Company Ltd.
3. Subramaniyan, M.& Brijlal JivanSeshan, (2008). *Atomic & Nuclear Physics,*New Delhi: Chand & Company.
4. Aruldhas, G. (2002). *Molecular Structure and Spectroscopy*, New Delhi: Prentice Hall of India Pvt. Limited.
5. Gupta, A.B.(2015*). Foundation of Quantum Mechanics,* Calcutta: Books and Allied (P) Ltd.

Course Code 20UPHC52	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	-	H	-	-	-	-	-	-	M
CO2	H	M	H	M	H	M	M	-	-	-
CO3	H	-	H	-	H	H	-	-	-	-
CO4	H	-	M	-	H	H	-	M	-	-
CO5	H	-	M	-	H	H	-	H	-	-

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester V	**SOLID STATE PHYSICS**	Hours/Week: 4	
Core Course-9		Credits: 4	
Course Code **20UPHC53**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : explain the fundamentals in crystal structure, imperfections, types of bondings and superconductivity. [K1]

CO2 : derive the relations related to crystal structure, electron theory of solids and discuss the theories related to bondings in solids, electron theory of solids and superconductivity. [K2]

CO3 : apply the learned concepts to solve problems in solid state physics. [K3]

CO4 : analyze the problems related to miller indices, reciprocal lattices, Fermi energy in electron theory, various parameters in superconductivity. [K4]

CO5 : determine the crystalline structure of nonmetallic elements, colour centre in crystalline compounds and recent applications of superconductivity. [K5]

UNIT I

Crystal structure:

Lattice points and space lattice – basis and crystal structure – unit cells and lattice parameters – unit cell versus primitive cell – crystal systems – crystal symmetry – twenty-three symmetry elements in a cubic crystal – five-fold rotation axis – combination of symmetry elements – rotation inversion axis – translation symmetry elements – space groups – Bravais space lattices – metallic crystal structures – relation between the density of crystal material and lattice constant in a cubic lattice – other cubic structures. (12 Hours)

UNIT II

Miller indices & Imperfections in Crystals:

Directions, planes and Miller indices – important features of Miller indices of crystal planes – important planes and directions in a cubic crystal – distribution of atoms in the atomic plane of simple cubic crystal – separation between lattice planes in a cubic crystal – allotropy and polymorphism – imperfections in crystals – reciprocal lattices. (12 Hours)

UNIT III

Bondings in solids:

Bondings in solids **-** Ionic bonding – bond energy of NaCl molecule – calculation of lattice energy of ionic crystals – calculation of Madelung constant of ionic crystals – calculation of repulsive exponent from compressibility data – Born-Haber cycle – properties of ionic solids – examples of ionic solids – covalent bond – saturation in covalent bonds – directional nature of a covalent bond – hybridization – properties of covalent compounds – metallic bond – properties of metallic crystals – intermolecular bonds – dispersion bonds – dipole bonds – hydrogen bonds.

(12 Hours)

UNIT IV

Electron theory of solids:

Introduction - the classical free electron theory –electron in a metal - electron energies in metals and Fermi energy - density of states – explanation of covalent bonding in crystals - electron in periodic potential – energy bands in solids **-** Brillouin zones – distinction among metals, insulators and semiconductors - effective mass of electron and concept of hole - Hall effect. (12 Hours)

UNIT V

Thermal properties of solids and superconductivity:

Specific heat - classical theory (Dulong and petit law) – Einstein's theory of specific heat – Debye's theory.

General properties of superconductors – effect of magnetic field – the Meissner effect – effect of current – thermal properties – isotope effect – London equations – Josephson effect- type I and type II Superconductors – explanation for the occurrence of superconductivity – BCS theory.

(12 Hours)

TEXT BOOKS

1. Pillai, S.O. (2012). *Solid State Physics*, sixth edition. New Delhi: New Age International Publishers.
2. Arumugam, M. (2013). *Material Science.* Kumbakonam: Anuradha Publications.

3. Palanisamy,P.K (2013). *Solid State Physics,* Chennai: Scitech Publications (India) Pvt. Ltd.

BOOK 1

UNIT I: Chapter 4 - Sections: I – XVII
UNIT II: Chapter 4 - Sections: XVIII - XXV
UNIT III: Chapter 3 – Sections: V – XXIV
UNIT V*:* Chapter 7 - Sections:I-V

BOOK 2

UNIT IV: Chapter 4 - Sections: 4.1- 4.4, 4.6- 4.12

BOOK 3

UNIT V: Chapter 8: 8.1 - 8.10

REFERENCE BOOKS

1. Gupta, S.L.,& Kumar, V. (2007). *Solid State Physics.* Meerut: K. Nath& Co Educational Publishers.
2. Keer, H.V. (2008). *Principles of Solid State*. New Delhi: New Age International Publishers.
3. Gupta, H.C. (2005). *Solid State Physics*. New Delhi: Vikas Publishing House PVT. Ltd.

Course Code 20UPHC53	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	-	H	M	H	M	M	L	-	M
CO2	H	L	M	M	M	M	M	M	-	M
CO3	H	M	M	L	L	H	H	M	-	-
CO4	H	M	H	M	M	H	H	H	-	-
CO5	H	M	M	M	L	H	H	H	-	-

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B.Sc. PHYSICS

(2023 -2024 onwards)

Semester V	**ANALOG ELECTRONICS**	Hours/Week: 5	
Core Course – 11		Credits: 4	
Course Code- **22UPHC53**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the basic concepts in electronic signal generators, ICs, modulators, regulated power supplies and operational amplifiers. [K1]

CO2: discuss the function of electronic signal generators, ICs, modulators, regulated power supplies and operational amplifiers. [K2]

CO3: illustrate the applications of active components and solve simple problems in analog electronic circuits. [K3]

CO4: analyze the effect of feedback in oscillators, operation of transistor and IC voltage regulators, modulators and operational amplifiers. [K4]

CO5: design analog electronic circuits such as phase shift oscillator, op amp comparator, voltage follower and dual tracking voltage regulators. [K5]

UNIT I

Oscillators:

Feedback principle – the effect of feedback on the gain of an amplifier – negative and positive feedback – effect of negative feedback on stability of the amplifier – principle of negative current feedback - expression for current gain with feedback – generation of electrical oscillations with LC circuit – oscillators – Barkhausen criterion – Colpitts oscillator – Hartley oscillator – Wein bridge oscillator – multivibrators – types of multivibrators - transistor astable multivibrator – transistor monostable multivibrator .

(15 Hours)

Modulation:

Modulation - need for modulation - different kinds of modulation - amplitude modulation - waveform, side bands and power - AM modulator with transistor – demodulation (AM detection) - envelope detector - frequency modulation - expression for frequency modulated voltage – instantaneous frequency and frequency deviation – Phase locked loop (PLL) and its application for FM detection - FM detection - AM Radio receivers - types of A.M radio receivers - stages of superhetrodyne radio receiver - advantages of superhetrodyne circuit - FM receiver - difference between FM and AM receivers. (15 Hours)

UNIT III

Integrated circuits:

Introduction - Integrated circuit- advantages and disadvantages of integrated circuits – Internal Structure of IC package – classification of IC – making monolithic IC – Fabrication of components on monolithic IC – simple monolithic ICs – IC packings – IC symbols – scale of integration – Voltage Regulator and Multivibrators using ICs - comparison between different ICs - linear integrated circuits - digital integrated circuits - IC design and manufacturing - material preparation - growing crystal and wafer preparation - oxidation - etching - photolithography - epitaxy. (15Hours)

UNIT IV

Voltage Regulators:

Ordinary dc power supply-important terms-regulated power supply - types of voltage regulators - zener diode voltage regulators –condition for proper operation- transistor series voltage regulators – series feedback voltage regulator- transistor shunt voltage regulators – shunt feedback voltage regulator - IC voltage regulators - fixed positive voltage regulators- fixed negative voltage regulators -adjustable voltage regulators. (15 Hours)

UNIT V

Operational amplifier:

Differential amplifier – operational amplifier – Block Diagram of operational amplifier - A.C analysis of op-amp and equivalent circuit – equivalent circuit of an op-amp – characteristics of an ideal op-amp – common mode rejection ratio – practical operational amplifier – pin diagram – bandwidth, frequency response of amplifier –slew rate – open loop operation – closed loop operation - positive and negative feedback – The concept of virtual ground – inverting operational amplifier – summing amplifier –subtracting amplifier – op-amp as integrator – op-amp as differentiator – non-inverting amplifier. (15Hours)

TEXT BOOKS

1. Jose Robin, G & Ubald Raj,A. (2014). *Basic Electronics*, Marthandam: Indra Publication.
2. Mehta, V.K. & Rohit Mehta. (2019).*Principles of Electronics. Reprint*, New Delhi: S. Chand & Company Ltd,
3. Sedha, R.S. (2019). *A Text Book of Applied Electronics,* New Delhi: S.Chand & Company Ltd.

BOOK 1

UNIT I - Chapter 3
UNIT II - Chapter 3
UNIT V - Chapter 5

BOOK 2

UNIT I - Chapter 18: Sections: 18.10 – 18.13
UNIT II - Chapter 16: Sections: 16.17 - 16.22
UNIT III - Chapter 23: Sections: 23.1 – 23.11
UNIT IV - Chapter 17: Sections: 17.1 – 17.8, 17.10, 17.11, 17.15 – 17.18

BOOK 3

UNIT III - Chapter 18: Sections: 18.6, 18.7, 18.9, 18.11, 18.14 - 18.18, 18.20, 18.21, 18.25, 18.26

REFERENCE BOOKS

1. Gayakwad, Ramakant A. (2011).*Op-Amps and Linear Integrated circuits*. 4thEdition. New Delhi: PHI Learning Pvt. Ltd.
2. Roy Choudhary, D. & Shail, B. Jain. (2010). *Linear Integrated Circuits.* 4thEdition. New Delhi: New Age International Publications.
3. Salivahanan,S. SureshKumar, N. & Vallavaraj, A.(2010). *Electronic Devices & Circuits*, Second Edition. New Delhi: The McGraw Hills Education Pvt. Ltd.

Course Code 22UPHC53	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO 1	H	-	M	-	M	L	-	H	-	M
CO 2	H	H	H	H	L	M	M	-	-	H
CO 3	H	-	M	M	H	H	L	-	-	-
CO 4	H	M	M	H	H	H	H	H	-	L
CO 5	H	L	M	M	M	H	M	H	M	L

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester V	**Analytical Instrumentation and ChemDraw**	Hours/Week: 4	
DSEC-1		Credits: 4	
Course Code **20UCHE51**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand the basic principles in precipitation and analytical instrumentation. [K1]

CO2 : classify the thermo gravimetric and colorimetric methods. [K2]

CO3 : appraise the software tools and the chromatographic techniques. [K3]

CO4 : Compare the different analytical techniques used in precipitation, thermogravimetry, spectroscopy and software tools. [K4]

CO5 : Sketch the diagrams of analytical instruments and structures of chemical compounds. [K5]

UNIT I

Theory of Gravimetric and statistical Analyses

a. Methods of obtaining the precipitate - condition - choice of precipitant - merits and demerits of organic precipitants - types - specific and selective precipitants - sequestering agents - theory of precipitation - dendrites - Paneth - Fajans - Hahn law - coprecipitation - post precipitation - precipitation from homogeneous solution.

b. Precision - accuracy - absolute and relative error – classification of errors - confidence limit - students Q-test - rejection of experimental data - sources and elimination of errors - significant figures and computation.

c. Analysis of experimental results - graphical method - curve fitting - method of least squares – problems involving straight line graphs. **(**12 Hours**)**

UNIT II

Instrumental methods of Analysis

a. Colorimetry

Beer-Lamberts Law - Principles of Colorimetric Analysis - Visual Colorimeter Standard Series method - Balancing method - Estimation of Ni^{2+} and Fe^{2+}.

b. Thermo analytical methods

Principle of thermogravimetric analysis and differential thermal analysis –Methods of obtaining thermograms – Derivative thermo Gravimetry –Instrumentation of TGA and DTA - factors affecting TGA and DTA curves –applications – TGA and DTA of calcium oxalate monohydrate.

(12 Hours**)**

UNIT III

Basic principles of Chromatography

Column chromatography - thin layer chromatography - R_f values - paper chromatography – ion exchange chromatography - gas liquid chromatography- applications of each technique.

(12 Hours**)**

UNIT IV

Instrumentation of NMR, UV and IR

a. Radiation source - UV and visible sources - Dispersive devices- monochromators - gratings, slits-samples-detectors - photo voltaic cell, photo multiplier tubes- spectro photometer for use in UV region.

b. IR- sources of IR radiation – monochromators - detectors techniques- simple beam and double beam spectrophotometers (brief outline only).

c. NMR – Brief outline of the instrumentation **(**12 Hours**)**

UNIT V

Computers in Chemistry

a. Chemdraw – basics - starting chem draw - working with document-drawing chemical structures - Chem sketch–basics- drawing chemical structures.

b. Origin and Avogadro software in drawing, navigating, and manipulating of molecules.

(12 Hours**)**

TEXT BOOKS

1. Gopalan, R. (2016). *Elements of Analytical Chemistry*.3rd Edition. New Delhi: Sultan Chand & Sons.
2. Skoog, D.A.West, D.M. and Hollar. F.J, (2014). *Fundamentals of Analytical Chemistry*. 9th Edition.U.K: Harcourt College Publishers.

3. Usharani, S. (2000). *Analytical Chemistry*. 1st Edition. Chennai: Macmillan India Ltd.
4. Srivastava, A.K & Jain.P.C. (2009). *Instrumental Approach to Chemical Analysis.* 4th Edition. New Delhi: S.Chand& Company Ltd.
5. https://library.columbia.edu>
6. https://www.acdlabs.com> docs
7. Origin and Avogadro Software by addinsoft 2019.

REFERENCE BOOKS

1. Sharma, B.K. (2015). *Instrumental Methods of Chemical Analysis.*30th Edition. New Delhi: KrishnaPrakashan MediaPvt.Ltd.
2. http://www.cambridgesoft.com/support/DesktopSupport/documentation/manuals/files/chembiodraw.pdf
3. www.chem.uzh.ch>gpc> files
4. www.chemteach.ac.nz>misc
5. Origin and Avogadro Google free version Software

Course Code 20UCHE51	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	H	H	H	H	H	H	M	H	M	-
CO1	H	H	H	L	M	M	M	M	M	-
CO2	H	H	H	L	H	H	H	H	H	-
CO3	H	H	H	H	L	H	H	H	H	-
CO4	H	H	H	H	H	H	H	H	H	-
CO5	H	H	H	H	H	H	M	H	M	-

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VIRUDHUNAGAR - 626 001

B.Sc. PHYSICS

(2020 -2021onwards)

Semester V	**NANO SCIENCE**	Hours/Week: 4	
DSEC-1		Credits: 4	
Course Code **20UPHE52**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : explain the fundamentals of bulk materials, preparation and characterization of nanomaterials. [K1]

CO2 : discuss the techniques involved in preparation and characterization and discuss the applications of nanomaterials. [K2]

CO3 : apply the learned concepts to synthesize and characterize the nanomaterials. [K3]

CO4 : analyze the nature and structures of nanomaterials. [K4]

CO5 : assess the impact of nanomaterials in the field of medicine, sensors, energy storage devices and commercial products. [K5]

UNIT I

Nanomaterials:

Solid materials and their strength - perspective of length - nanoscience and nanotechnology - nanostructures in nature-quantum structures - quantum confinement- surface effects of nanomaterials - prime materials - carbon nanostructures - oxides. (12 Hours)

UNIT II

Preparation methods:

Nanomaterials synthesis - physical approaches - laser ablation - high-energy ball milling (Mechanical alloying method) - chemical vapor deposition – plasma synthesis method – Electro-deposition – chemical approaches - hydrothermal synthesis – reverse micellar/micro-emulsionmethod - sol-gel synthesis - sonochemical process - co-precipitation.

(12 Hours)

UNIT III

Characterization Techniques:

Principles of electron Microscopy - Scanning Electron Microscope (SEM) – strength and limitation of Scanning Electron Microscopy - Energy dispersive X-ray analysis (EDX) – Transmission Electron Microscope (TEM) – Scanning Tunneling Microscope - Atomic Force Microscope (AFM) - powder method - grain size /crystallite size using Scherrer's Formula – crystallite size distribution using X-ray line shape analysis – photoluminescence - Fourier transform infrared spectroscopy – Raman spectroscopy. (12 Hours)

UNITIV

Properties:

Mechanical behavior- mechanical properties of nanomaterials - elastic properties-hardness and strength - ductility and toughness – superplastic behavior – optical properties - optical properties of nanomaterials - surface plasmon resonance - quantum size effects- applications of optical properties of nanomaterials - electrical properties - magnetic properties - magnetic properties of nanomaterials – superparamagnetism – electrochemical properties – chemical sensing properties. (12 Hours)

UNIT V

Sectors influenced by Nanomaterials:

Energy - applications of nanomaterials in energy sector – nanomaterials for hydrogen production and conversion – thermoelectric and piezoelectrics – nanomaterials in energy storage – Environment - nanomaterials for pollution abatement. (12 Hours)

TEXT BOOKS

1. Shah Tokeer Ahmad. M.A, (2010), *Principles of Nano science and Nanotechnology*. New Delhi: Narosa Publishing House.
2. Viswanathan,B. (2014). *Nanomaterials.* New Delhi: Narosa Publishing House.

BOOK 1

UNIT I- Chapter 1-Section: 1.1-1.11

UNIT II- Chapter 2-Section: 2.1-2.3, 2.3.2, 2.3.5-2.3.8, 2.4, 2.4.2-2.4.4, 2.4.6, 2.4.7

UNIT III- Chapter 3 –Section: 3.1-3.8

Chapter 4- Section: 4.1, 4.6, 4.6.1, 4.6.2

Chapter 5 – Section: 5.6-5.8

UNIT IV- Chapter6 - Section: 6.1-6.4, 6.6-6.8

BOOK 2

UNIT V- Chapter 5 - Section: 5.1 – 5.6

Chapter 6 - Section: 6.1, 6.2

REFERENCE BOOKS

1. Chattopadhyay, K.K., & Banerjee, A.N. (2012). *Introduction to Nanoscience and Nanotechnology*. New Delhi PHI Learning Private Limited.
2. Poole,Jr., Charles P., Owens., Frank J., & John, A. (2006). *Introduction to Nanotechnology*. New Jersy: Wiley Sons. Inc., Publication.
3. Pradeep, T. (2007). *Nano: The Essentials: Understanding Nanoscience and Nano Technology*. New Delhi: McGraw Hill Education Pvt. Ltd.

Course Code 20UPHE52	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	-	H	-H	-	M	H	H	-	M
CO2	H	H	M	M	-	M	H	M	-	M
CO3	H	H	M	L	L	H	H	M	-	-
CO4	H	M	M	M	L	H	H	M	-	-
CO5	H	H	M	M	L	H	H	M	M	M

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester V	**SPECTROSCOPY**	Hours/Week: 4	
DSEC-1		Credits: 4	
Course Code		Internal	External
20UPHE53		25	75

COURSE OUTCOMES

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

CO1 : explain basic aspects of electromagnetic radiation, rotational, vibrational, Raman, electronic and NMR spectra of molecules. [K1]

CO2 : describe electromagnetic spectrum, energy level transitions in molecules due to different regions of EM spectrum and instrumentation techniques involved to obtain the spectrum. [K2]

CO3 : apply relevant theories / principles to interpret spectra obtained due to energy level transitions in molecule. [K3]

CO4 : analyze information from various spectroscopic techniques to understand properties of molecules. [K4]

CO5 : assess the spectroscopic techniques involved in the study of celestial bodies. [K5]

UNIT I

Electromagnetic spectrum:

Electromagnetic spectrum - types of molecular energies- different spectroscopic methods- an overview- spectral line width – absorption and emission of radiation-Einstein's coefficients - Lasers.

Microwave Spectroscopy:

Classification of molecules – interaction of radiation with rotating molecule – rotational spectra of rigid diatomic molecules – isotope effect in rotational spectra - intensity of rotational lines- non-rigid rotator. (12 Hours)

UNIT II

Infrared Spectroscopy:

Vibrational energy of a diatomic molecule - infrared spectra - preliminaries - infrared selection rules - vibrating diatomic molecules - diatomic vibrating rotator – vibrations of polyatomic molecules - normal vibrations of CO_2 and H_2O molecules - dipole moment changes in CO_2 molecule – IR spectrometer - instrumentation – sample handling techniques – Fourier Transform Infrared spectroscopy –applications. (12 Hours)

UNIT III

Raman Spectroscopy:

Introduction - theory of Raman scattering - rotational Raman spectra - vibrational Raman spectra - mutual exclusion principle -Raman Spectrometer –sample handling techniques – fibre coupled Raman spectrometer – Fourier Transform Raman spectrometer -polarization of Raman scattered light- single crystal Raman spectra- structure determination using IR and Raman spectroscopy. (12 Hours)

UNIT IV

Electronic spectra of diatomic molecule:

Vibrational coarse structure - vibrational analysis of band systems -Deeslandre's table – progressions and sequences – information derived from vibrational analysis - Franck-Condon principle -Intensity of vibrational electronic spectra - dissociation - predissociation - Photoelectron spectroscopy – informations from Photoelectron spectra. (12 Hours)

UNIT V

Nuclear Magnetic Resonance:

Magnetic properties of nuclei – resonance condition – NMR instrumentation – relaxation processes – bloch equation – dipolar interaction – chemical shift – indirect spin-spin interaction – NMR imaging. (12 Hours)

TEXT BOOKS

1. Arul Das. (2014). *Molecular structure and Spectroscopy II edition*. New Delhi: Prentice-Hall of India Pvt. Ltd.

   UNIT I: Chapter 1 – Sections: 1.1 -1.7.
   Chapter 6 – Sections: 6.1- 6.6.

   UNIT II: Chapter 7 - Sections: 7.1 – 7.7, 7.16 - 7.19.

   UNIT III: Chapter 8 - Sections: 8.1 – 8.12.

UNIT IV: Chapter 9- Sections: 9.1 – 9.12.

UNIT V: Chapter 10 - Sections: 10.1-10.3, 10.5 – 10.9, 10.19.

REFERENCE BOOKS

1. Gupta, Kumar &Sharma. (1987). *Elements of Spectroscopy*. 6thEdition. Meerut: PragatiPrakashan.
2. Banwell, Coliin N., McCash.,& Elaine M. (1995). *Fundamental of Molecular Spectroscopy.* New Delhi: McGraw-Hill International Book Company.
3. Chatwal.R.Gurdeep., &Anand, K Sham. (1985). *Spectroscopy.* Revised 2nd Edition. Mumbai: Himalaya Publishing House.

Course Code 20UPHE53	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	M	-	H	-	-	L	-	L	-	-
CO2	M	H	H	-	-	L	M	L	-	-
CO3	H	L	H	M	H	M	M	M	-	-
CO4	H	M	H	H	M	H	H	H	M	M
CO5	H	M	H	H	M	H	H	M	M	M

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B.Sc. PHYSICS

(2021 -2022 onwards)

Semester V	**MICROPROCESSOR**	Hours/Week: 2	
SEC -4		Credits: 2	
Course Code-**20UPHS51**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : explain the basic concepts involved in the architecture, instructions, counters, time delays, stack and subroutine. [K1]

CO2 : Discuss the various features, blocks in architecture, counters, time delays, stack and subroutine of 8085 microprocessor. [K2]

CO3 : describe the functions of various instructions and execution of simple programs. [K2]

CO4 : apply the functions of various instructions in 8085 microprocessor to write programs. [K3]

CO5 : illustrate the programs in counters, time delays, stack and subroutine. [K4]

UNIT I

Microprocessor

Computer and its organization- input system-output system-arithmetic logic unit-memory –control system-instruction execution – clock- programming system-machine language program-assembly language program – assembler directives – compilers-operating systems-what is microprocessor – address bus, data bus and control bus-tri state bus-clock generation- connecting microprocessor to I/O Devices - I/O mapped I/O interface – memory mapped I/O interface – data transfer Schemes – Parallel Data Transfer - programmed I/O – interrupt I/O – direct memory access-serial data transfer. (6 Hours)

UNIT II

Hardware architecture:

The 8085 clock – programmable registers – address and data buses – memory interfacing – interrupt system – direct memory access – serial input – output – the 8085 actively status information – the 8085 reset – the 8085 pin out – the 8085 signals – instruction execution – direct memory access timing diagram – external interrupts timing diagram. (6 Hours)

UNIT III

Instructions:

Instructions classification - instruction word size - OP code format - data format –adding two hexadecimal numbers - overview of the 8085 instructions - data transfer operations - addressing modes - arithmetic operations – addition of two 8-bit number –8-bit subtraction - logical operations–data masking with logical AND - one's complement of 16 bit number - two's complement of 16 bit number-branch operations– testing of the carry flag - program to find the largest number in data Array - to arrange a set of numbers in descending order. (6 Hours)

UNIT IV

Counters and Time Delays:

Time delay using one register – time delay using a register pair – time delay using loop within a loop technique –additional techniques for time delay – counter design with time delay - hexadecimal counter – zero to nine counter - generating pulse waveform- debugging counter and time delay programs.

Stack and subroutine:

Stack – program for resetting and displaying flags – subroutine –restart, conditional call and return instructions. (6 Hours)

UNIT V

Simple assembly language programs:

Addition and subtraction of two BCD numbers - separation of hexadecimal number into two digits– searching a number in an array and finding its parity - sum of a series of 8 bit numbers – 8 bit multiplication – 8 bit division – to find square root of number – block transfer of data – palindrome - generate and sum 15 Fibonacci series including carry - to insert a number at correct place in a sorted array - binary to BCD conversion - BCD to binary conversion.

(6 Hours)

TEXT BOOK

1. Gaonkar, Ramesh S. (2013).*Microprocessor, Architecture, Programming, and Applications with the 8085*.6th Edition. India: Penram International Publishing Pvt. Ltd.
2. Krishna Kant (2011). Microprocessors and Microcontrollers: *Architecture, Programming, and System design 8085, 8086, 8051, 8096:* Eighth Printing. Asoke K.Ghosh, PHI Learning Private Limited, New Delhi.

BOOK2:

UNIT I: Chapter 2 – Sections: 2.1 - 2.2.7, 2.3.1 – 2.3.5, 2.4 – 2.9

UNIT II: Chapter 3 - Sections: 3.1 – 3.7

BOOK1:

UNIT III: Chapter 2 - Sections: 2.2, 2.3, 2.4.1, 2.5

Chapter 6 - Sections: 6.1, 6.1.1, 6.2, 6.2.2, 6.2.4, 6.3, 6.3.2, 6.4, 6.4.4

Chapter 7 - Sections: 7.2 – 7.5

Study material

UNIT IV: Chapter8 - Sections: 8.1 – 8.5

Chapter 9 - Sections: 9.1, 9.1.2, 9.2, 9.2.1, 9.3

Chapter12 - Sections: 12.1, 12.1.1, 12.2, 12.2.1-12.2.2

UNIT V: Study material

REFERENCE BOOKS

1. Gupta, M.K. (2007). *Microprocessor, Microcomputer, Microcontroller and interfacing*. 2nd Edition. New Delhi: Paragon International Publishers.
2. Ram.B. (2005), *Fundamentals of microprocessors and Microcomputers*, 6thEdition, Dhanpat Rai Publications.
3. Hall, Douglas V. (1991).*Microprocessors and Interfacing Programming and Hardware*. New Delhi: Tata McGraw Hill Publishing Company Limited.
4. Nagoor Kani, A. (2005).*Microprocessor & Microcontroller*. 1stEdition.RBA Publication.
5. Ahson, S.I. (1989). *Microprocessor with Applications in Process Control*. 3rd Reprint. New Delhi: Tata McGraw Hill Publishing Company Limited.

Course Code 20UPHS51	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	-	M	M	-	H	-	M
CO2	H	H	H	M	-	M	M	-	-	H
CO3	H	-	M	L	M	H	L	-	-	-
CO4	H	-	M	M	H	M	L	M	-	-
CO5	H	M	M	H	H	M	H	H	-	L

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester V	**BIOPHYSICS**	Hours/Week: 0
Extra Credit Course-2		Credits: 2
Course Code **20UPHO51**		Internal 100

COURSE OUTCOMES

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

CO1 : explain the basic concepts of various physical mechanism of the living cells

CO2 : describe the theories and methods involved in matter, biological systems, molecular physics

CO3 : interpret the biological structures, techniques and methodologies that rely on biophysics

CO4 : discuss the structural and functional aspects of biological entities

CO5 : illustrate the biological and medical applications

UNIT I

Matters and Mechanics of Cells:

Materials of the cell – colloids – kinetic-molecular theory – diffusion – osmosis – osmotic pressure and turgor pressure – water potential – relation of O.P., T.P., and D.P.D – permeability – evaporation – capillary – imbibitions.

UNIT II

pH and Buffer Solution:

Acid and Basis – hydrogen ion concentration and pH – dissociation of acids and basis – buffer solution – titration curves – production of hydrogen ion in the body – physiological buffers in the body – buffers used in biochemical experiments.

Physics in Biological Systems:

Lung air volumes- modified forms of breathing – disorders and medical terminology – respiratory distress syndrome.

UNIT III

Transport across Membranes:

Passive transport – active transport: energy and gradients – outward and inward transport: exocytosis and endocytosis.

UNIT IV:

Molecular Physics of Plant Physiology:

Distribution of light – central importance of light to the physiology of plants – photochemistry – photochemical evidence.

UNIT V:

Ultrasound:

Scanning – echoencephalograph – echo-opthalmoscope – Doppler technique – ultrasonic technique – supersonic bones conduction hearing in humans.

Centrifugation and sub-cellular fractionation:

Separation of organelles and macromolecules – principles of centrifugation – component parts – types of centrifuges – centrifugation techniques – general operation and maintaineance.

TEXT BOOKS

Aurora. Mohan, P. (2012). *BioPhysics.* Mumbai: Himalaya Publishing House.

UNIT I- Chapter 1

UNIT II- Chapter 3, 9

UNIT III- Chapter 6

UNIT IV- Chapter 13

UNIT V- Chapter 15, 21

REFERENCE BOOKS

Arumugam, N. &Kumaresan, V., (2016).*Biophysics*.First Edition.Nagercoil: Saras Publication.

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B.Sc. PHYSICS

(2020 -2021 onwards)

Semester V	**PROGRAMMING IN C**	Hours/Week: 2	
SEC – 5 Practical I		Credits: 2	
Course Code **20UPHS52P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : apply the C language to solve the problems in physics using array, structures. [K3]

CO2 : write C Program using C fundamentals, input output operations, control statements, arrays and structures. [K3]

CO3 : Compile the C program and identify, correct the syntax and logical errors in C program. [K3]

CO4 : execute and run the written program, completion of record work. [K3]

CO5 : analyze the physical parameters obtained using C program with that of theoretical value. [K4]

List of 'C' Programs (Any 10)

1. Conversion of temperature from Celsius to Fahrenheit and vice-versa
2. Calculation of radius of curvature of lens by Newton's rings
3. Calculation of resonance frequency of LCR circuit
4. Calculation of power for different resistance values
5. Calculation of distance travelled by a vehicle
6. Calculation of the amount of work done in twisting a wire
7. Calculation of time period of oscillations of a compound pendulum.
8. Determination of mass from relativistic equation $m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}$
9. Multiply two matrices using multidimensional arrays
10. Sort the array in an ascending order
11. Perform addition of two matrices

12. Illustrate the uses of arrays of structures

Course Code 20UPHS52P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	M	L	H	-	-	L	-	-	M
CO2	H	H	H	H	-	M	-	-	-	L
CO3	H	H	H	H	-	M	-	L	H	-
CO4	H	H	H	-	H	M	-	L	M	H
CO5	M	H	M	H	H	H	M	M	M	H

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester V	**PROJECT**	Hours: 0
Core Course-10		Credits: 1
Course Code- **20UPHC5PR**		Internal : 100 Marks

COURSE OUTCOMES

On completion of the practical, the students will be able to

CO1 : apply the learned concepts to select projects in Physics, Electronics and related interdisciplinary fields. [K3]

CO2 : apply the theoretical knowledge to construct/arrange the circuit diagram /experimental set up to calculate the required physical/electrical parameters. [K3]

CO3 : execute the technical skills in handling the equipment, observe the measurements and exhibit written communication skill acquired in related project. [K3]

CO4 : analyze the accuracy of the results with the theoretical standards and communicate academic and technological knowledge orally. [K4]

CO5 : assess the project to meet the challenges at higher education level /societal level. [K5]

Students are expected to select a project in the field of Physics, Electronics and related interdisciplinary fields. Two students can do one project. Minimum pages for project report should be 20 pages. Two typed copies of the report on the completed project will be submitted to the Controller of Examination through the Head of the department in the month of November during V semester. Evaluation will be done internally.

Project work & Report - 60 marks

Presentation & Viva-voce - 40 marks

Course Code 20UPHC5PR	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	M	-	M	M	M	-	H	-	H
CO2	H	H	M	H	H	M	H	H	H	H
CO3	H	H	H	M	H	H	H	H	H	H
CO4	H	-	H	M	H	M	H	H	-	-
CO5	H	-	H	M	H	M	H	H	-	-

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester VI	**ANALOG ELECTRONICS**	Hours/Week: 5	
Core Course - 11		Credits: 4	
Course Code- **20UPHC61**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the basic concepts in electronic signal generators, ICs, modulators, regulated power supplies and operational amplifiers. [K1]

CO2: discuss the function of electronic signal generators, ICs, modulators, regulated power supplies and operational amplifiers. [K2]

CO3: apply the learned concepts to solve the related problems in analog electronic circuits. [K3]

CO4: analyze the effect of feedback in oscillators, operation of transistor and IC voltage regulators, modulators and operational amplifiers. [K4]

CO5: design analog electronic circuits such as phase shift oscillator, op amp comparator, voltage follower and dual tracking voltage regulators. [K5]

UNIT I

Oscillators and Multivibrator:

Feedback principle – the effect of feedback on the gain of an amplifier – negative and positive feedback – effect of negative feedback on stability of the amplifier – principle of negative current feedback and expression for current gain with feedback – generation of electrical oscillations with LC circuit – oscillators – Barkhausen criterion – Colpitts oscillator – Hartley oscillator – Wein bridge oscillator – multivibrators – types of multivibrators - transistor astable multivibrator – transistor monostable multivibrator . (15 Hours)

UNIT II

Modulation:

Modulation - need for modulation - different kinds of modulation - amplitude modulation - waveform, side bands and power - AM modulator with transistor – demodulation (AM detection) - envelope detector - frequency modulation - expression for frequency modulated voltage – instantaneous frequency and frequency deviation – Phase locked loop (PLL) and its application for FM detection - FM detection - AM Radio receivers - types of A.M radio receivers - stages of superhetrodyne radio receiver - advantages of superhetrodyne circuit - FM receiver - difference between FM and AM receivers. (15 Hours)

UNIT III

Integrated circuits:

Introduction - Integrated circuit- advantages and disadvantages of integrated circuits – Inside IC package – classification of IC by structure – making monolithic IC – Fabrication of components on monolithic IC – simple monolithic ICs – IC packings – IC symbols – scale of integration - some circuits using ICs - comparison between different ICs - linear integrated circuits - digital integrated circuits - IC design and manufacturing - material preparation - crystal growing and wafer preparation - oxidation - etching - photolithography - epitaxy. (15 Hours)

UNIT IV

DC Power supply:

Ordinary dc power supply-important terms-regulated power supply - types of voltage regulators - zener diode voltage regulators –condition for proper operation- transistor series voltage regulators – series feedback voltage regulator- transistor shunt voltage regulators – shunt feedback voltage regulator - IC voltage regulators - fixed positive voltage regulators- fixed negative voltage regulators -adjustable voltage regulators. (15 Hours)

UNIT V

Operational amplifier:

Differential amplifier – amplifier – operational amplifier – A.C analysis of op-amp and equivalent circuit – equivalent circuit of an op-amp – characteristics of an ideal op-amp – common mode rejection ratio – practical operational amplifier – pin diagram – bandwidth, frequency response of amplifier –slew rate – open loop operation – closed loop operation - positive and negative feedback – The concept of virtual ground – inverting operational amplifier – summing amplifier –subtracting amplifier – op-amp as integrator – op-amp as differentiator – non-inverting amplifier. (15Hours)

TEXT BOOKS

1. Jose Robin, G & Ubald Raj,A. (2014). *Basic Electronics*, Marthandam: Indra Publication.
2. Mehta, V.K. & Rohit Mehta. (2019).*Principles of Electronics. Reprint*, New Delhi: S. Chand & Company Ltd,
3. Sedha, R.S. (2019). *A Text Book of Applied Electronics*, New Delhi: S.Chand & Company Ltd.

BOOK 1

UNIT I - Chapter 3

UNIT II - Chapter 3

UNIT V - Chapter 5

BOOK 2

UNIT I - Chapter 18: Sections: 18.10 – 18.13

UNIT II - Chapter 16: Sections: 16.17 - 16.22

UNIT III - Chapter 23: Sections: 23.1 – 23.11

UNIT IV - Chapter 17: Sections: 17.1 – 17.8, 17.10, 17.11, 17.15 – 17.18

BOOK 3

UNIT III - Chapter 18: Sections: 18.6, 18.7, 18.9, 18.11, 18.14 - 18.18, 18.20, 18.21, 18.25, 18.26

REFERENCE BOOKS

1. Gayakwad, Ramakant A. (2011).*Op-Amps and Linear Integrated circuits*. 4th Edition. New Delhi: PHI Learning Pvt. Ltd.
2. Roy Choudhary, D. & Shail, B. Jain. (2010). *Linear Integrated Circuits.* 4th Edition. New Delhi: New Age International Publications.
3. Salivahanan,S. SureshKumar, N. & Vallavaraj, A.(2010). *Electronic Devices & Circuits,* Second Edition. New Delhi: The McGraw Hills Education Pvt. Ltd.

Course Code 20UPHC61	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	-	M	L	-	H	-	M
CO2	H	H	H	H	L	M	M	-	-	H
CO3	H	-	M	M	H	H	L	-	-	-
CO4	H	M	M	H	H	H	H	H	-	L
CO5	H	L	M	M	M	H	M	H	M	L

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VIRUDHUNAGAR - 626 001

B.Sc. PHYSICS

(2023 -2024 onwards)

Semester VI	**SOLID STATE PHYSICS**	Hours/Week: 4	
Core Course-9		Credits: 4	
Course Code **22UPHC61**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : explain the fundamentals in crystal structure, imperfections, types of bondings and superconductivity. [K1]

CO2 : derive the relations related to crystal structure, electron theory of solids and discuss the theories related to bondings in solids, electron theory of solids and superconductivity. [K2]

CO3 : apply the learned concepts to find lattice constants, Fermi Energy and determine properties of crystals. [K3]

CO4 : analyze density of states and infer properties of solids. [K4]

CO5 : determine the crystalline structure of nonmetallic elements, colour centre in crystalline compounds and recent applications of superconductivity. [K5]

UNIT I

Crystal structure:

Basis and seven crystal structure – unit cells and lattice parameters – unit cell versus primitive cell – crystal systems – crystal symmetry – twenty-three symmetry elements in a cubic crystal – five-fold rotation axis – combination of symmetry elements – rotation inversion axis – translation symmetry elements – space groups – Bravais space lattices – metallic crystal structures – relation between the density of crystal material and lattice constant in a cubic lattice – other cubic structures. (12 hours)

UNIT II

Miller indices & Imperfections in Crystals:

Directions, planes and Miller indices – important features of Miller indices of crystal planes – important planes and directions in a cubic crystal – distribution of atoms in the atomic plane of simple cubic crystal – separation between lattice planes in a cubic crystal – allotropy and polymorphism – imperfections in crystals (Thermal vibrations, Point Defects, Line Defects, Surface Defects & Volume Defects). (12 hours)

UNIT III

Bondings in solids:

Bondings in solids **-** Ionic bonding – bond energy of NaCl molecule – calculation of lattice energy of ionic crystals – calculation of Madelung constant of ionic crystals – calculation of repulsive exponent from compressibility data – Born-Haber cycle – properties of ionic solids – examples of ionic solids – covalent bond – saturation in covalent bonds – directional nature of a covalent bond – hybridization – properties of covalent compounds – metallic bond – properties of metallic crystals – intermolecular bonds – dispersion bonds – dipole bonds – hydrogen bonds.

(12 hours)

UNIT IV

Electron theory of solids:

Introduction - the classical free electron theory –electron in a metal - electron energies in metals and Fermi energy - density of states – explanation of covalent bonding in crystals - electron in periodic potential – energy bands in solids - Brillouin zones – distinction among metals, insulators and semiconductors - effective mass of electron and concept of hole - Hall effect. (12 Hours)

UNIT V

Thermal properties of solids and superconductivity:

Specific heat – Einstein's theory of specific heat – Debye's theory.

General properties of superconductors – effect of magnetic field – the Meissner effect – effect of current – thermal properties – isotope effect – London equations – Josephson effect-type I and type II Superconductors – explanation for the occurrence of superconductivity – BCS theory (Qualitative features only). (12 Hours)

TEXT BOOKS

1. Pillai, S.O. (2012). *Solid State Physics*, sixth edition. New Delhi: New Age International Publishers.
2. Arumugam, M. (2013). *Material Science.* Kumbakonam: Anuradha Publications.
3. Palanisamy,P.K (2013). *Solid State Physics*, Chennai: Scitech Publications (India) Pvt. Ltd.

BOOK 1

UNIT I: Chapter 4 - Sections: III – XVII

UNIT II: Chapter 4 - Sections: XVIII - XXIV

UNIT III: Chapter 3 – Sections: V – XXIV

UNIT V*:* Chapter 7 - Sections: I, II, IV, V

BOOK 2

UNIT IV: Chapter 4 - Sections: 4.1- 4.4, 4.6- 4.12

BOOK 3

UNIT V: Chapter 8: 8.1 - 8.10

REFERENCE BOOKS

1. Gupta, S.L.,& Kumar, V. (2007). *Solid State Physics.* Meerut: K. Nath& Co Educational Publishers.
2. Keer, H.V. (2008). *Principles of Solid State*. New Delhi: New Age International Publishers.
3. Gupta, H.C. (2005). *Solid State Physics*. New Delhi: Vikas Publishing House PVT. Ltd.

Course Code **22UPHC61**	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO 1	H	-	H	M	H	M	M	L	-	M
CO 2	H	L	M	M	M	M	M	M	-	M
CO 3	H	M	M	L	L	H	H	M	-	-
CO 4	H	M	H	M	M	H	H	H	-	-
CO 5	H	M	M	M	L	H	H	H	-	-

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VIRUDHUNAGAR - 626 001

B.Sc. PHYSICS

(2020 -2021onwards)

Semester VI	**NUCLEAR AND PARTICLE PHYSICS**	Hours/Week: 5	
Core Course -12		Credits: 4	
Course Code- **20UPHC62**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the principles and concepts related to nuclear physics and elementary particles. [K1]

CO2: describe the experimental methods to explain nuclear structure, nuclear reactors, radio activity, detectors & accelerators and discuss radiation effects and properties of elementary particles. [K2]

CO3: apply the learnt concepts to solve problems in nuclear structure, radio activity, nuclear reactions and accelerators. [K3]

CO4: analyze the issues related to various nuclear models, radio activity, nuclear reactions, and chemical & biological effects of radiation. [K4]

CO 5: assess the environmental impact on nuclear waste disposal, radiation hazards, global warming and water pollution. [K5]

UNIT I

Nuclear properties and structure:

Classification of nuclei - general properties - binding energy - nuclear stability - theories of nuclear composition - nuclear forces - Meson theory – mirror nuclei method - liquid drop model – applications of semi-empirical mass formula - shell model – the collective model.

(15 Hours)

UNIT II

Radioactivity:

Introduction-properties of alpha, beta and gamma rays - range of alpha particles - experimental measurements – alpha particle disintegration energy –alpha particle spectra – theory

of alpha decay - Gamow's theory of alpha decay - beta ray spectrum - origin of the continuous spectrum - neutrino theory of beta decay - detection of neutrino - determination of wavelength of gamma rays - origin of gamma rays – nuclear isomerism - internal conversion – Soddy Fajan's displacement law - law of radioactive disintegration- half-life period - mean life – laws of successive disintegration – radioactive dating : the age of the earth. (15 Hours)

UNIT III

Nuclear reactions:

The discovery of artificial transmutation - Q-value equation for a nuclear reaction - energy balance in nuclear reactions and the Q value - threshold energy of an endoergic reaction - types of nuclear reactions - conservation laws – nuclear transmutations – discovery of artificial radioactivity – preparation of radio elements – applications of radio isotopes - nuclear fission - energy released in fission - chain reaction- atom bomb - nuclear reactors - pressurized water reactor - boiling water reactor - fast breeder reactor- nuclear fusion - sources of stellar energy - thermo nuclear reactions - fusion reactor - plasma confinement. (15 Hours)

UNIT IV

Nuclear detectors, accelerators and Elementary particles:

Ionization chamber – Geiger-Muller counter - the Wilson cloud chamber - bubble chamber – nuclear emulsions - the linear accelerator – the cyclotron - synchro cyclotron – the betatron – the synchrotrons – the proton synchrotron.

Elementary particles - particles and antiparticles – antimatter- the fundamental interaction- elementary particle quantum numbers.

(15 Hours)

UNIT V

Chemical and Biological effects of radiation:

Radiation – radiation monitoring and dosimeters – physical effects of radiation - chemical effects of radiation – nuclear agriculture – biological effects of radiation – somatic and genetic effects – radio nuclides – radio isotope in India – tracer techniques in medical science – nuclear energy and social development. (15 Hours)

TEXT BOOKS

1. Murugeshan, R., & Kiruthiga Sivaprasath. (2018). *Modern Physics.*18th Edition (Reprint). New Delhi: S.Chand Publishing Pvt. Ltd.

2. Tayal, D.C. (2008). *Nuclear Physics*. (Reprint 2019) Mumbai: Himalaya Publishing House.

BOOK 1

UNIT – I: Chapter 17 - Sections: 17.1, 17.2 -17.7.1, 17.9 – 17.13
UNIT –II: Chapter20- Sections: 20.1, 20.4 – 20.8, 20.10, 20.12 – 20.15, 20.17, 20.18, 20.20, 20.21
UNIT –III: Chapter 21 - Sections: 21.1- 21.3, 21.6 – 21.8
Chapter 22 - Sections: 22.1, 22.1.1, 22.2, 22.2.1, 22.3, 22.6, 22.7
UNIT-IV: Chapter 18 - Sections: 18.3, 18.6 – 18.9
Chapter 19 - Sections: 19.2 – 19.7
Chapter 24 - Sections: 24.1-24.5

BOOK 2

UNIT–V: Chapter 16 - Sections: 16.1- 16.11

REFERENCE BOOKS

1. Arthur Beiser. (1983). *Concepts of Modern Physics*.3rdEdition. New Delhi: McGraw-Hill, International Book Company.
2. Subramanyam, N., & Brijlal. (2008). *Atomic and Nuclear Physics*. Revised by JivanSeshan. New Delhi: S Chand & Co Ltd.
3. Saxena, A.K. (2014). *Principles of Modern Physics*. 4th Edition. London: Narosa Publishing House.
4. Krane, S. Kenneth. (2008). *Introductory Nuclear Physics*. New Delhi: Wiley India Pvt. Ltd.

Course Code 20UPHC62	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	-	H	-	M	L	-	L	-	M
CO2	H	L	M	M	-	M	M	-	L	H
CO3	H	-	M	L	H	H	M	-	-	-
CO4	H	-	M	L	H	H	L	L	-	-
CO5	H	-	H	M	H	H	H	H	-	H

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester VI	**DIGITAL ELECTRONICS**	Hours/Week: 5	
Core Course -13		Credits: 4	
Course Code **20UPHC63**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain concepts of number system, Boolean algebra combinational circuits, sequential circuits and converters. [K1]

CO2: describe number system, Boolean algebra and explain the working of arithmetic, combinational and sequential circuits and converters. [K2]

CO3: apply the learned concepts to solve problems in digital circuits. [K3]

CO4: analyze various digital circuits using laws & theorems and to solve related problems. [K4]

CO5: design the modulus counters (mod5 & mod12), universal shift register and flash ADC. [K5]

UNIT I

Number system and Boolean algebra:

Introduction - number system - arithmetic operation - l's and 2's complements - codes - weighted binary codes - non-weighted codes - Boolean logic operations – basic laws of Boolean algebra - De Morgan's theorems – sum of products and product of sums – Karnaugh map.

(15 Hours)

UNIT II

Logic gates, Arithmetic and Combinational circuits:

Positive and negative logic designation - logic gates – half adder - full adder - half subtractor - full subtractor.

Multiplexer – basic 4 input multiplexer - 8 to 1 multiplexer - applications of multiplexer – demultiplexer –1 to 4 demultiplexer - 1 to 8 demultiplexer - decoders - basic binary

decoder - 3 to 8 decoder – BCD to decimal decoder – BCD to seven segment decoder / driver - encoders - octal to binary encoder- decimal to BCD encoder. (15 Hours)

UNITIII

Flip-Flops:

Introduction – latches - flip-flops- types of flip-flops – S-R flip flop - D flip flop - J-K flip flop - T flip flop (state diagram is excluded for all flip-flops) – triggering of flip flops - synchronous inputs in flip flops - Master slave J.K flip flop – applications of flip flops.

(15 Hours)

UNIT IV

Counters and Registers:

Introduction - asynchronous counter – ripple counters with modulus < 2^n – counter ICs - asynchronous down counter – UP/DOWN counter - propagation delay in ripple counter – synchronous counter – synchronous counter with ripple carry - synchronous down counter – synchronous UP/DOWN counter – synchronous/asynchronous counter.

Shift Registers - SISO - SIPO – PISO- PIPO registers - ring counter – shift counter.

(15 Hours)

UNIT V

Data acquisition system:

Introduction - objectives of data acquisition system – analog data acquisition system – digital data acquisition system – single channel data acquisition system – multichannel data acquisition system – multiplexing – introduction to DAC and ADC – digital to analog converter – transfer characteristics of DAC – digital to analog conversion techniques – performance parameters of DAC – sources of errors in DAC – analog to digital converters – analog to digital conversion techniques – single slope ADC – dual slope ADC – successive approximation ADC. (15 Hours)

TEXT BOOK

1. Salivahanan, S. & Arivazhagan, S. (2019). *Digital Circuits and Design*, Fifth Edition. New Delhi: Oxford University Press.
2. Bakshi, U.A. and Bakshi, A.V. (2013). Measurements & Instrumentation, Fifth Edition. Pune: Technical Publications.

BOOK 1

UNIT I - Chapter 1 – Sections: 1.1, 1.2, 1.4, 1.5, 1.9, 1.9.1, 1.9.2

Chapter 2 – Sections: 2.3 - 2.7

UNIT II - Chapter 3 – Sections: 3.2, 3.3

Chapter 5 – Sections 5.3, 5.4, 5.6, 5.7

Chapter 6 –Sections: 6.1, 6.2, 6.2.1, 6.2.2, 6.3, 6.4, 6.4.1, 6.4.2, 6.5, 6.5.1, 6.5.2, 6.5.6, 6.5.7, 6.5.9, 6.7, 6.7.1, 6.7.2

UNIT III - Chapter 7 – Sections: 7.1 - 7.10, 7.12

UNIT IV - Chapter 8 – Sections: 8.1, 8.2, 8.4 - 8.13

Chapter 9 – Sections: 9.1, 9.2, 9.2.1, 9.2.3, 9.2.5, 9.2.7, 9.4.1, 9.5

BOOK 2

UNIT V – Chapter 7 – Sections: 7.1 – 7.6, 7.9 – 7.20

REFERENCE BOOKS

1. Leach, Donald P. Albert Paul Malvino & Goutam Saha. (2014). *Digital principles and Applications.* 6th Edition. New Delhi: Tata McGraw Hill Publishing Company Ltd.
2. Basava Raj, B. (2000). *Digital Fundamentals.* 3rdReprint. New Delhi: Vikas Publishing House Pvt. Ltd.
3. Salivahanan, S. & Arivazhagan, S. (2013). *Digital Electronics.* First Edition. New Delhi: Vikas Publishing House PVT Ltd.

Course Code 20UPHC63	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	-	M	L	-	-	-	M
CO2	H	H	H	M	-	M	L	-	-	-
CO3	H	-	M	M	H	M	M	-	-	-
CO4	H	L	M	M	H	H	M	M	-	-
CO5	H	H	M	H	H	H	M	H	M	L

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester VI	**MATERIAL SCIENCE**	Hours/Week: 5	
DSEC-2		Credits: 4	
Course Code		Internal	External
20UPHE61		25	75

COURSE OUTCOMES

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

CO1: explain the basic concepts involved in properties of materials. [K1]

CO2: derive the expressions and discuss the theory of conducting, dielectric and magnetic materials. [K2]

CO3: apply the learned concepts to solve problems in materials. [K3]

CO4: examine the concepts concerning to dielectric, conductive, superconducting, optical, magnetic and new materials. [K4]

CO5: assess the impact of materials in applied physics. [K5]

UNIT I

Dielectric Material:

Introduction - fundamental definition in dielectric - different types of electric polarization - frequency and temperature effects on polarization - dielectric loss - local field or internal field - Classius - Mosotti relation - determination of dielectric constant - dielectric breakdown.

(15 Hours)

UNIT II

Conducting Material:

Atomic interpretation of ohm's law - relaxation time and electrical conductivity - derivation of electrical conductivity of metal - electrical and thermal conductivity - source of resistivity of metals - thermal conductivity - Widemann-Franz law - different types of conducting metals.

Potential Applications of Superconductivity:

Electrical switching element – superconductor fuse and breaker – superconductor transformers and transmission lines – magnetic mirror and generators – Josephson junction devices – low temperature superconductors – high temperature superconductors – squids.

(15 Hours)

UNIT III

Optical Materials:

Introduction - Optical absorption in metals, semiconductors and insulators –optical modulators - display devices and display materials - photovoltaic cells – design of a solar cell – detector arrays – thermography and its materials - laser materials. (15 Hours)

UNIT IV

Magnetic Materials:

Introduction - Definitions – different types of magnetic materials – paramagnetism: quantum theory of paramagnetism - ferromagnetic materials – Heisenberg's exchange interaction –ferrimagnetic materials (ferrites) – hard and soft magnetic materials – computer aided tomography.

Shape Memory Alloys:

Introduction - Fundamental characteristics – methods of processing – commercial shape memory alloys – applications. (15 Hours)

UNIT V

Polymer Materials:

Introduction - Polymerization mechanism – degree of polymerization – classification of polymers – structure of polymer – fabrication process – properties of the polymers – applications.

Nonlinear Materials:

Introduction - Basic principle – classification of nonlinear materials – nonlinear properties – nonlinear materials – applications. (15 Hours)

TEXT BOOK

1. Arumugam, M.(2013), M*aterial Science.*23rd reprint, Tamil Nadu, Anuradha Agencies.
2. Rajendran.V, Marikani.A, (2010), M*aterial Science*, Eleventh Reprint, New Delhi: Tata McGraw Hill Education Private Limited.
3. Pillai.S.O, (2012), *Solid State Physics*, Sixth Edition, New Delhi: New Age International Publishers.

BOOK1

Unit I– Chapter 6 – Sections: 6.1-6.9

Unit II – Chapter 5– Sections: 5.1 – 5.3, 5.6 – 5.8, 5.13

Unit III – Chapter 10– Sections: 10.1, 10.2, 10.4, 10.6, 10.7 (iii & iv), 10.8, 10.9

BOOK2

Unit IV– Chapter 11 – Sections: 11.1 – 11.3, 11.4.2, 11.5, 11.7, 11.9, 11.10, 11.19

Chapter 19 – Sections: 19.1 – 19.3, 19.5, 19.6

Unit V– Chapter21– Sections: 21.1 – 21.8

Chapter 23– Sections: 23.1 – 23.6

BOOK3

Unit II– Chapter 8 – Sections: XXIV

REFERENCE BOOKS

1. Puri, R.K., & Babbar, V.K. (1997). *Solid State Physics*. 1st Edition. New Delhi: S. Chand & Co.
2. Palanisamy, P.K. (2011).*Physics of material.* 1st Edition. India: Scitech publications Pvt. Ltd.
3. Keer, V. (1993). *Principles of the solid state*. First Edition. New York: Wiley Eastern Ltd.
4. Charles Kittel. (2007). *Introduction to Solid Physics*. 3rd Reprint. New York: WSE Wiley India Pvt. Ltd.

Course Code 20UPHE61	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	-	M	M	-	H	-	M
CO2	H	H	H	M	-	M	M	-	-	H
CO3	H	-	M	L	M	H	L	-	-	-
CO4	H	-	M	M	H	M	L	M	-	-
CO5	H	M	M	H	H	H	H	H	-	L

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester VI	**MEDICAL PHYSICS**	Hours/Week: 5	
DSEC-2		Credits: 4	
Course Code **20UPHE62**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : explain bio potential, transducers, biomedical recorders, radio therapy, medical and safety instrumentation. [K1]

CO2 : describe the principle of bio electrodes, active & passive transducers, biomedical recorders, X-ray, Laser and safety instrumentation. [K2]

CO3 : apply the theories to calculate the relevant physical parameters for medical devices/instrumentation. [K3]

CO4 : examine the structure and mechanism of cells, transducers, biomedical recorders, medical and safety instrumentation. [K4]

CO5 : justify the Medical Instrumentation techniques based on their safety level. [K5]

UNIT I

Bio Medical Electrodes

Cells and their structure-transport of ions through cell membrane-resting and action potentials-bio electric potentials-design of medical instruments-components of tile bio medical instrument system- electrodes, micro electrodes, depth & needle electrodes and surface electrodes. Transducers and types. (15 Hours)

UNIT II

Bio Potential Recorders

Electrocardiography(ECG)-origin of Cardiac Action Potential-ECG lead configurations-ECG recording set up- Practical considerations for ECG recording-analysis of ECG signals-Electroencephalography(EEG)-origin of EEG- brain waves-placement of electrodes-recording

setup-Analysis of EEG-Electromyography(EMG)-recording setup-determination of conduction velocities in nerve motors-Electroretinography and Electrooculography. (15 Hours)

UNIT III

Radio therapy & Laser Applications

Teletherapy units-x-rays for therapy- physical components of LINAC- sources used for Brachytherapy-Brachytherapy-sources and methods-remote after loading effects-medical applications of Laser in opthalmology and dermatology. (15 Hours)

UNIT IV

Medical Instrumentation

Physics of x-ray production – properties-medical uses of x-rays- x-ray units- direct Fluoroscopy-CT scanners- primary radiological image formation-MRI-difference between CT and MRI-mammography units

Blood cell counter-photometers and calorimeters-filter photometer-spectrophotometer-flame photometer-filter fluorometer-chromatography-digital thermometer. (15 Hours)

UNIT V

Safety Instrumentation

Introduction-radiation safety Instrumentation-effects of radiation exposure-radiation monitoring instruments-micro shock and macro shock-micro shock hazards-electrical accidents in hospitals- macro shock hazards-devices to protect against electrical hazards. (15 Hours)

TEXT BOOKS

1. Arumugam, M. (2014).*Bio medical Instrumentation*. 14thReprint. Tamil Nadu: AnuradhaPublications.
2. FaizM.Khan,John P.Gibbons (2014), *The Physics of Radiation Therapy*, China: Library of Congress Cataloging-in-Publication Data.

Unit I - Chapter 1 – Sections: 1.4-1.6

Chapter 2 – Sections: 2.2 - 2.4 (2.4.1-2.4.7), 2.5, 2.5.1-2.5.8

Unit II - Chapter 4 – Sections: 4.3.1 to 4.3.5, 4.4.1 to 4.4.5, 4.5.1 to 4.5.2, 4.6

Unit IV- Chapter 7 – Sections: 7.2,7.5,7.5.1,7.5.2,7.5.3,7.5.4,7.5.5,7.6

Unit V- Chapter 9 – Sections: 9.1,9.2,9.2.1,9.2.2,9.4,9.5,9.5.1,9.5.2,9.6

Unit III & IV – Study material prepared by Department of Physics (Book 2)

REFERENCE BOOKS

1. Mandeep Singh. (2010). *Introduction to Biomedical Instrumentation*. New Delhi: PHI Learning Private Limited.
2. Chatterjee Shakti. (2008). *Biomedical Instrumentation Systems*. India: Thomson Press Ltd.
3. Sawhney, G. S. (2012). *Biomedical Electronics and Instrumentation Made Easy.* New Delhi: I.K. International Pvt. Ltd.
4. John G Webster (2010). *Medical Instrumentation – Application and Design,* John Wiley and Sons.

Course Code 20UPHE62	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	-	M	-	-	L	-	M	-	H
CO2	H	L	M	L	-	L	-	M	-	M
CO3	H	-	-	-	M	L	L	H	-	-
CO4	H	L	L	-	-	M	L	H	-	L
CO5	H	-	L	-	-	M	M	H	L	L

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester VI	**MEDICINAL CHEMISTRY**	Hours/Week: 5	
DSEC-2		Credits: 4	
Course Code **20UCHE63**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : recall common diseases, poisons and sources of drugs. [K1]

CO2 : classify important pharmacy terminologies, drugs and their actions. [K2]

CO3 : use first aid box , paracetamol, aspirin and inorganic compounds for sufferings. [K3]

CO4 : explain routes of administration and biological responses of drugs for major diseases. [K4]

CO5 : summarize the treatment, mechanism, assay and side effects of drugs for diseases. [K5]

UNIT I

Introduction

Sources of drugs – Terminologies –Pharmacy – Pharmacology – molecular pharmacology – pharmacodynamics – Pharmacokinetics – Pharmacophore – Antimetabolites – Mutation – Chemotherapy – Pharmacognosy – classification of drugs – Mechanism of drug action – Action at cellular & extracellular sites – Drug receptors and biological responses. (15 Hours)

UNIT II

Metabolism of drugs

Different types of drug action- Absorption of drugs – Routes of administration of drugs – factors affecting absorption – Assay of Drugs – Drug Dosage–Metabolism of drugs – Chemical pathways of drug metabolism. (15 Hours)

UNIT III

Analgesics, Anaesthetics, Common poisons and antidotes

Analgesics – Definition – Types – Narcotic analgesics - Action of morphine – Synthetic analgesics –preparation of pethidine – Non - narcotic analgesics – Preparation of Aspirin and paracetamol - Anaesthetics – Characteristics – Classification – Advantages and Disadvantages of ether chloroform – Local Anaesthetics – Cocaine -Common poisons and antidotes - Acid poisoning, Alkali poisoning, poisoning by disinfectants, Alcohol poisoning, Mercury poisoning, and Salicylate poisoning. (15 Hours)

UNIT IV

Medicinal uses and Biological role of Inorganic compounds

Inorganic compounds and their medicinal uses – Compounds of Aluminium, Phosphorus, Iron, Platinum and Mercury- Biological role of Inorganic compounds – Sodium, Potassium, Calcium, Iodine, Copper and Zinc. (15 Hours)

UNIT V

Common Diseases, Diabetes, Cancer and First aid for accidents

Common diseases and their treatment – Malaria, Common cold, Plague, Diphtheria, tuberculosis, cholera, typhoid, dysentery, jaundice, asthma & epilepsy- Diabetes – Types – Control – hypoglycemic drug – insulin - Cancer – Types – Common causes of cancer – spread of cancer – treatment of cancer – cytotoxic agents - Melphalan - First aid for accidents – Important rules of first aid – First aid box – First aid for Bleeding - Fractures, Burns, Fainting and poisonous bites. (15 Hours)

TEXT BOOKS

1) Jayashree Ghosh. (2014)..*A Text Book of Pharmaceutical Chemistry.* 3rd Edition. New Delhi: S.Chand& Company Ltd.
2) Ashutosh Kar. (2010). *Medicinal Chemistry.*5th Edition. New Delhi: New Age International Publishers.
3) Ilango, K.&Valentina, P. (2007). *Text Book of Medicinal Chemistry.*1st Edition. Chennai: Keerthi Publishers.

REFERENCE BOOKS

1. Parimoo, P. (2011). *A Text Book of Medicinal Chemistry.*1st Edition. New Delhi: CBS Publishers & Distributors Pvt. Ltd.
2. Delgado,J.N.& Remers, W.A.(1998).*Text book of Organic,Medicinal & Pharmaceutical Chemistry*. 9th Edition. Philadelphia: J.B. Lippincott Company.

Course Code 20UCHE63	PO1		PO2	PO3		PO4		PO5		PO6	PO7
	PSO 1. a	PSO 1. b	PSO 2 .	PSO 3. a	PSO 3. b	PSO 4 .a	PSO 4. b	SO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	H	M	M	H	H	M	H	M	-	M
CO2	H	H	M	M	H	H	M	H	M	-	M
CO3	H	H	H	H	H	H	H	H	H	-	H
CO4	H	H	H	H	M	H	M	M	M	-	H
CO5	H	H	H	M	M	M	M	H	M	-	H

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VIRUDHUNAGAR - 626 001

B.Sc. PHYSICS

(2020 -2021onwards)

Semester V/ VI	**GENERAL PHYSICS PRACTICAL - III**	Hours/Week: 3	
Core Course Practical III		Credits: 3	
Course Code- **20UPHC61P**		Internal 40	External 60

COURSE OUTCOMES

On completion of the practical, the students will be able to

CO1: apply the theoretical concepts in Electromagnetism, Heat and Optics related experiments. [K3]

CO2: draw/ arrangement for the circuit diagram /experimental set up with tabular column/model graph and write the appropriate formula to calculate the required physical parameters. [K3]

CO3: execute the technical skills in handling the equipment and observe the required measurements related to the experiment. [K3]

CO4: calculate the necessary parameters using the formula/graph and complete the record work. [K3]

CO5: analyze the accuracy of the results obtained and compare it with the theoretical value. [K4]

List of Practicals

1. Absolute capacity of condenser using B.G.
2. i-d curve by spectrometer
3. i-i' curve by spectrometer
4. Cauchy's constants by spectrometer
5. Hartmann's Interpolation formula by spectrometer
6. L.C.R-Series Resonance Circuit
7. L.C.R-Parallel Resonance Circuit
8. Self inductance of the given coil by Anderson's Bridge
9. Self inductance of the given coil by Maxwell's Bridge
10. λ of Hg spectrum using Grating - minimum deviation by spectrometer

11. Determination of Planck constant
12. Determination of Dielectric constant
13. Temperature coefficient of a coil using potentiometer
14. E.m.f. of a thermocouple by B.G
15. Comparison of Mutual inductances by B.G
16. High Resistance by leakage - B.G

Course Code 20UPHC61P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	H	L	H	-	-	M	-	-	M
CO2	H	H	H	H	-	M	-	-	-	L
CO3	H	H	H	H	-	M	-	L	H	-
CO4	H	H	H	-	H	M	-	L	M	H
CO5	M	H	M	H	H	H	M	M	M	H

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester V/ VI	**ELECTRONICS PRACTICAL**	Hours/Week: 3	
Core Course Practical IV		Credits: 3	
Course Code- **20UPHC62P**		Internal 40	External 60

COURSE OUTCOMES

On completion of the practical, the students will be able to

CO1: apply the theoretical concepts in regulated power supply, electronic signal generators, op-amp application, verification of gates, theorems and related experiments. [K3]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required necessary electrical parameters. [K3]

CO3: execute the technical skills in handling the equipment & components and observe the required measurements related to the experiment. [K3]

CO4: calculate the necessary parameters using the formula/graph and complete the record work [K3]

CO5: analyze the accuracy of the results obtained and compare it with the theoretical value. [K4]

List of Practicals

1. Reverse bias characteristics of Zener diode and voltage regulator
2. Hartley Oscillator
3. Astable multivibrator using discrete components
4. Dual power supply using IC
5. Voltage doubler and tripler
6. FET characteristics
7. Adder and subtractor using IC 741
8. Schmitt trigger using IC 555
9. Universal NAND & NOR gates using IC

10. Low pass filter and high pass filter
11. Verification of reciprocity theorem
12. Integrator and Differentiator using Op Amp
13. UJT – V-I characteristics
14. Amplitude Modulation
15. Single stage amplifier
16. Verification of Norton's theorem
17. Frequency modulation
18. Phase Locked Loop Oscillator

Course Code 20UPHC62P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	H	L	H	-	-	M	-	-	M
CO2	H	H	H	H	-	M	-	-	-	L
CO3	H	H	H	H	-	M	-	L	H	-
CO4	H	H	H	-	H	M	-	L	M	H
CO5	M	H	M	H	H	H	M	M	M	H

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester V/VI	**DIGITAL ELECTRONICS PRACTICAL**	Hours/Week: 2	
Core Course Practical V		Credits: 2	
Course Code **20UPHC63P**		Internal 40	External 60

COURSE OUTCOMES

On completion of the practical, the students will be able to

CO1: apply the theoretical concepts in digital electronics. [K3]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required physical parameters. [K3]

CO3: develop the technical skills in handling the equipment and components and observe the required measurements related to the experiment. [K3]

CO4: verify the truth tables of the digital circuits and complete the record work. [K3]

CO5: analyze the accuracy of the results obtained and compare it with the theoretical value. [K4]

List of Practicals:

1. Characteristics of LED and Seven Segment Display
2. R-S Flip flop
3. Astable multivibrator using IC 555
4. Binary to GRAY and GRAY to Binary Conversion
5. D Flip flop
6. Decoders - 2 to 4 decoder
7. J-K Flip flop
8. Decade counter
9. BCD to seven segment decoder

10. Half Adder and Full Adder
11. Time Division Multiplexing
12. Ring Counter
13. Multiplexer and Demultiplexer
14. Shift register
15. Pulse Code Modulation
16. Pulse Width Modulation and Demodulation

Course Code 20UPHC63P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	H	L	H	-	-	M	-	-	M
CO2	H	H	H	H	-	M	-	-	-	L
CO3	H	H	H	H	-	M	-	L	H	-
CO4	H	H	H	-	H	M	-	L	M	H
CO5	M	H	M	H	H	H	M	M	M	H

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B.Sc. PHYSICS

(2020 -2021onwards)

Semester V/VI	**MICROPROCESSOR PRACTICAL**	Hours/Week: 2	
Skill Enhancement Course Practical II		Credits: 2	
Course Code **20UPHS61P**		Internal 40	External 60

COURSE OUTCOMES

On completion of the practical, the students will be able to

CO1: apply the functions of various instructions used in 8085 microprocessor and write the programs. [K3]

CO2: write the programs related to the problems and calculate the necessary parameters. [K3]

CO3: develop the logical skills in writing the program and observe the required outputs related to the problem. [K3]

CO4: verify the output of the program and complete the record work [K3]

CO5: analyze the accuracy of the results obtained and compare it with the theoretical value. [K4]

List of Programs:

1. Addition of two 8-bit numbers
2. Subtraction of two 8-bit numbers
3. Division of two 8-bit numbers
4. Multiplication of two 8-bit numbers
5. Searching a number in an array and finding its parity
6. Square root of number
7. Block transfer of data
8. Palindrome
9. Generate and sum 15 Fibonacci series including carry
10. Largest and smallest number in an array of data
11. Descending order/Ascending order
12. Binary to BCD conversion

Course Code 20UPHS61P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1a	PSO 1b	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5	PSO 6	PSO 7
CO1	H	H	L	H	-	-	M	-	-	M
CO2	H	H	H	H	-	M	-	-	-	L
CO3	H	H	H	H	-	M	-	L	H	-
CO4	H	H	H	-	H	M	-	L	M	H
CO5	M	H	M	H	H	H	M	M	M	H

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