



V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

(Belonging to Virudhunagar Hindu Nadars)

An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai

Reaccredited with 'A++' Grade (4th Cycle) by NAAC

VIRUDHUNAGAR

Quality Education with Wisdom and Values

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM REGULATIONS AND SYLLABUS

(with effect from Academic Year 2025 - 2026)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 13 UG Programmes (Aided), 13 UG Programmes (SF), 13 PG 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 (TANSCH) 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, Data Science, Computer Applications and Computer Applications - Graphic Design
Commerce & Management	:	Commerce, Commerce (Computer Applications), Commerce (Professional Accounting), Business Administration

PG PROGRAMMES

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

* AICTE approved Programmes

OUTLINE OF CHOICE BASED CREDIT SYSTEM – UG

1. Core Courses
2. Elective Courses
 - Generic Elective Courses
 - Discipline Specific Elective Courses (DSEC)
 - Non Major Elective Courses (NMEC)
3. Skill Enhancement Courses (SEC)
4. Environmental Studies (EVS)
5. Value Education
6. Self Study Courses (Online)
7. Extra Credit Courses (Self Study Courses) (Optional)

List of Non Major Elective Courses (NME)
(2024 – 2025 onwards)

UG PROGRAMMES

Name of the Course	Course Code	Semester	Department	
			Offered by	Offered for
Introduction to Tourism	24UHIN11	I	History (E.M)	Students other than B.A. History Discipline
Indian Constitution	24UHIN21	II		
சுற்றுலா ஓர் அறிமுகம்	24UHIN11	I	History (T.M)	
இந்திய அரசியலமைப்பு	24UHIN21	II		
Popular Literature and Culture	24UENN11	I	English	Students other than B.A. English Discipline
Philosophy for Literature	24UENN21	II		
அடிப்படைத் தமிழ் இலக்கணம் - I எழுத்தறிதல்	24UBTN11	I	Tamil	students who have chosen Part I Hindi
அடிப்படைத்தமிழ் -II மொழித் திறனறிதல்	24UBTN21	II		

பேச்சுக்கலைத்திறன்	24UTAN11	I	Tamil	Students other than B.A. Tamil Discipline
பயன்முறைத் தமிழ்		II		
Basic Hindi - I	24UBHN11	I	Hindi	All Discipline students
Basic Hindi - II	24UBHN21	II		
Everyday Banking/ Practical Banking	24UCON11N/ 24UCON11	I	Commerce (Aided)	Students other than Commerce Discipline
Basic Accounting Principles	24UCON21	II		
Everyday Banking	24UCON11N	I	Commerce (Self)	
Emotional Intelligence	24UCON21N	II		
Everyday Banking/Self- Employment and Startup Business	24UCON11N/	I	Commerce C.A.(Self)	
Fundamentals of Marketing	24UCCN21	II		
Everyday Banking/ Practical Banking	24UCPN11N/ 24UCPN12N	I	Commerce	
Basic Accounting Principles	24UCPN21N	II	Professional Accounting	
Basics of Event Management	24UBAN11	I	Business Administration	Students other than B.B.A. Discipline
Managerial Skill Development	24UBAN21	II		
Quantitative Aptitude -I	24UMTN11	I	Mathematics	Students other than B.Sc. Mathematics Discipline
Quantitative Aptitude – II	24UMTN21	II		
Physics for EveryDay Life	24UPHN11	I	Physics	Students other than B.Sc. Physics Discipline
Astrophysics	24UPHN21	II		
Food Chemistry	24UCHN11	I	Chemistry	Students other than B.Sc. Chemistry Discipline
Dairy Chemistry	24UCHN21	II		
Ornamental fish farming and Management	24UZYN11	I	Zoology	Students other than B.Sc. Zoology Discipline
Biocomposting for Entrepreneurship	24UZYN21	II		
Foundations of Baking and Confectionery	24UHSN11	I	Home Science – Nutrition and Dietetics	Students other than B.Sc. Home Science – Nutrition and Dietetics Discipline
Women's Health and Wellness	24UHSN21	II		
Nutrition and Health	24UBCN11	I	Biochemistry	Students other than B.Sc. Biochemistry Discipline
Life Style Diseases	24UBCN21	II		
Social and Preventive Medicine	24UMBN11	I	Microbiology	Students other

Nutrition and Health Hygiene	24UMBN21	II		than B.Sc. Microbiology Discipline
Herbal Medicine	24UBON11	I	Biotechnology	Students other than B.Sc. Biotechnology Discipline
Organic Farming and Health Management	24UBON21	II		
Basics of Fashion	24UCFN11	I	Costume Design And Fashion	Students other than B.Sc. Costume Design And Fashion Discipline
Interior Designing	24UCFN21	II		
Introduction to HTML	24UCSN11N	I	Computer Science	Students other than Computer Science Discipline
Office Automation	24UCSN21N	II		
Basics of Internet	24UITN11N	I	Information Technology	
Data Analysis using Spreadsheet	24UITN21N	II		
Fundamentals of Information Technology	24UDSN11	I	Data Science	
Computer Fundamentals	24UDSN21	II		
Web Designing	24UCAN11N	I	B.C.A.	
Fundamentals of Computers	24UCAN21N	II		
Organic Farming	24UBYN11	I	Botany	All Discipline students
Nursery and Landscaping	24UBYN12	I		
Mushroom Cultivation	24UBYN21	II	Botany	
Medicinal Botany	24UBYN22	II		
Library and Information Science - I	24ULSN11	I	Library Science	All Discipline students
Library and Information Science - II	24ULSN21	II		
Cadet Corps for Career Development I	24UNCN11	I	National Cadet Corps	students who have chosen NCC as Part V course
Cadet Corps for Career Development II	24UNCN21	II		

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 Programme Specific 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	PEO1	PEO2	PEO3
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 articulate innovative thoughts and ideas proficiently in both in spoken and written forms. (*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 through assignments, case studies, Internship and projects for the

fulfillment of the local, national and global developmental needs. (*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 Multicultural 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 placement by applying diverse frames of reference.

PSO 1.b: be able to demonstrate their technical and observational skills in handling the equipment/instruments with precautions and to interpret the data for formulating engaging ideas.

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, society and high potential organizations.

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 in research and development.

PSO 3.b: enrich their problem-solving skills that make them successful entrepreneurs to meet the challenges and demands of the business world.

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 devices/components by start-up organizations for the stakeholders.

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 and sharing with collaborators for mutual benefit.

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

PSO 6 :build up their leadership qualities, team spirit and good interpersonal relations to make them citizen of the world.

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 for the upliftment of society.

PO-PEO Mapping Matrix

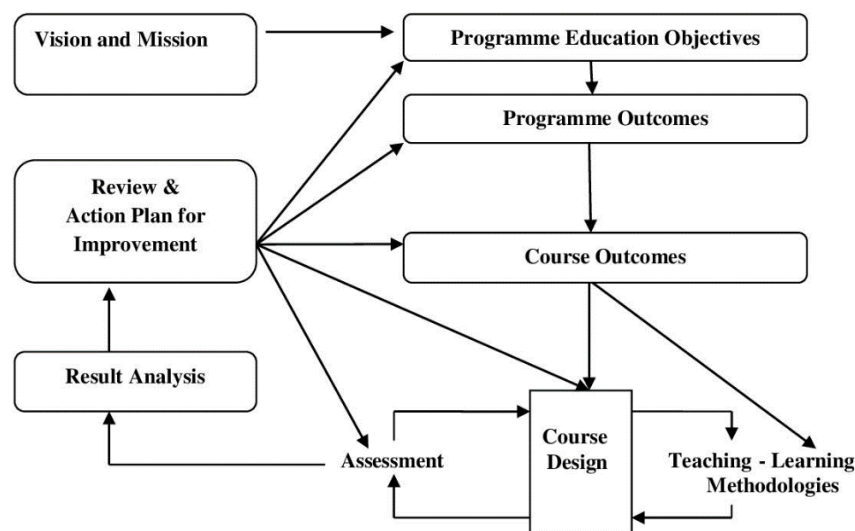
Attainment of PEOs can be measured by a PO-PEO matrix. PEOs should evolve through constant feedback from alumnae, students, industry, management, *etc.* It is mandatory that each PEO should be mapped to at least one of the POs.

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

B.1.4 Course Outcomes (COs)

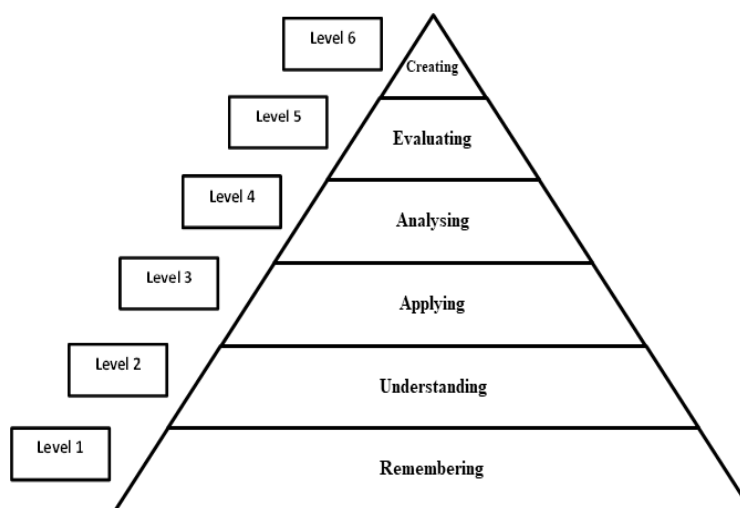
Course Outcomes are narrow statements restricted to the course contents given in five units. Course Outcomes describe what students would be capable of, after learning the contents of the course. They reflect the level of knowledge gained, skills acquired and attributes developed by the students after 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'S TAXONOMY



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, 2 and 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 Course
Part II	:	English
Part III	:	Core Courses
		Elective Courses <ul style="list-style-type: none"> • Generic Elective Courses • Discipline Specific Elective Courses
		Self-Study Course - online
Part IV	:	Skill Enhancement Courses (SEC)
		Elective Course (NMEC)
		Environmental Studies Value Education
		Internship/Industrial Training
		Self-Study Course (online)
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/ National Cadet Corps/ Rotaract Club

B.2 EVALUATION SCHEME

B.2.1.PART II

Components	Internal Assessment Marks	Summative Examination Marks	Total Marks
Theory	15	60	100
Practical	5	15	
Assignment	5	-	

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

B.2.2.Part I & PART III - Core Courses, Elective Courses (Generic, DSEC)

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	25	75	100

INTERNAL ASSESSMENT**Distribution of Marks****Theory**

Mode of Evaluation			Marks
Periodic Test			15
Assignment	K3 Level	:	5
Quiz	K1 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
Practical Test*			30
Record & Performance			10
Total			40

*Average of the two practical tests will be considered

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

Section	Questions No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 4	Multiple Choice	4	4	1	4
B	5 -6	Internal Choice - Either ... or Type	3	3	7	21
C	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

SUMMATIVE EXAMINATION**Question Pattern****Duration: 3 Hours**

Section	Q. No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 -10	Multiple Choice	10	10	1	10
B	11 - 15	Internal Choice – Either ...or Type	5	5	7	35
C	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.2.3 PART IV - Skill Enhancement Courses, Non Major Elective Courses and Foundation Course

B.2.3.1 FOUNDATION COURSE**INTERNAL ASSESSMENT****Distribution of Marks****Theory**

Mode of Evaluation		Marks
Periodic Test	:	15
Assignment	K2 Level	5
Quiz	K1 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

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

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 3	Internal Choice - Either ...or Type	3	3	5	15
B	4	Internal Choice – Either ...or Type	1	1	10	10
Total						25*

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

SUMMATIVE EXAMINATION

Mode of Evaluation	Marks
Summative Examination	: 50
Online Quiz (Multiple Choice Questions - K2 Level)	: 25
Total	: 75

Question Pattern**Duration: 2 Hours**

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Internal Choice - Either ... or Type	5	5	6	30
B	6 - 7	Internal Choice – Either... or Type	2	2	10	20
Total						50

B.2.3.2 Skill Enhancement Course - Entrepreneurial skills**INTERNAL ASSESSMENT ONLY****Distribution of Marks**

Mode of Evaluation	Marks
Periodic Test	: 15
Assignment	: 5
Quiz	: 5
Model Examinations	: 60
Online Quiz (Multiple Choice Questions - K2 Level)	: 15
Total	: 100

Question Pattern for Periodic Tests**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	5	15
B Q. No.(4)	Internal Choice – Either Or Type	1	1	10	10
Total					25

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

Two Periodic Tests - Better of the two will be considered

Two Assignments - Better of the two will be considered

Two Quiz Tests - Better of the two will be considered

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.2.3.3 Skill Enhancement Courses/ Non Major Elective Courses**INTERNAL ASSESSMENT****Distribution of Marks****Theory**

Mode of Evaluation		Marks
Periodic Test		: 15
Assignment	K3 Level	: 5
Quiz	K2 Level	: 5
Total		: 25

Three Periodic Test - 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

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

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 3	Internal Choice - Either ...or Type	3	3	5	15
B	4	Internal Choice – Either ...or Type	1	1	10	10
Total						25*

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

SUMMATIVE EXAMINATION

Mode of Evaluation	Marks
Summative Examination	: 50
Online Quiz (Multiple Choice Questions - K2 Level)	: 25
Total	: 75

Question Pattern**Duration: 2 Hours**

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Internal Choice - Either ... or Type	5	5	6	30
B	6 - 7	Internal Choice – Either... or Type	2	2	10	20
Total						50

B.2.4 PART IV- ENVIRONMENTAL STUDIES / VALUE EDUCATION**INTERNAL ASSESSMENT ONLY****Evaluation Pattern**

Mode of Evaluation	Marks
Periodic Test	: 15
Assignment - K3 Level	: 10
Online Quiz (Multiple Choice Questions - K2 Level)	: 25
Poster Presentation - K3 Level	10
Report - K3 Level	10
Model Examination	: 30
Total	: 100

Three Assignment - Best of the three will be considered

Question Pattern for Periodic Tests**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

Two Periodic tests - Better of the two will be considered

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

Question Pattern for Model Examination**Duration: 2 ½ Hours**

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

*The total marks obtained in the Model Examination will be calculated for 30 marks

B. 2. 5 PART IV- Internship / Industrial Training

Internship / Industrial Training is mandatory for all the Students

- **Internship:** Students have to involve in a designated activity, working in an organization under the guidance of an identified mentor for a period of 15 days.
- **Industrial Training:** Student has to undertake in-plant training in industries individually or in group for a period of 15 days.
- Internship / Industrial Training must be done during the fourth semester holidays
- **Internal Assessment only.**

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

B.2.5 SELF STUDY COURSE**B.2.5.1 PART III – Discipline Specific Quiz – Online**

Assessment by Internal Examiner only

- Question Bank is prepared by the Faculty Members of the Departments for all the Core and Elective Courses offered in all the Semesters.
- 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	:	25
Model Examination	:	75
Total	:	100

Two Periodic Tests - Better of the two will be considered

B.2.5.2 PART IV - 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 conducted 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	:	25
Model Examination	:	75
Total	:	100

Two Periodic Tests - Better of the two will be considered

B.2.6. Part V – Extension Activities**INTERNAL ASSESSMENT ONLY****Distribution of Marks**

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

B.2.7 Transfer of credits earned through MOOC (UGC recognized Courses)

- Students can opt for minimum of
 - 12 weeks Courses for Core Courses
 - 8 weeks Courses for Elective Courses
 - 4 weeks Courses for Skill Enhancement Course
- The Online Courses opted by the students will be verified and approved by the Head of the Department and forwarded to the Controller of Examinations through the Principal.
- Students are required to register for the equivalent Online Courses through the Institution's SWAYAM-NPTEL Local Chapter after submitting a Permission letter to the Head of the Department.
- The Course should be completed before the beginning of that particular Semester in which the selected Course is offered.
- The student should submit the Course Completion Certificate immediately after receiving it, to the Department.
- The Head of the Department has to send the list of the students and their Course Completion Certificates to the Controller of Examinations through the Principal.
- The students who have submitted the Completion Certificate are exempted from appearing the Periodic Tests and Summative Examinations of the respective course but without any exemption for class attendance.

- Credits allotted for the particular Course in the Curriculum will be transferred after the completion of the Online Course
- Students can earn up to 10 credits within the mandatory credits requirements of the Degree Programme by completing UGC recognised Online Courses.

B.2.8 EXTRA CREDIT COURSES (OPTIONAL)

2.8.1 Extra Credit Course offered by the Department.

Assessment by Internal Examiner Only (To be conducted along with the III Periodic Test)

Distribution of Marks

Mode of Evaluation	Marks
Quiz (Multiple Choice Questions)	25
Model Examination	75
Total	100

Question Pattern for Model Examination

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	7	35
B Q.No.(6-9)	Internal Choice- Either or Type	4	4	10	40
				Total	75

2.8.2 Extra credit Course offered by MOOC (Massive Open Online Course)

- The Courses shall be completed within the first V Semesters of the Programme.
- The allotment of credits is as follows (**Maximum of 10 credits**)

4weeks Course	- 1 credit
8 weeks Course	- 2 credits
12 weeks Course	- 3 credits

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 marks for Core Courses, Elective Courses (Generic Elective, DSEC Courses)
- Pass minimum for External Examination is 18 marks out of 50 marks for Skill Enhancement Courses and Non Major Elective Courses (NMEC).
- The aggregate minimum pass percentage is 40 marks for all Courses.
- Pass minimum for External Practical Examination is 21 marks out of 60 marks.

Attendance

- The students who have attended the classes for 76 days (85%) and above are permitted to appear for the Summative Examinations without any condition.
- 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.
- The students who have attended the classes for 59 days and less - up to 45 days (50%- 65%) can appear for the Summative Examinations only after getting special permission from the Principal.
- 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.
- For Part V in UG Programmes, the students require 75 % of attendance to get a credit.
- 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.

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

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

Attainment Levels of COs

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

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 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 - 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 of Programme Outcomes
	Co-curricular/ Extra-curricular activities 15%	For participation in Co-curricular / Extracurricular activities during period of their study.

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
Attainment Value $\geq 70\%$	Excellent
60% Attainment Value $< 70\%$	Very Good
$50\% \leq$ Attainment Value $< 60\%$	Good
$40\% \leq$ Attainment Value $< 50\%$	Satisfactory
Attainment 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	15% of the class strength	30% of the class strength
Progression to Higher Education	50% 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

$$\begin{aligned} \text{Percentage of PEO Attainment from Employment} &= \frac{\text{Number of Students who have got Employment}}{\text{Target}} \times 100 \\ \text{Percentage of PEO Attainment from Higher Education} &= \frac{\text{Number of Students who pursue Higher Education}}{\text{Target}} \times 100 \\ \text{Percentage of PEO Attainment from Entrepreneurship} &= \frac{\text{Number of Students who have become Entrepreneurs}}{\text{Target}} \times 100 \end{aligned}$$

Expected Level of Attainment for each of the Programme Educational Objectives

POs	Level of Attainment
Attainment Value $\geq 70\%$	Excellent
$60\% \leq \text{Attainment Value} < 70\%$	Very Good
$50\% \leq \text{Attainment Value} < 60\%$	Good
$40\% \leq \text{Attainment Value} < 50\%$	Satisfactory
Attainment 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 PROGRAMME 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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VIRUDHUNAGAR

Quality Education with Wisdom and Values

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 2024-2025

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, Allied Courses and Self Study Course							
Core Course	5 (5)	5 (5)	5 (5)	4 (4)	6 (6)	6(6)	31 (31)
Core Course	-	-	-	-	5 (5)	6(5)	11 (10)
Core Course	-	-	-	-	5 (4)	5(5)	10(9)
Core Course Practical	3(2)	3 (2)	3 (2)	3 (2)	3 (2)	3 (2)	18(12)
Core Course Project	-	-	-	-	1 (1)	-	1 (1)
Elective Course (DSEC)	-	-	-	-	5(4)	5 (4)	10 (8)
Elective Course (DSEC Practical)	-	-	-	-	3(2)	3(2)	6(4)
Elective Course I (Allied)	6 (4)	3(2) & 3(2)	-	-	-	-	12(8)
Elective Course I Practical I(Allied)	-	-	-	-	-	-	-
Elective Course II(Allied)	-	-	4 (3)	4 (3)	-	-	8(6)
Elective Course II Practical II(Allied)	-	-	2 (1)	2 (1)	-	-	4 (2)
Self Study Course	-	-	-	-	-	0 (1)	0 (1)
Part IV : Skill Enhancement Courses, Elective Courses, Environmental Studies, Value Education , Self-Study Course & Internship/ Industrial Training							
SEC	2 (2)	-	1 (1)	2 (2)	-	-	5(5)
SEC	-	2 (2)	2 (2)	2 (2)	-	2 (2)	8 (8)
Elective Course(NME)	2 (2)	2 (2)	-	-	-	-	4 (4)
Value Education	-	-	-	-	2 (2)	-	2 (2)
Environmental Studies	-	-	1 (0)	1 (2)	-	-	2 (2)
Self-Study Course	-	-	-	-	0 (1)	-	0 (1)
Internship/ Industrial Training	-	-	-	-	0 (1)	-	0 (1)
Part V : Extension Activities	-	-	-	-	-	0 (1)	0 (1)
Total	30 (21)	30 (21)	30 (20)	30(22)	30(28)	30(28)	180 (140)
Extra Credit Course (Self Study Course)	-	-	-	-	0(2)	-	0(2)

DSEC: Discipline Specific Elective Course;
NMEC: Non Major Elective Course

SEC– Skill Enhancement Course


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**B.Sc. PHYSICS – 2016
PROGRAMME CONTENT
SEMESTER I
(2024-2025 onwards)**

S. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	Part I		Tamil/Hindi	24UTAG11/ 24UHDG11	6	3	3	25	75	100
2.	Part II		English	24UENG11	6	3	3	25	75	100
3.	Part III	Core Course -1	Properties of Matterand Acoustics	24UPHC11	5	5	3	25	75	100
4.		Core Course -2 Practical I	Properties of Matter Practical	24UPHC11P	3	2	3	40	60	100
5.		Elective Course -1	Mathematical Foundations – I	24UMTA11	6	4	3	25	75	100
6.	Part IV	NME - 1	Physics for Every Day Life	24UPHN11	2	2	2	25	75	100
7.		SEC-1 Foundation Course	Introductory Physics	24UPHF11	2	2	2	25	75	100
Total					30	21	700			

SEMESTER II

S. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	Part I		Tamil/ Hindi	24UTAG21/ 24UHDG21	6	3	3	25	75	100
2.	Part II		English	24UENG21	6	3	3	25	75	100
3.	Part III	Core Course -3	Heat, Thermodynamics and Statistical Physics	24UPHC21	5	5	3	25	75	100
4.		Core Course -4 Practical II	Heat, Oscillations, Waves and Sound Practical	24UPHC21P	3	2	3	40	60	100
5.		Elective Course – I	Mathematical Foundations – II	24UMTA21	3	2	3	25	75	100
6.		Elective Course - I	Statistics and Operations Research	24UMTA22	3	2	3	25	75	100
7.	Part IV	NME – 2	Astrophysics	24UPHN21	2	2	2	25	75	100
8.		SEC-2	Programming in C	24UPHS21	2	2	2	25	75	100
Total					30	21	800			

SEMESTER III

S. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	Part I		Tamil/Hindi	24UTAG31/ 24UHDG31	6	3	3	25	75	100
2.	Part II		English	24UENG31	6	3	3	25	75	100
3.	Part III	Core Course -5	Mechanics	24UPHC31	5	5	3	25	75	100
4.		Core Course -6 Practical III	Electricity Practical	24UPHC31P	3	2	3	40	60	100
5.		Elective Course -II	Basic Electronics	24UEIA31	4	3	3	25	75	100
6.		Elective Course -II Practical I	Applied Electronics and Instrumentation Practical- I	24UEIA31P	2	1	3	40	60	100
7.	Part IV	SEC - 3	Arduino Programming Practical	24UPHS31P	1	1	2	100	-	100
8.		SEC - 4	Numerical Methods	24UPHS32	2	2	2	25	75	100
9.			Environmental Studies	24UGES41	1	-	-	-	-	-
Total					30	20				800

SEMESTER IV

S. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	Part I		Tamil/ Hindi	24UTAG41/ 24UHDG41	6	3	3	25	75	100
2.	Part II		English	24UENG41	6	3	3	25	75	100
3.	Part III	Core Course - 7	Optics and Laser Physics	24UPHC41	4	4	3	25	75	100
4.		Core Course - 8 Practical IV	Optics Practical	24UPHC41P	3	2	3	40	60	100
5.		Elective Course –II	Electronic devices and Instrumentation	24UEIA41	4	3	3	25	75	100
6.		Elective Course – II Practical	Applied Electronics and Instrumentation Practical- II	24UEIA41P	2	1	3	40	60	100
7.	Part IV	SEC - 5	Solar Energy	24UPHS41	2	2	2	25	75	100
8.		SEC - 6	Programming in C Practical	24UPHS42P	2	2	2	40	60	100
9.			Environmental Studies	24UGES41	1	2	2	100	-	100
Total					30	22	900			

SEMESTER V

S. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	Part III	Core Course - 9	Electricity, Magnetism and Electromagnetism	24UPHC51	6	6	3	25	75	100
2.		Core Course - 10	Atomic and Nuclear Physics	24UPHC52	5	5	3	25	75	100
3.		Core Course - 11	Analog and Communication Electronics	24UPHC53	5	4	3	25	75	100
4.		Core Course – 12 Practical V	General Physics Practical - I	24UPHC51P	3	2	3	40	60	100
5.		Core Course – 13	Project	24UPHC54PR	1	1	-	100	-	100
6.		Elective Course DSEC -1	Nanoscience and Nano Technology / Mathematical Physics	24UPHE51 / 24UPHE52	5	4	3	25	75	100
7.		Elective Course DSEC -2 Practical I	General Physics Practical – II / Linear Integrated Circuits Practical	24UPHE53P / 24UPHE54P	3	2	3	40	60	100
8.	Part IV	Internship / Industrial Training	Internship	24UPHI51	-	1	-	100	-	100
9.			Value Education	24UGVE51	2	2	2	100	-	100
10.		Self-Study Course	Practice for Competitive Examination - Online	24UGCE51	-	1	-	100	-	100
Total					30	28				1000

11.	Extra Credit Course (Self-Study Course)	Bio Physics	24UPHO51	-	2	3	100	-	100
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SEMESTER VI

S. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. ours	Marks		
								Int.	Ext.	Total
1.	Part III	Core Course – 14	Quantum Mechanics and Relativity	24UPHC61	6	6	3	25	75	100
2.		Core Course – 15	Solid State Physics	24UPHC62	6	5	3	25	75	100
3.		Core Course – 16	Digital Electronics and Microprocessor 8085	24UPHC63	5	5	3	25	75	100
4.		Core Course – 17 Practical VI	Electronics Practical	24UPHC61P	3	2	3	40	60	100
5.		Self-Study Course	Discipline Specific Quiz - Online	24UPHQ61	-	1		100	-	100
6.		Elective Course DSEC - 3	Material Science / Energy Physics	24UPHE61 / 24UPHE62	5	4	3	25	75	100
7.		Elective Course DSEC – 4 Practical II	Digital Electronics Practical/ Digital Circuits Simulation Practical	24UPHE63P / 24UPHE64P	3	2	3	40	60	100
8.	Part IV	Professional Competency Skill -7	Microprocessor Practical	24UPHS61P	2	2	2	40	60	100
9.	Part V	Extension Activity	Extension Activity		-	1	-	100	-	100
Total					30	28				900


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Semester I	PROPERTIES OF MATTER AND ACOUSTICS	Hours/Week: 5	
Core Course- 1		Credits: 5	
Course Code 24UPHC11		Internal 25	External 75

COURSE OUTCOMES

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

CO1: identify basic concepts related to elasticity, fluid dynamics, wave motion and sound. [K1]

CO2: describe the experimental methods in SHM, bending of beams and derive the physical parameters under elasticity, fluid dynamics. [K2]

CO3: obtain the physical parameters in bending of beams, acoustics and also explain the experimental methods in ultrasonics, fluid dynamics. [K2]

CO4: demonstrate the applications of SHM, ultrasonics and solve problems related to elasticity. [K3]

CO5: illustrate the applications and also solve problems in bending of beams & fluid dynamics. [K3]

UNIT-I
ELASTICITY

Hooke's law – stress-strain diagram – elastic constants –Poisson's ratio – relation between elastic constants and Poisson's ratio – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion– torsional pendulum . (15 hours)

UNIT-II
BENDING OF BEAMS

Cantilever– expression for Bending moment – expression for depression at the loaded end of the cantilever– oscillations of a cantilever – expression for time period – experiment to find Young's modulus – non-uniform bending– experiment to determine Young's modulus by Koenig's method – uniform bending – expression for elevation – experiment to determine Young's modulus using microscope. (15 hours)

UNIT-II
FLUID DYNAMICS

Surface Tension: definition – molecular forces– excess pressure inside a curved liquid

surface – application to spherical and cylindrical drops and bubbles – determination of surface tension by Jaegar’s method–variation of surface tension with temperature.

Viscosity: Definition – streamline and turbulent flow – rate of flow of liquid in a capillary tube – Poiseuille’s formula –correction – terminal velocity and Stoke’s formula– variation of viscosity with temperature. (15 hours)

UNIT-IV

WAVES AND OSCILLATIONS

Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM – composition of two SHM in a straight line and at right angles – Lissajous's figures - free, damped, forced vibrations –resonance and Sharpness of resonance.

Laws of transverse vibration in strings –sonometer – determination of AC frequency using sonometer –determination of frequency using Melde’s string apparatus. (15 hours)

UNIT-V

ACOUSTICS OF BUILDINGS AND ULTRASONICS

Intensity of sound – decibel – loudness of sound –reverberation – Sabine’s reverberation formula – acoustic intensity – factors affecting the acoustics of buildings.

Ultrasonic waves: Production of ultrasonic waves – Piezoelectric crystal method – magnetostriction effect – application of ultrasonic waves. (15 hours)

SELF STUDY

Sonometer – determination of AC frequency using sonometer –determination of frequency using Melde’s string apparatus.

TEXT BOOKS

1. Murugesan. R, (2019). *Properties of Matter*, S. Chand & Company Ltd., New Delhi.
2. Mathur. D.S., (2012). *Elements of Properties of Matter*, S. Chand & Company Ltd., New Delhi.
3. Brijlal & N. Subrahmanyam, (2003). *Properties of Matter*, S. Chand & Company Ltd., New Delhi.
4. Brijlal and N.Subrahmanyam, (1995). *A Text Book of Sound*, Second revised edition, Vikas Publishing House, Chennai.

REFERENCEBOOKS

1. Smith, C.J., (1960). *General Properties of Matter*, Orient Longman Publishers.
2. Gulati, H.R., (1977). *Fundamental of General Properties of Matter*, Fifth edition, R. Chand& Co.
3. French A.P, (1973). *Vibration and Waves*, MIT Introductory Physics, Arnold-Heinmann India.

WEBLINKS

1. <https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work>
2. <http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html>
3. <https://www.youtube.com/watch?v=gT8Nth9NWPM>
4. <https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s>
5. <https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work>
6. <https://learningtechnologyofficial.com/category/fluid-mechanics-lab/>
7. <http://www.sound-physics.com/>
8. <http://nptel.ac.in/courses/112104026/>

Course Code 24UPHC11	PO1		PO2	PO 3		PO4		PO 5	PO 6	PO 7
	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	3	3	3	-	-	-	-	3	-	2
CO2	3	-	3	-	3	3	-	-	-	-
CO3	3	3	2	2	2	3	3	-	-	-
CO4	3	3	2	3	-	2	-	2	-	2
CO5	3	-	2	-	2	-	-	2	1	1

Strong (3) Medium (2) Low (1)

Dr.A.Azhagu Parvathi
Head of the Department

Dr.S.Thenmozhi
Course Designer


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Semester I	PROPERTIES OF MATTER PRACTICAL	Hours/Week: 3	
Core Course – 2 Practical - I		Credits: 2	
Course Code 24UPHC11P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the theoretical concepts in Properties of matter and

formulate the experimental procedure. [K2]

CO2: draw the circuit diagram /experimental set up with tabular

 column/model graph and write the formula to calculate the required
physical parameters. [K2]

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: assess the results obtained and compare it with the theoretical value. [K3]

List of Practicals (Any Eight of the below list)

.

1. Determination of rigidity modulus using Torsional pendulum.
2. Determination of Young's modulus by uniform bending – load depression graph.
3. Determination of Young's modulus by non-uniform bending – scale & telescope.
4. Determination of Young's modulus by cantilever – load depression graph.
5. Determination of Young's modulus by cantilever – oscillation method
6. Determination of rigidity modulus by static torsion.
7. Determination of surface tension by drop weight method.

8. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
9. Determination of 'g' using compound pendulum.
10. Error Analysis

Course Code 24UPHC11P	PO1		PO2	PO 3		PO4		PO 5	PO 6	PO 7
	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	3	-	2	3	-	2	-	-	-	2
CO2	3	3	3	3	2	2	-	-	-	1
CO3	3	3	3	3	-	3	-	2	3	3
CO4	3	3	3	3	-	2	-	2	2	3
CO5	-	2	2	2	-	2	-	2	2	3

Strong (3) Medium (2) Low (1)

Dr. A.Azhagu Parvathi
Head of the Department

Dr. M.Sankareswari
Course Designer


V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

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VIRUDHUNAGAR
Quality Education with Wisdom and Values
B.Sc. PHYSICS
(2024-2025 onwards)

Semester I	MATHEMATICAL FOUNDATIONS - I	Hours/Week:6	
Elective Course-I		Credits:4	
Course Code 24UMTA11		Internal 25	External 75

COURSE OUTCOMES

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

CO1: retrieve the fundamental concepts, techniques in Calculus, Algebra and Numerical Methods. [K1]

CO2: explain curvature of a curve, method of solving algebraic, transcendental and simultaneous equations. [K2]

CO3: find the eigen values and eigen vectors of a given matrix and evaluate double and triple integrals. [K2]

CO4: apply the knowledge gained in Calculus and Algebra to other fields. [K3]

CO5: use appropriate method to solve algebraic, transcendental and simultaneous equations. [K3]

UNIT I
The Solution of Numerical Algebraic and Transcendental Equations

The Bisection method - Iteration method – Regula Falsi method – Newton Raphson method – Horner's method (without proof) (Simple problems only) (18 hours)

UNIT II
Solution of Simultaneous Linear Algebraic Equations

Introduction - Gauss Elimination method – Gauss Jordan method – Gauss Jacobi method - Gauss Seidel method of iteration – (Restricted to three variables only) (Simple problems only) (18 hours)

UNIT III**Matrices**

Eigen Values and Eigen Vectors – Diagonalization of Matrices – Cayley – Hamilton Theorem – Inverse of a Matrix (18 hours)

UNIT IV**Differential Calculus**

n^{th} derivatives – Leibnitz theorem (without proof) – Jacobian – Curvature and radius of curvature (18 hours)

UNIT V**Ordinary Differential Equations**

Linear equations with Constant coefficients

Partial Differential Equations

Formation of Partial Differential Equations – Solution of a Partial Differential Equation – Standard Forms (18 hours)

TEXT BOOKS

1. P.Kandasamy, K.Thilagavathy, K.Gunavathy, Numerical Methods (2016), S.Chand & Company Ltd., New Delhi-55.
2. P.Duraipandian and Dr.S.Udayabaskaran, Allied Mathematics Volume I (2014), S.Chand & Company Ltd., New Delhi-55.
3. P.Duraipandian and Dr.S.Udayabaskaran, Allied Mathematics Volume II (2014), S.Chand & Company Ltd., New Delhi-55.

Course Code 24UMTA11	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	2	1	2	-
CO2	3	2	3	2	1	2	-
CO3	2	2	3	2	1	2	-
CO4	3	3	3	3	1	2	-
CO5	3	2	3	2	1	3	-

Strong(3) Medium(2) Low(1)

Dr.M.C.Maheswar

Head of the Department

Mrs. G. Nagalakshmi

Course Designer


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**B.Sc. PHYSICS
(2024-2025 onwards)**

Semester I	INTRODUCTORY PHYSICS	Hours/Week: 2	
SEC-1		Credits: 2	
Foundation Course			
Course Code 24UPHF11		Internal 25	External 75

COURSE OUTCOMES

CO1: identify scalar and vector quantities in Physics, units and dimensions of Physical quantities, different types of forces and different forms of energy. [K1]

CO2: list out types of motion, Oscillations, properties of matter. [K1]

CO3: understand algebraic operations of vector quantities, type of force between microscopic & macroscopic bodies in nature and conservation of momentum, energy in different process. [K2]

CO4: explain various energy resources, mechanics of linear and circular motion. [K2]

CO5: describe how mechanics of microscopic and macroscopic bodies can be realized for real life applications. [K2]

UNIT I

Vectors, scalars – examples for scalars and vectors from physical quantities – addition, subtraction of vectors – resolution and resultant of vectors – units and dimensions – standard physics constants. (6 Hours)

UNIT II

Different types of forces – gravitational, electrostatic, magnetic, electromagnetic, nuclear – mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces. (6 Hours)

UNIT III

Different forms of energy– conservation laws of momentum, energy – types of collisions – angular momentum– alternate energy sources–real life examples. (6 Hours)

UNIT IV

Types of motion– linear, projectile, circular, angular, simple harmonic motions – satellite motion – banking of a curved roads – stream line and turbulent motions – wave motion – comparison of light and sound waves – free, forced, damped oscillations. (6Hours)

UNIT V

Surface tension – shape of liquid drop – angle of contact – viscosity –lubricants – capillary flow – diffusion – real life examples– properties and types of materials in daily use– conductors, insulators – thermal and electric. (6 Hours)

TEXT BOOKS

1. Mathur, D.S., (2010). *Elements of Properties of Matter*, S. Chand & Company Ltd., New Delhi.
2. Brijlal & Subrahmanyam, N., (2003). *Properties of Matter*, S. Chand & Company Ltd., New Delhi.

REFERENCE BOOKS

1. Gulati, H.R., (1977). *Fundamental of General Properties of Matter*, Fifth edition. S. Chand & Company Ltd., New Delhi.
2. Verma, H.C., (2017). *Concepts of Physics*, Bharati Bhawan Publishers, New Delhi.

Course Code 24UPHF11	PO1		PO2	PO 3		PO4		PO 5	PO 6	PO 7
	PSO 1. a	PSO 1. b	PSO 2	PSO 3. a	PSO3. B	PSO 4. a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	3	-	3	-	-	-	-	-	-	2
CO2	3	-	3	-	-	-	-	-	-	2
CO3	3	-	3	2	-	2		-	-	-
CO4	3	-	3	2	-	2	-	-	-	-
CO5	3	-	2	3	-	3	-	2	-	-

Strong (3) Medium (2) Low (1)

Dr.A.Azhagu Parvathi

Head of the Department

Dr. G.Shanmuga Priya

Course Designer


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B.Sc. PHYSICS

(2024-2025 onwards)

Semester II	HEAT, THERMODYNAMICS AND STATISTICAL PHYSICS	Hours/Week: 5	
Core Course 3		Credits: 5	
Course Code 24UPHC21		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 thermodynamics, heat transfer process and statistical physics [K1]

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

CO3: derive the expressions for physical parameters related to calorimetry, thermodynamics, radiation process and statistical mechanics [K2]

CO4: illustrate the applications of low temperature physics, laws of thermodynamics to heat engine heat transfer process and statistical mechanics [K3]

CO5: apply the learned concepts to solve simple the problems in calorimetry performance of thermodynamics system, heat transfer process and statistical mechanics. [K3]

UNIT I
CALORIMETRY: Specific heat capacity – specific heat capacity of gases C_P and C_V – Meyer's relation – Joly's method for determination of C_V – Regnault's method for determination of C_P
LOW TEMPERATURE PHYSICS: Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect – Boyle temperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetisation.

(15 Hours)

UNIT II
THERMODYNAMICS-I: Zeroth law and first law of thermodynamics – P-V diagram – heat engine – efficiency of heat engine – Carnot's engine, construction, working and efficiency of petrol engine and diesel engines – comparison of engines.

(15 Hours)

UNIT III

THERMODYNAMICS-II: Second law of thermodynamics –entropy of an ideal gas – entropy change in reversible and irreversible processes – temperature entropy diagram – thermodynamical scale of temperature – Maxwell's thermodynamical relations –Clasius-Clapeyron's equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.

(15 Hours)

UNIT IV

HEAT TRANSFER: Modes of heat transfer: conduction, convection and radiation.

Conduction: thermal conductivity – determination of thermal conductivity of a good conductor by Forbe's method – determination of thermal conductivity of a bad conductor by Lee's disc method.

Radiation: black body radiation (Ferry's method) – distribution of energy in black body radiation – Wien's law and Rayleigh Jean's law –Planck's law of radiation – Stefan's law – deduction of Newton's law of cooling from Stefan's law.

(15 Hours)

UNIT V

STATISTICAL MECHANICS: Definition of phase-space – micro and macro states – ensembles – different types of ensembles – classical and quantum Statistics – Maxwell-Boltzmann statistics – expression for distribution function – Bose-Einstein statistics – expression for distribution function – Fermi-Dirac statistics – expression for distribution function – comparison of three statistics.

(15 Hours)

TEXT BOOKS

1. Brijlal & N. Subramaniam, 2022, Heat, Thermodynamics & Statistical Physics, S. Chand & Company Ltd., New Delhi.
2. Murugesan, R. and Kiruthiga Sivaprasath, (2018). Thermal Physics, S. Chand & Company Ltd., New Delhi
3. Gupta, Kumar, Sharma, 2013, Statistical Mechanics, 26th Edition, S. Chand and Co.

REFERENCE BOOKS

1. Rajam, J.B., and Arora, C.L., (1976). *Heat and Thermodynamics*, 8th edition, S.Chand & Co. Ltd.
2. Mathur, D.S., (2021). *Heat and Thermodynamics*, 5th Revised edition, Sultan Chand & Sons.
3. Resnick, Halliday & Walker, (2010). *Fundamentals of Physics*, 6th Edition.
4. Sears, Zemansky, Hugh, D. Young, Roger and Freedman, A., (2021). *University Physics with Modern Physics*, 15th Edition, Pearson.

WEBSITE LINKS

1. https://youtu.be/M_5KYncYNyc
2. <https://www.youtube.com/watch?v=4M72kQulGKk&vl=en>

Course Code 24UPHC21	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO
	1.a	1.b	2	3.a	3.b	4.a	4.b	5	6	7
CO 1	3	3	3	-	-	-	-	3	-	2
CO 2	3	-	3	3	-	1	-	-	-	-
CO 3	3	3	3	2	-	3	2	-	-	1
CO 4	3	3	2	3	2	2	-	2	-	2
CO 5	3	-	2	-	2	3	-	3		-

Strong (3)**Medium (2)****Low (1)**

Dr.A.Azhagu Parvathi
Head of the Department

Dr.A.Azhagu Parvathi
Course Designer


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**B.Sc. PHYSICS
(2024-2025 onwards)**

Semester II	HEAT, OSCILLATIONS, WAVES & SOUND PRACTICAL	Hours/Week: 3	
Core Course – 4 Practical – II		Credits: 2	
Course Code 24UPHC21P		Internal 40	External 60

COURSE OUTCOMES

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

- CO1: understand the theoretical concepts in Heat Oscillations, Waves & Sound and formulate the experimental procedure. [K2]
- CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required physical parameters. [K2]
- 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: assess the results obtained and compare it with the theoretical value. [K3]

List of Experiments: Any Eight

1. Determination of specific heat by cooling – graphical method.
2. Determination of thermal conductivity of bad conductor by Lee's disc method.
3. Determination of specific heat capacity of solid.
4. Determination of specific heat of liquid by Joule's electrical heating method
5. Velocity of sound through a wire using Sonometer.
6. Determination of frequency of an electrically maintained tuning fork
7. To verify the laws of transverse vibration using sonometer.
8. To verify the laws of transverse vibration using Melde's apparatus.
9. Frequency of AC by using sonometer.
10. Verification of Stefan's Law

Course Code 24UPHC21P	PO1		PO2	PO 3		PO4		PO 5	PO 6	PO 7
	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	3	-	3	2	-	2	-	-	-	2
CO2	3	3	3	2	2	2	-	-	-	1
CO3	-	3	3	3	-	3	-	2	3	3
CO4	-	3	3	3	-	2	-	2	2	3
CO5	-	2	2	3	-	2	-	2	2	3

Strong (3) Medium (2) Low (1)

Dr. A.Azhagu Parvathi
Head of the Department

Dr.R.Hepzi Pramila Devamani
Course Designer


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**B.Sc. PHYSICS
(2024-2025 onwards)**

Semester II	MATHEMATICAL FOUNDATIONS - II	Hours/Week:3	
Elective Course-I		Credits:2	
Course Code 24UMTA21		Internal 25	External 75

COURSE OUTCOMES

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

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

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

CO3: find approximate solutions, establish the relation between roots and coefficients of an equation. [K2]

CO4: apply the concepts in Algebra and trigonometry in various fields. [K3]

CO5: solve problems in Vector calculus, Algebra and Trigonometry. [K3]

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 Stoke's (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 $\sin\theta$, $\cos\theta$, $\tan\theta$ 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.

Course Code 24UMTA21	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	2	2	-	-
CO2	3	1	3	2	2	1	-
CO3	3	2	3	2	2	1	-
CO4	2	2	1	2	2	-	-
CO5	3	1	1	2	2	1	-

Strong(3) Medium(2) Low(1)

Dr. M.C.Maheswari

Head of the Department

Dr. S.Kohila

Course Designer


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**B.Sc. PHYSICS AND CHEMISTRY
(2024-2025 onwards)**

Semester II	STATISTICS AND OPERATIONS RESEARCH	Hours/Week:3	
Elective Course-I		Credits:2	
Course Code 24UMTA22		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the 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: find solutions to solve the problems in the society. [K2]

CO4: calculate some statistical constants to get statistical inference and use O.R techniques to solve real life problems. [K3]

CO5: apply Correlation and Regression to draw conclusion for a given data. [K3]

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.

Course Code 24UMTA22	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	3	3	3	-
CO2	3	2	3	3	3	2	-
CO3	3	3	3	3	3	3	-
CO4	3	2	3	3	3	3	-
CO5	3	2	3	3	3	3	-

Strong(3) Medium(2) Low(1)

Dr.M.C.Maheswari

Head of the Department

Dr.P.Getchial Pon Packiavathi

Course Designer



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B.Sc. PHYSICS (2024-2025 onwards)

Semester II	PROGRAMMING IN C	Hours/Week: 2	
SEC – 2		Credits: 2	
Course Code 24UPHS21		Internal 25	External 75

COURSE OUTCOMES

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

CO 1: write the basics of 'C' fundamentals with its syntax. [K1]

CO 2: outline the syntax of arrays, structures and functions in C. [K1]

CO 3: explain the functions of operators input, output operations and control statements in C. [K2]

CO 4: describe the functions of arrays, structures and functions in C. [K2]

CO 5: write programs by applying the syntax in C language. [K3]

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

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 24UPHS21	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO
	1.a	1.b	2	3.a	3.b	4.a	4.b	5	6	7
CO 1	3	-	3	-	-	-	-	2	-	2
CO 2	3	-	3	-	-	-	-	2	-	2
CO 3	3	-	2	1	1	-	2	2	-	2
CO 4	3	3	2	2	-	-	3	2	-	2
CO 5	3	2	2	-	3	-	3	2	-	-

Strong (3) Medium (2) Low (1)

Dr.A. Azhagu Parvathi
Head of the Department

Dr.R.Hepzi Pramila Devamani
Course Designer



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B.Sc. PHYSICS (2024-2025 onwards)

Semester III	MECHANICS	Hours/Week: 5	
Core Course – 5		Credits: 5	
Course Code 24UPHC31		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain basic laws of motion, conservation of energy and momentum [K1]

CO2: derive the physical parameters and experimental methods involved in gravitation and conservation laws. [K2]

CO3: obtain the physical quantities involved in rigid body dynamics and Lagrangian mechanics. [K2]

CO4: apply basic laws/principles to simple mechanical systems in real life. [K3]

CO5: use learned concepts to solve mechanical problems. [K3]

UNIT I

FORCES AND MOTION: Mechanics-causes of motion: Force-Newton's law of motion-freely falling bodies – motion in a vertical plane-projectile motion-equilibrium of forces-frictional forces-static friction and coefficient of static friction –dynamic friction and coefficient of dynamic friction.

GRAVITATION: Newton's law of gravitation – Kepler's law of planetary motion – determination of G – Boy's experiment – density of earth – mass of the earth and sun – velocity of escape from earth– from solar system – weightlessness – relation between orbital velocity and escape velocity- satellites-orbital velocity of satellite – orbital speed and period of revolution of a satellite very close to earth-artificial satellites - gravitational field and potential - gravitational field and potential due to solid sphere – variation of g with latitude, altitude and depth. (15 hours)

UNIT II

CONSERVATION LAWS OF LINEAR AND ANGULAR MOMENTUM: Conservation of linear momentum – impulse- principle applied to a system of particles- centre of mass –

motion of velocity of centre of mass- total linear momentum about the centre of mass – equation of motion of centre of mass- collision – calculation of final velocities of colliding particles (one dimension) – systems of variable mass – Rocket – angular momentum – torque- relation between torque and angular momentum- conservation of angular momentum – examples - proton scattering by heavy nucleus. (15 hours)

UNIT III

CONSERVATION LAWS OF ENERGY: Concepts of work, power and energy- conservative forces- energy- work energy theorem- potential energy- conservative force as negative gradient of potential energy- law of conservation of mechanical energy – potential energy in an electrical field- electric potential- linear restoring force- non conservative forces. (15 hours)

UNIT IV

RIGID BODY DYNAMICS: Translational and rotational motion –angular impulse - moment of inertia – general theorems of moment of inertia – moment of inertia of a circular ring, circular disc, cylinder, hollow cylinder, solid sphere, –rotation about fixed axis – kinetic energy of rotation – examples – body rolling along a plane surface – body rolling down in inclined plane (15 hours)

UNIT V

LAGRANGIAN MECHANICS: Generalized coordinates –degrees of freedom – constraints - principle of virtual work and D’ Alembert’s Principle – Lagrange’s equation from D’ Alembert’s principle – application –simple pendulum – Atwood’s machine – compound pendulum. (15hours)

SELF STUDY

Weightlessness - proton scattering by heavy nucleus - moment of inertia of hollow cylinder - Atwood’s machine

TEXT BOOKS

1. Murugesan, R.,(2018). *Properties of matter*, S.Chand and Company Limited, New Delhi.
2. Mathur, D. S., and Hemne, P. S. (2000). *Mechanics*, Revised Edition, S.Chand and Co.
3. DuraiPandian, P., LaxmiDuraiPandian and Muthamizh Jaya pragasam, (2005). *Mechanics*, 6th revised edition, S.Chand and Co.
4. Upadhyaya, J.C., (2019). *Classical Mechanics*, Himalaya Publishing house, Mumbai.

5. Shukla R. K .Anchal Srivastava(2006), *Mechanics*, New age International Publishers, New Delhi.

REFERENCEBOOKS

1. Goldstein Herbert, (1980). *Classical Mechanics*. U.S.A: Addison and Wesley.
2. Halliday, David and Robert, Resnick, (1995). *Physics Vol.I*. New Age, International, Chennai.
3. Halliday, David Robert Resnick and Walker Jearl, (2001). *Fundamentals of Physics*, John Wiley, New Delhi.

WEB RESOURCES

1. https://youtu.be/X4_K-XLUIB4
2. <https://www.youtube.com/watch?v=p075LPq3Eas>
3. https://www.youtube.com/watch?v=mH_pS6fruyg
4. <https://www.youtube.com/watch?v=tdkFc88Fw-M>

Course Code 24UPHC31	PO1		PO2	PO 3		PO4		PO 5	PO 6	PO 7
	PSO 1. a	PSO 1. b	PSO2	PSO 3. a	PSO 3. b	PSO 4. a	PSO 4. b	PSO 5	PSO 6	PSO 7
CO1	3	-	3	-	-	-	-	3	-	2
CO2	3	-	3	-	3	3	-	-	-	-
CO3	3	3	2	2	2	3	3	-	-	-
CO4	3	3	2	3	-	2	-	2	-	2
CO5	3	-	2	-	2	-	-	2	-	1

Strong (3) Medium (2) Low (1)

Dr.A.Azhagu Parvathi
Head of the Department

Dr.A.Azhagu Parvathi
Course Designer



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B.Sc. PHYSICS (2024-2025 onwards)

Semester III	ELECTRICITY PRACTICAL	Hours/Week: 3	
Core Course – 6 Practical - III		Credits: 2	
Course Code 24UPHC31P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the theoretical concepts in Electricity and formulate the experimental procedure. [K2]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required physical parameters. [K2]

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: check/verify the accuracy of the result against standard value and to test whether the principles of the experiment are understood. [K3]

List of Practical's (Any Eight of the below list)

1. Calibration of low range voltmeter using potentiometer.
2. Calibration of high range voltmeter using potentiometer.
3. Calibration of ammeter using potentiometer.
4. Measurement of resistance using potentiometer.
5. Determination of capacitance using Desauty's bridge.
6. Comparison of EMF of two cells using spot galvanometer.
7. Comparison of capacitance of two capacitors using spot galvanometer.
8. Determination of resistance and specific resistance using Carey Foster's bridge.
9. Determination of e.m.f of thermo couple using potentiometer.
10. Determination of internal resistance of a cell using potentiometer.

Course Code 24UPHC31P	PO1		PO2	PO 3		PO4		PO 5	PO 6	PO 7
	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	3	-	3	1	-	1	-	-	-	2
CO2	3	3	3	2	2	2	-	-	-	1
CO3	-	3	3	3	-	3	-	2	3	3
CO4	-	3	3	3	-	2	-	2	2	3
CO5	-	2	2	2	-	2	-	2	2	3

Strong (3) Medium (2) Low (1)

Dr.A.Azhagu Parvathi
Head of the Department

Dr.M.Sankareswari
Course Designer



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VIRUDHUNAGAR

Quality Education with Wisdom and Values

B.Sc. PHYSICS (2024-2025 onwards)

Semester III	BASIC ELECTRONICS	Hours/Week: 4	
Elective Course -II		Credits: 3	
Course Code 24UEIA31		Internal 25	External 75

COURSE OUTCOMES

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

CO1: list the types of active & passive elements, biasing methods, network theorems and identify the configuration of semiconducting devices & power supplies. [K1]

CO2: explain the function and characteristics of active & passive elements and power supplies. [K2]

CO3: describe various biasing methods, filter circuits and power supplies. [K2]

CO4: use electronic components to construct rectifiers and regulators. [K3]

CO5: apply network theorems to simplify electronic circuits and use the learnt concept to solve simple problems in capacitance and transistors. [K3]

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 - capacitors in Series — capacitors in Parallel — energy stored in a capacitor. (12 Hours)

UNIT II

Semiconducting Devices:

Energy bands in solids – valances and conduction band - types of semiconductors - intrinsic, extrinsic semiconductors - PN junction diode - construction, working, V-I - characteristics -

Zener diode – Tunnel diode - Photo diode - L D R - Rectifiers - half wave rectifier - full wave rectifier - bridge rectifier - clipping circuits - filters - π filters - LC-filter.

(12 Hours)

UNIT III

Transistor and Transistor Biasing:

Transistor - Transistor action- transistor connections - 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-

Transistor as amplifier.

(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

Power Supplies:

Introduction – unregulated power supply – Regulated Power Supply – IC Regulated Power supply - Zener voltage regulator – three terminal regulated power supplies – study of IC 7800 and 7900 series – LM 317 – IC 723 Voltage regulator.

(12 Hours)

TEXT BOOKS

1. Theraja, B.L. (2014). *Basic Electronics*, New Delhi: S.Chand & Company Ltd.
2. Mehta, V. K. & Rohit Mehta (2022). *Principles of Electronics*, New Delhi: S.Chand & Company Ltd.

REFERENCE BOOKS

1. Albert Malvino, David Bates, Patrick Hoppe, (2021) *Electronic Principles*, Mc Graw Hill Publications Pvt Ltd.
2. Walter Banzhaf, (2010) *Understanding Basic Electronics*, ARRL Publishing Pvt Ltd.

Course Code 24UEIA31	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	3	-	3	1	-	1	-	-	-	-
CO 2	3	-	3	-	2	2	1	-	-	2
CO 3	3	2	3	2	-	1	-	2	-	2
CO 4	3	-	2	-	3	3	-	-	-	-
CO 5	3	-	2	-	3	3	-	3	-	-

Strong (3) Medium (2) Low (1)

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B.Sc. PHYSICS

(2024-2025 onwards)

Semester III	APPLIED ELECTRONICS AND INSTRUMENTATION PRACTICAL- I	Hours/Week: 2	
Elective Course II Practical – I		Credits: 1	
Course Code 24UEIA31P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the theoretical concepts in Electronics and formulate the experimental procedure. [K2]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required parameters. [K2]

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: check/verify the accuracy of the result against standard value and to test whether the principles of the experiment are understood. [K3]

List of Practicals: (Any Seven)

1. Characteristics of Zener diode
2. Half wave and full wave rectifiers using diodes
3. Bridge rectifier using diodes
4. Clipping Circuits
5. Verification of Kirchhoff's laws
6. Characteristics of p-n junction diode
7. Low Pass and High Pass Filters using Passive Components

Course Code 24UEIA31P	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	3	3	3	1	-	1	-	3	-	2
CO 2	-	3	3	2	2	2	2	-	-	-
CO 3	-	3	3	3	-	2	2	-	3	2
CO 4	-	3	3	3	2	2	1	-	-	2
CO 5	-	3	2	3	2	2	2	2	2	2

Strong (3) Medium (2) Low (1)

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(2024-2025 onwards)

Semester III	ARDUINO PROGRAMMING PRACTICAL	Hours/Week: 1
SEC - 3		Credits: 1
Course Code 24UPHS31P		Internal 100

COURSE OUTCOMES

CO1: identify syntax, inbuilt functions and statements used in Arduino programs. [K2]

CO2: write simple Arduino programs. [K2]

CO3: construct relevant electronic circuits using Arduino. [K3]

CO4: verify the operation of the constructed circuits by simulation. [K3]

CO5: acquire Arduino programming skills and entrepreneurial skills. [K3]

List of Practical's:

1. Blink an LED
2. Soil Moisture Tester using moisture Sensor
3. Night Lamp using LDR sensor
4. LCD Display
5. Control LED brightness using potentiometer
6. Tone melody using piezo buzzer
7. Sweep a servo through its full range of motion using servo motor

Course Code 24UPHS31P	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	3	3	3	-	-	-	1	-	-	2
CO 2	-	3	3	2	-	2	-	-	-	1
CO 3	-	3	3	3	-	2	-	1	3	-
CO 4	-	3	2	3	3	2	-	1	2	-
CO 5	-	3	2	3	3	3	2	2	2	-

Strong (3) Medium (2) Low (1)

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B.Sc. PHYSICS

(2024-2025 onwards)

Semester III	NUMERICAL METHODS	Hours/Week: 2	
SEC – 4		Credits: 2	
Course Code 24UPHS32		Internal 25	External 75

COURSE OUTCOMES

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

CO1: identify formulas/techniques involved in numerical methods. [K1]

CO2: explain basic principles of numerical methods. [K1]

CO3: deduce the mathematical relations involved in iteration, interpolation, curve fitting, numerical integration. [K2]

CO4: derive the mathematical formulas used in solving simultaneous equations and differential equations. [K2]

CO5: apply the numerical methods to solve problems. [K3]

UNIT I

Algebraic and Transcendental Equations: Introduction -Bisection method - Newton Raphson method.

Simultaneous Equations: Introduction - Simultaneous equations – Back Substitution - Gauss elimination method. (6 hours)

UNIT II

Interpolation: Introduction - Newton's interpolation formulae - Lagrange's interpolation formula - Divided differences. (6 hours)

UNIT III

Curve fitting: Introduction - Method of least squares - Fitting a straight line - Fitting an exponential curve. (6 hours)

UNIT IV

Numerical Integration: Introduction - Newton Cote's Quadrature Formula - Trapezoidal Rule - Simpson's one third rule - Simpson's three eight rule. (6 hours)

UNIT V

Numerical Solutions of Ordinary Differential Equation: Euler's method - Modified Euler's method - Runge kutta second order method - Runge kutta fourth order method. (6 hours)

TEXT BOOK

Arumugam, S. Thangapandi Isaac, A. and Somasundaram, A. (2015). *Numerical Methods*, Scitech Publications (India) Pvt. Ltd.,

REFERENCE BOOKS

1. Singaravelu, A., *Numerical Methods* (2016), Meenakshi Agency.
2. Kandasamy, P. Thilagavathy, K., Gunavathi, K., *Numerical Methods* (20218), S.Chand & Company LTD.
3. Venkataraman, M.K., *Numerical Methods in Science and Engineering*, (2013), The National Publishing Company.

Course Code 24UPHS32	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	3	-	3	-	-	-	-	-	-	2
CO 2	3	2	3	2	2	2	-	-	-	-
CO 3	3	2	3	3	2	2	2	-	-	-
CO 4	3	1	2	-	3	3	3	-	1	-
CO 5	3	2	2	-	3	3	3	3	1	-

Strong (3) Medium (2) Low (1)

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B.Sc. PHYSICS

(2024-2025 onwards)

Semester IV	OPTICS AND LASER PHYSICS	Hours/Week: 4	
Core Course - 7		Credits: 4	
Course Code 24UPHC41		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 lasers. [K1]

CO2: derive the physical parameters related to geometrical, physical optics and laser. [K2]

CO3: discuss experimental methods related to geometrical & physical optics and working of different lasers [K2]

CO4: apply the phenomena in geometrical and physical optics to real life situations. [K3]

CO5: apply the learned concepts to solve problems in optics. [K3]

UNIT I

LENS AND PRISMS: Fermat's principle of least time – Fermat's principle of law of reflection and refraction – refraction through thick and thin lenses – focal length, power and cardinal points– narrow angled prisms.

aberrations - spherical aberration in a lens– conditions for minimizing spherical aberration of two thin lens separated by a distance – chromatic aberrations in a lens– condition for a chromatism of two thin lenses placed in contact - dispersion - achromatism in prism- dispersion without deviation – direct vision spectroscope –eyepiece – Huygen's eye – piece. (12 Hours)

UNIT II

INTERFERENCE: division of wave front, Fresnel's biprism – fringes with white light – division of amplitude: interference in thin films due to, (i) reflected light, (ii) transmitted light – colours of thin films applications – air wedge – Newton's rings.

Interferometers: Michelson's interferometer – applications, (i) determination of the wavelength of a monochromatic source of light, (ii) determination of the wavelength and separation D_1 and D_2 lines of sodium light, (iii) determination of a thickness of a mica sheet.

(12 Hours)

UNIT III

DIFFRACTION: Fresnel's assumptions – zone plate – action of zone plate for an incident spherical wave front – differences between a zone plate and a convex lens – Fresnel type of diffraction – diffraction pattern due to a straight edge – positions of maximum and minimum intensities – Fraunhofer type of diffraction – plane diffraction grating – experiment to determine wavelengths – width of principal maxima

RESOLVING POWER: Rayleigh's criterion for resolution – limit of resolution for the eye – resolving power of, Prism and grating.

(12 Hours)

UNIT IV

POLARISATION: optical activity – optically active crystals – polarizer and analyser – double refraction – optic axis, principal plane – Huygens's explanation of double refraction in uniaxial crystals – polaroids and applications – circularly and elliptically polarized light – quarter wave plate – half wave plate – production and detection of circularly and elliptically polarized lights – Fresnel's explanation – specific rotation – Laurent half shade polarimeter – experiment to determine specific rotatory power.

(12 Hours)

UNIT V

LASERS: general principles of lasers – properties of lasers action – spontaneous and stimulated emission – population inversion – optical pumping – He-Ne laser (principle and working) – CO_2 laser (principle and working) semiconductor laser – laser applications – principle of holography – recording of the hologram – reconstruction of the image – holography and photography – Applications of holography.

(12 Hours)

SELF STUDY

direct vision spectroscope – resolving power – prism – polaroids and applications - holography

TEXT BOOKS

1. Murugesan, R & Kiruthiga Sivaprasath, (2014) . *Optics and Spectroscopy*, 17th Revised Edition, New Delhi: S.Chand & Company Pvt Ltd
2. Subramaniam, N and Brijlal, (2014). *Optics*, 25th Ed, S. Chand and Co.

REFERENCE BOOKS

1. Ajoy Ghatak (2005). *Optics*, 3rd Edition, New Delhi: McGraw Hill Company.
2. Jenkins A. Francis and White. (2011), *Fundamentals of Optics*, 4th edition, McGraw Hill Inc., New Delhi
3. Sasikumar, P.R. (2012). *Photonics*, PHI Pvt Ltd, New Delhi.

WEB RESOURCES

1. <https://science.nasa.gov/ems/>
2. https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UIGkb-8Pr6svxWo-LA&start_radio=1&dt=2472
3. <https://science.nasa.gov/ems/>
4. <https://imagine.gsfc.nasa.gov/educators/gammaraybursts/imagine/index.html>
5. <http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/>

Course Code 24UPHC41	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	3	-	3	-	-	-	-	3	-	3
CO 2	3	-	3	2	-	2	2	-	-	3
CO 3	3	3	3	1	3	3	-	-	-	-
CO 4	3	-	2	2	3	3	1	2	-	-
CO 5	3	2	2	3	3	3	3	3	-	1

Strong (3) Medium (2) Low (1)

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B.Sc. PHYSICS (2024-2025 onwards)

Semester IV	OPTICS PRACTICAL	Hours/Week: 3	
Core Course - 8 Practical IV		Credits: 2	
Course Code 24UPHC41P		Internal 40	External 60

COURSE OUTCOMES

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

- CO1: understand the theoretical concepts in light experiments and formulate the experimental procedure. [K2]
- CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required physical parameters. [K2]
- 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: check/verify the accuracy of the result against standard value and to test whether the principles of the experiment are understood. [K3]

List of Experiments: Any Eight

1. Determination of refractive index of prism using spectrometer
2. Determination of refractive index of liquid using hollow prism and spectrometer
3. Determination of dispersive power of a prism
4. Determination of radius of curvature of lens by forming Newton's rings
5. Determination of thickness of a wire using air wedge
6. Determination of refractive index of a given liquid by forming liquid lens
7. Determination of width of rectangular aperture and thickness of wire using Laser

8. Laser Diffraction – Determination of Number of lines per cm on Grating and size of lycopodium powder
9. Determination of refractive index of liquid using Laser

Course Code 24UPHC41P	PO1		PO2	PO 3		PO4		PO 5	PO 6	PO 7
	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	3	-	3	1	-	1	-	-	-	2
CO2	3	3	3	2	2	2	-	-	-	1
CO3	-	3	3	3	-	3	-	2	3	3
CO4	-	3	3	3	-	2	-	2	2	3
CO5	-	2	2	2	-	2	-	2	2	3

Strong (3) Medium (2) Low (1)

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B.Sc. PHYSICS (2024-2025 onwards)

Semester IV	ELECTRONIC DEVICES AND INSTRUMENTATION	Hours/Week: 4	
Elective Course –II		Credits: 3	
Course Code 24UEIA41		Internal 25	External 75

COURSE OUTCOMES

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

CO1: identify the principles and concepts of electronic devices and instruments [K1]

CO2: explain the electronic instruments, functions of CRO, semiconducting devices and bio medical devices. [K2]

CO3: describe the construction and working of biopotential recorders and different types of transducers. [K2]

CO4: apply physics principles to construct different types of electrical and electronic instruments and transducers. [K3]

CO5: illustrate applications of CRO, semiconducting devices, biomedical devices and instruments. [K3]

UNIT I

ELECTRICAL AND ELECTRONIC INSTRUMENTS:

Moving iron attraction type instruments-moving iron repulsion type instrument-radial vane repulsion type instrument - torque equation for moving iron instruments-advantages-disadvantages - basic DC Ammeter - ammeter-requirements - DC Voltmeter - single phase energy meter-calibration of an energy meter-advantages-disadvantages-digital voltmeters-advantages of digital voltmeters-performance parameters of digital voltmeters-basic block diagram of DVM-electronic multimeter - magnetic measurements - fluxmeter - measurement of flux density-theory of flux density measurement. (12 Hours)

UNIT II

CATHODE RAY 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.

SEMICONDUCTOR DEVICES: construction, working, operation and applications of SCR and UJT. (12 Hours)

UNIT III

PHYSIOLOGICAL ASSIST DEVICES

Pacemakers - Energy required to excite heart muscle - methods of simulation - Pacemaker batteries - Mercury cells, lithium cells - Artificial heart valve - Defibrillators - internal defibrillators - external defibrillator (AC and DC defibrillator) Heart lung machine.

(12 Hours)

UNIT IV

BIO POTENTIAL RECORDERS: Characteristics of the recording system, Electrocardiography - Electroencephalography – Electromyography - Electroretinography, Electrooculography.

(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.
2. Dr.M.Arumugam, (2014), *Biomedical Instrumentation*, Anuradha Publications, Sankar Printers Pvt Ltd.
3. Mehta, V.K. (2006). *Principles of Electronics*, S.Chand & Company Ltd. Unit II

REFERENCE BOOKS

1. Leslie Cromwell, Fred Weibell, Erich Pfeiffer (2002) *Biomedical Instrumentation and Measurements* Prentice Hall of India, New Delhi.

2. Khandpur, R. S. (2003). Handbook of *Biomedical Instrumentation* 2ndEdn. Tata McGraw Hill, New Delhi.
3. Kuppasamy Thayalan (2017), *Basic Radiological Physics* 2nd Edn. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.
4. Theraja, B.L. (2014). *Basic Electronics Solid State*, Revised Edition, S.Chand & Company Ltd.
5. Ubald Raj, A., & Jose Robin, G. (1997). *Basic Electronics*, Edition, Indira Publications.
6. Sedha, R.S. (2008). *A Text book of Applied Electronics*, Revised Edition, S.Chand & Company Ltd.

Course Code 24UEIA41	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	3	-	3	-	-	2	-	-	-	2
CO 2	3	2	3	2	2	2	-	-	-	-
CO 3	3	2	3	3	2	2	2	-	-	-
CO 4	3	1	2	2	3	3	3	3	-	-
CO 5	3	2	2	2	3	3	3	3	-	-

Strong (3) Medium (2) Low (1)

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B.Sc. PHYSICS

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Semester IV	APPLIED ELECTRONICS AND INSTRUMENTATION PRACTICAL –II	Hours/Week: 2	
Elective Course – II Practical -II		Credit: 1	
Course Code 24UEIA41P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the theoretical concepts in Electronics and formulate the experimental procedure. [K2]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required parameters. [K2]

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: check/verify the accuracy of the result against standard value and to test whether the principles of the experiment are understood. [K3]

List of Practicals: (Any Seven)

1. Measurement of R, L and C using multimeter
2. IC regulated power supply (5 V)
3. UJT characteristics
4. Thermistor characteristics
5. Logic gates using discrete components
6. Transistor emitter follower
7. Integrator and differentiator using discrete components
8. Verification of Norton's theorem

Course Code 24UEIA41P	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	3	3	3	2	2	2	-	3	-	2
CO 2	-	3	3	2	2	3	2	-	-	-
CO 3	-	3	3	3	-	2	2	-	3	2
CO 4	-	3	2	3	2	2	1	-	-	2
CO 5	-	3	2	3	2	2	2	2	2	2

Strong (3) Medium (2) Low (1)

Dr.A.Azhagu Parvathi
Head of the Department

Dr.I.Rathinamala
Course Designer



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VIRUDHUNAGAR

Quality Education with Wisdom and Values

B.Sc. PHYSICS (2024-2025 onwards)

Semester IV	SOLAR ENERGY	Hours/Week: 2	
SEC – 5		Credits: 2	
Course Code 24UPHS41		Internal 25	External 75

COURSE OUTCOMES

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

CO1: understand the basics of solar energy, solar thermal system, solar cells and solar PV panels [K1]

CO2: explain the concepts of non-conventional energy, principles and types of solar thermal gadgets and solar cells [K1]

CO3: discuss the construction and working of solar thermal gadgets [K2]

CO4: describe the construction and working of PV cell and module [K2]

CO5: apply the learned concepts to calculate the efficiency of solar thermal devices and reveal the applications of PV module [K3]

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 - 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 - cell size - energy payback period (EPP) – solar cell classification - on the basis of thickness of active material - on the basis 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*, Second Edition: Tata McGraw-Hill Education Private Limited, New Delhi.

REFERENCE BOOKS

1. Rai, G.D. (2004). *Solar Energy Utilization*, Delhi: Khanna Publications.
2. Sukhatme, S.P. (2017). *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 24UPHS41	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	3	-	2	-	-	2	-	-	-	1
CO 2	3	-	3	3	2	2	-	-	-	-
CO 3	3	2	3	3	2	2	2	-	-	-
CO 4	3	-	2	2	3	3	3	-	1	-
CO 5	3	2	2	2	3	3	3	3	1	-

Strong (3) Medium (2) Low (1)

Dr.A.Azhagu Parvathi
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B.Sc. PHYSICS

(2024-2025 onwards)

Semester IV	PROGRAMMING IN C PRACTICAL	Hours/Week: 2	
SEC – 6		Credits: 2	
Course Code 24UPHS42P		Internal 40	External 60

COURSE OUTCOMES

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

- CO1 : understand the C language to solve the problems in physics using control statements and arrays. [K2]
- CO2 : write the C Program using C fundamentals, input & output operations, control statements and arrays. [K2]
- 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 : check/verify the accuracy of the result against standard value and to test whether the principles of the experiment are understood. [K3]

List of Practical (Any Eight)

1. Calculation of the amount of work done in twisting a wire
2. Calculation of time period of oscillations of a compound pendulum.
3. Determination of mass from relativistic equation $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$
4. Calculation of radius of curvature of lens by Newton's rings
5. Calculation of resonance frequency of LCR circuit
6. Finding the roots of equation by Bisection method
7. Finding the roots of equation by Newton Raphson method

8. Finding the solution of numerical integration by Trapezoidal rule
9. Finding the solution of numerical integration by Runge Kutta II order method
10. Finding the solution of numerical integration by Runge Kutta IV order method

Course Code 24UPHS42P	PO1		PO2	PO 3		PO4		PO 5	PO 6	PO 7
	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	3	-	2	3	-	2	-	-	-	2
CO2	-	3	3	3	2	2	-	-	-	1
CO3	-	3	3	3	-	3	-	2	3	3
CO4	-	3	3	3	-	2	-	2	2	3
CO5	-	2	2	2	-	2	-	2	2	3

Strong (3) Medium (2) Low (1)

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B.Sc. PHYSICS

(2024-2025 onwards)

Semester V	ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM	Hours/Week: 6	
Core Course - 9		Credits: 6	
Course Code 24UPHC51		Internal 25	External 75

COURSE OUTCOMES

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

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

CO2: discuss the theories and experiments related to thermoelectricity, magnetism and electromagnetism. [K2]

CO3: derive the physical parameters related to magnetic effects of current, transient & AC and electromagnetic waves. [K2]

CO4: apply the learnt concepts to study magnetic induction in various coils, LCR circuits, properties of electromagnetic waves through various medium, determination of capacitance in various capacitors. [K3]

CO5: apply the learnt concepts to solve problems in electricity, magnetism and electromagnetism. [K3]

UNIT I

Capacitors and Thermo-electricity: Capacitor - principle - capacitance of a parallel plate capacitor (with and without dielectric slab) - spherical capacitor (outer sphere earthed) – cylindrical capacitor - effect of dielectric - Carey Foster bridge - temperature coefficient of resistance - Seebeck effect - laws of thermo emf - measurement of thermo emf using potentiometer - Peltier effect - Thomson effect - determination of Peltier and Thomson coefficients - thermoelectric diagrams – uses of thermoelectric diagrams. (18 hours)

UNIT II

Magnetic Effects of Current: Introduction - Biot and Savart's law - magnetic induction due to circular coil - magnetic induction due to solenoid - Ampere's circuital law - differential

form - divergence of magnetic field - magnetic induction due to toroid - force on a current element by magnetic field - force between two infinitely long conductors - torque on a current loop in a field - moving coil galvanometer - damping correction. (18 hours)

UNIT III

Magnetism and Electromagnetic Induction: Magnetic induction B - magnetization M - relation between B , H and M – magnetic susceptibility - magnetic permeability - experiment to draw B - H curve - energy loss due to hysteresis - importance of hysteresis curves - Faraday and Lenz laws - vector form - self-induction - coefficient of self-inductance of solenoid - Anderson's method - mutual induction - coefficient of mutual inductance between two coaxial solenoids - coefficient of coupling – transformer. (18 hours)

UNIT IV

Transient and Alternating Currents: Growth and decay of current in a circuit containing resistance and inductance - growth and decay of charge in a circuit containing resistance and capacitor - emf induced in a coil rotating in a magnetic field - peak, average and rms values of ac - LCR series and parallel circuits - resonance condition - Q factor - power factor – choke coil. (18 hours)

UNIT V

Maxwells Equations and Electromagnetic Waves: Introduction - displacement current - Maxwell's equations in vacuum, material media - physical significance of Maxwell's equations - plane electromagnetic waves in free space - velocity of light - Poynting vector - electromagnetic waves through homogenous, isotropic media - refractive index. (18 hours)

Self-Study: Demonstration: Peltier effect - Thomson effect

TEXT BOOKS

Murugesan, R., (2017) *Electricity and Magnetism*, 10th Edition, S.Chand and Co, New Delhi.

REFERENCE BOOKS

1. Sehgal, D.L., Chopra, K.L, and Sehgal N.K., (2020) *Electricity and Magnetism*, Sultan Chand and Sons, New Delhi.
2. Brijlal and Subramanian, *Electricity and Magnetism* (1966) 6th Edition, Ratanand Prakash, Agra.
3. Halliday, D., Resnik R., and Walker, J., (2001) *Fundamentals of Physics*, 6th Edition, Wiley, New York.

Course Code 24UPHC51	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	3	-	3	1	-	1	-	-	-	3
CO 2	3	2	3	2	-	-	-	-	2	-
CO 3	3	3	3	-	2	2	-	2	-	3
CO 4	3	3	3	3	-	2	-	3	-	-
CO 5	3	-	2	-	3	3	2	-	-	-

Strong (3) Medium (2) Low (1)

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B.Sc. PHYSICS

(2024-2025 onwards)

Semester V	ATOMIC AND NUCLEAR PHYSICS	Hours/Week: 5	
Core Course - 10		Credits: 5	
Course Code 24UPHC52		Internal 25	External 75

COURSE OUTCOMES

CO1: explain the basics of atom models, spectral lines and notations, nuclear decay, types of nuclear reactions and classification of elementary particles. [K1]

CO2: describe experimental methods to determine related parameters in atomic and nuclear physics. [K2]

CO3: discuss the theory related to atom models & atomic spectra, radioactive decay, elementary particles and energy involved in nuclear reactions. [K2]

CO4: illustrate the operations of nuclear reactors, particle detectors & accelerators, study of elementary particles and applications of radioisotopes. [K3]

CO5: apply the learnt concepts to solve problems in atomic quantisation, atomic spectra, radioactivity and nuclear reactions. [K3]

UNIT I

Vector Atom Model: Introduction to atom model - Bohr atom model - Determination of radius of nth orbit - drawback of Bohr atom model - Sommerfeld's relativistic atom model - vector atom model - electron spin - spatial quantisation - quantum numbers associated with vector atom model - L-S and J-J coupling - Pauli's exclusion principle - periodic classification of elements - electronic configuration of elements - magnetic dipole moment due to orbital motion and spin motion of the electron - Bohr magneton - Stern-Gerlach experiment. (15 hours)

UNIT II

Atomic Spectra: Excitation and ionization potentials - atomic excitation - Davis and Goucher's method - optical spectra - spectral terms and notations - fine structure of sodium D-lines - fine structure of H α lines - Zeeman effect - Larmor's theorem - quantum

mechanical explanation of normal Zeeman effect - anomalous Zeeman effect - Paschen-Back effect - Stark effect. (15 hours)

UNIT III

Radioactivity: Natural radio activity - properties of alpha rays, beta rays and gamma rays - range of alpha particles - experimental measurement of range of alpha particles - Geiger-Nuttall experiment - alpha particle spectra - theory of alpha decay - Gamow's theory of alpha decay - beta ray spectra - neutrino theory of beta decay – determination of the wavelength of gamma rays - origin of gamma rays - nuclear isomerism - internal conversion - fundamental laws of radio activity - law of radioactive disintegration - the mean life. (15 hours)

UNIT IV

Nuclear Reactions: Discovery of artificial transmutation - Q-value equation for a nuclear reaction - threshold energy - types of nuclear reactions - conservation laws of nuclear reaction - artificial radio activity – discovery - preparation of radio elements - application of radio isotopes - the discovery of neutron - classification of neutrons - nuclear fission - energy released in fission - chain reaction - atom bomb - nuclear reactor - nuclear fusion - sources of stellar energy - thermo nuclear reaction. (15 hours)

UNIT V

Nuclear Instrumentation and Elementary Particles: Wilson cloud chamber - bubble chamber - cyclotron - synchro cyclotron - classification of elementary particles - particles and Anti-particles - antimatter - fundamental interactions - discovery of cosmic rays - latitude effect - azimuth effect - altitude effect - primary and secondary cosmic rays - cosmic ray showers - Van Allen belts - origin of cosmic rays. (15 hours)

Self-Study: Determination of the wavelength of gamma rays - origin of gamma rays - nuclear isomerism - internal conversion

TEXT BOOK

Murugesan. R, (2017) *Modern Physics*, 18th edition, S. Chand and Co, New Delhi.

REFERENCE BOOKS

1. Sehgal, Chopra and Sehgal (2013), *Modern Physics*, 9th Edition, Sultan Chand & Sons, New Delhi
2. Arthur Beiser, Shobhit Mahajan and Rai Choudhury.S (2015), *Concepts of Modern Physics*, 7th Edition, McGraw Hill Education (India) Private Limited.
3. Tayal, D.C (2021), *Nuclear Physics*, 5th Edition, Himalaya Publishing House Private Limited, Mumbai.

Course Code 24UPHC52	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	3	-	3	-	2	1	-	1	-	2
CO2	3	1	2	2	-	2	2	-	1	3
CO3	3	-	2	1	3	3	2	-	-	-
CO4	3	-	2	1	3	3	1	1	-	-
CO5	3	-	3	2	3	3	3	3	-	3

Strong (3)

Medium (2)

Low (1)

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B.Sc. PHYSICS

(2024-2025 onwards)

Semester V	ANALOG AND COMMUNICATION ELECTRONICS	Hours/Week: 5	
Core Course - 11		Credits: 4	
Course Code 24UPHC53		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the characteristics of semiconducting devices, amplifiers, oscillators, and principles of modulation techniques. [K1]

CO2: discuss the operations of FET, transistor circuits, amplifiers & power supplies and condition of oscillators. [K2]

CO3: explain the different types of modulation techniques and working of operational amplifiers in inverting and non-inverting amplifier. [K2]

CO4: illustrate the applications of FET and transistor as amplifiers and oscillators. [K3]

CO5: demonstrate the applications of operational amplifiers and modulation/demodulation circuits. [K3]

UNIT I

Transistor Amplifiers: transistor configurations: CB, CE CC modes – I-V characteristics – DC load line – Q point self-bias – RC coupled CE amplifier – direct coupled amplifier – transformer coupled amplifier – power amplifiers – classification of power amplifiers: A, B, C – push pull amplifiers – tuned amplifiers. (15 Hours)

UNIT II

Transistor Oscillators: feedback amplifier - principle of feedback, positive and negative feedback of voltage and current gain, advantages of negative feedback - Barkhausen's criterion - Transistor oscillators: Hartely, Colpitt, Phase shift oscillators with mathematical analysis.

UNIT III

Field Effect Transistor: FET – junction FET – static characteristics of JFET – DC biasing of a JFET – common source JFET amplifier – advantages of FET – MOSFET – DE MOSFET - static characteristics of DE MOSFET – enhancement-only N-channel MOSFET – FET as switches – FET applications. (15 Hours)

UNIT IV

Operational Amplifiers: differential amplifiers – OPAMP characteristics –IC 741 pin configuration – inverting and non-inverting amplifiers – unity follower –summing and difference amplifiers – differentiator and integrator – astable multivibrator (square wave generator) – monostable multivibrator. (15 Hours)

UNIT V

Modulation and Demodulation: theory of amplitude modulation - frequency modulation – comparison of AM and FM – phase modulation – sampling theorem – pulse width modulation – demodulation: AM and FM detection - Super heterodyne receiver (block diagram). (15 Hours)

Self-Study: FET as switches, FET applications, Colpitt oscillator.

TEXT BOOKS

1. Theraja, B.L., (2022). *Basic Electronics Solid State*, S.Chand & Company Limited, New Delhi
2. Jose Robin, G & Ubald Raj,A. (2014). *Basic Electronics*, Marthandam: Indra Publication.
3. Mehta, V.K. & Rohit Mehta. (2019).*Principles of Electronics*. S. Chand & Company Ltd, New Delhi
4. Sedha, R.S. (2019). *A Text Book of Applied Electronics*, S.Chand & Company Ltd. New Delhi

REFERENCE BOOKS

1. Albert Malvino, David Bates, Patrick Hoppe, (2021) *Electronic Principles*, Mc Graw Hill Publications Pvt Ltd.
2. Vijayendran, V., (2009) *Integrated Electronics*, S.Vishwanathan Publishers, Chennai.

Course Code 24UPHC53	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	3	-	2	-	2	1	-	3	-	2
CO 2	3	3	3	3	1	2	2	-	-	3
CO 3	3	-	2	2	3	3	1	-	-	-
CO 4	3	2	2	3	3	3	3	3	-	1
CO 5	3	1	2	2	2	3	2	3	2	1

Strong (3) Medium (2) Low (1)

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(2024 -2025 onwards)

Semester V	GENERAL PHYSICS PRACTICAL - I	Hours/Week: 3	
Core Course – 12 Practical V		Credits: 2	
Course Code 24UPHC51P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the theoretical concepts in Electric, Electromagnetism and Optics, and formulate the experimental procedure. [K2]

CO2: draw the circuit diagram / experimental set up with tabular column and write the formula to calculate the required parameters. [K2]

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 and complete the record work. [K3]

CO5: check/verify the accuracy of the result against standard value and to test whether the principles of the experiment are understood [K3]

List of Experiments: (Any Eight)

1. Spectrometer – Grating - Normal Incidence – Wavelength of mercury spectral lines
2. Determination of Refractive Index of a small angled prism by spectrometer
3. Determination of ece of copper using copper voltameter
4. E.M.F. of a thermocouple by spot reflecting galvanometer
5. Determination of Planck's constant
6. Comparison of Mutual Inductances by spot reflecting galvanometer
7. i – d curve by spectrometer
8. Cauchy's constants by spectrometer
9. L.C.R. Series Resonance Circuit
10. Self Inductance of the given coil by Anderson's bridge

Course Code 24UPHC51P	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	3	3	3	1	-	1	-	3	-	2
CO 2	-	3	3	2	2	2	2	-	-	-
CO 3	-	3	3	3	-	2	2	-	3	2
CO 4	-	3	3	3	2	2	1	-	-	2
CO 5	-	3	2	3	2	2	2	2	2	2

Strong (3) Medium (2) Low (1)

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Semester V	PROJECT	Hours/Week: 1
Core Course - 13		Credits: 1
Course Code 24UPHC54PR		Internal 100

COURSE OUTCOMES

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

CO1: understand the concepts to select projects related to Physics, Electronics and related interdisciplinary fields. [K2]

CO2: apply the theoretical knowledge to construct the circuit /experimental set up /theoretical model 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: relate the accuracy of the results with the theoretical standards and communicate academic and technical knowledge orally. [K3]

CO5: assess the project to meet the challenges at higher education level /societal level. [K4]

Students are expected to select a project in the field of Physics, Electronics and related interdisciplinary fields.

Projects can be done individually or in a group of two students. Minimum pages for Project report should be 20 pages.

Two typed copies of the report on the completed project must 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 24UPHC54PR	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO
	1.a	1.b	2	3.a	3.b	4.a	4.b	5	6	7
CO 1	3	2	-	2	2	2	-	3	-	3
CO 2	3	3	2	3	3	2	3	3	3	3
CO 3	3	3	3	2	3	3	3	3	3	3
CO 4		-	3	2	3	2	3	3	-	-
CO 5	3	-	3	2	3	2	3	3	-	-

Strong (3) Medium (2) Low (1)

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(2024 -2025 onwards)

Semester V	NANOSCIENCE AND NANO TECHNOLOGY	Hours/Week: 5	
Elective Course DSEC - 1		Credits: 4	
Course Code 24UPHE51		Internal 25	External 75

COURSE OUTCOMES

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

CO1: list the geometry of different nanostructures properties, explain principles and concepts in fabrication and characterization techniques. [K1]

CO2: discuss the different types of nanostructures, properties of nanomaterials. [K2]

CO3: describe the various fabrication methods, characterization techniques, construction and working of nano devices. [K2]

CO4: apply the properties of nanomaterials to illustrate the applications of nanostructure and nano devices in real life situations. [K3]

CO5: apply the physics concepts to develop the fabrication methods and to develop the characterization techniques. [K3]

UNIT I

Nanoscience And Nanotechnology: nanoscale– nature and nanostructures – nanostructures: 0D, 1D, 2D– surface to volume ratio– size effect – quantum confinement– metal based nanoparticles (metal and metal oxide) – nanocomposites (non-polymer based) – carbon nanostructures – fullerene –SWCNT and MWCNT. (15 Hours)

UNIT II

Properties of Nanomaterials: introduction –mechanical behavior –elastic properties – hardness and strength – ductility and toughness –superplastic behavior – optical properties – surface plasmon resonance – electrical properties – dielectric materials and properties – magnetic properties – super paramagnetism – electrochemical properties – properties of

CNTs.

(15 Hours)

UNIT III

Fabrication Methods And Vacuum Techniques: Top-down and bottom-up approaches – electrochemical method – chemical and physical vapour depositions (CVD and PVD) – plasma arc discharge – sputtering – thermal evaporation – pulsed laser deposition – ball milling – lithography: photolithography – e-beam lithography – sol-gel methods – synthesis of CNT. (15 Hours)

UNIT IV

Characterization Techniques: Scanning probe microscopy – scanning tunneling microscopy – atomic force microscopy – scanning electron microscopy – transmission electron microscopy – powder XRD method: determination of structure and grain size analysis – UV-visible and photoluminescence spectroscopy. (15 Hours)

UNIT V

Applications of Nanomaterials: Medicine: drug delivery – photodynamic therapy – molecular motors – energy: fuel cells – rechargeable batteries – supercapacitors – photovoltaics. sensors: nanosensors based on optical and physical properties – electrochemical sensors – nanobiosensors. nanoelectronics: CNTFET – display screens – GMR read/write heads – nanorobots – applications of CNTs (15 Hours)

Self-Study: GMR read/write heads, synthesis of CNT.

TEXT BOOKS

1. Chattopadhyay K.K. and Banerjee A.N (2012), *Introduction to Nanoscience and Nanotechnology*, PHI Learning Pvt. Ltd.,
2. Shah. Tokeer Ahmad M.A (2010), *Principles of Nanoscience and Nanotechnology*, Narosa Publishing House Pvt Ltd.
3. Mick Wilson, et al (2005) *Nanotechnology*, Overseas Press.
4. Pradeep T. (2008) *NANO: The Essentials*, Tata Mc Graw –Hill Publishing Company Limited, New Delhi.

REFERENCE BOOKS

1. Richard Booker and Earl Boysen, (2005) *Nanotechnology*, Wiley Publishing Inc. USA
2. Fendler J.H. (2007) *Nano particles and nano structured films; Preparation, Characterization and Applications*, John Wiley and Sons
3. Murty B.S (2012) *Textbook of Nanoscience and Nanotechnology*, Universities Press.

Course Code 24UPHE51	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	3	-	3	1	-	1	-	-	-	3
CO 2	3	2	3	2	-	-	-	-	2	-
CO 3	3	3	3	-	2	2	-	2	-	3
CO 4	3	3	3	3	-	2	-	3	-	-
CO 5	3	-	2	-	3	3	2	-	-	-

Strong (3) Medium (2) Low (1)

Dr.A.Azhagu Parvathi
Head of the Department

Dr.S.Thenmozhi
Course Designer


V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

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VIRUDHUNAGAR

Quality Education with Wisdom and Values

B.Sc. PHYSICS

(2024-2025 onwards)

Semester V	MATHEMATICAL PHYSICS	Hours/Week: 5	
Elective Course DSEC - 1		Credits: 4	
Course Code 24UPHE52		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain types of matrices, basic concepts and theorems in vector calculus, orthogonal curvilinear coordinates and Fourier series. [K1]

CO2: derive the theorems in vector calculus and matrices, differential operators in terms of various coordinate systems, and Fourier coefficient for different types of functions. [K2]

CO3: discuss the properties of various types of matrices and significance of gradient, divergence, curl of vectors and obtain the solutions to PDE. [K2]

CO4: solve the problems in vector calculus, characteristic equation in matrices, Fourier series and partial differential equations. [K3]

CO5: demonstrate the applications of Fourier series and partial differential equations in different branches of Physics. [K3]

UNIT -I

MATRICES: introduction – special types of matrices – transpose – conjugate– conjugate transpose– symmetric and anti symmetric – Hermitian and skew Hermitian – orthogonal and unitary matrices – properties - characteristic equation - eigen values, eigen vectors — Cayley-Hamilton theorem - diagonalization - simple problems. (15 hours)

UNIT-II

VECTOR CALCULUS: vector differentiation – directional derivatives –definitions and Physical significance of gradient, divergence, curl – Laplace operators– vector identities – line, surface and volume integrals – statement, proof and simple problems for Gauss's divergence, Stoke's theorem, Green's theorem. (15 hours)

UNIT-III

ORTHOGONAL CURVILINEAR COORDINATES: tangent basis vectors – scale factors – unit vectors in cylindrical and spherical coordinate systems – gradient of a scalar – divergence and curl of a vector – Laplacian in these coordinate systems. (15 hours)

UNIT-IV

FOURIER SERIES: periodic functions – Dirichlet's conditions – general Fourier series – even and odd functions and their Fourier expansions – Fourier cosine and sine – half range series – change of length of interval. Fourier analysis of square wave, saw-tooth wave, half wave rectifier wave forms. (15 hours)

UNIT-V

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS (PDE): solutions to PDE's by method of separation of variables - PDE for transverse vibrations in elastic strings (one dimensional wave equation) – one dimensional heat flow equation - solutions to these PDE's by method of separation of variables - problems based on boundary conditions and initial condition. (15 hours)

Self-Study: Cayley–Hamilton theorem - Laplace operators - Fourier analysis of square wave.

TEXT BOOKS

1. Das, H. K., *Mathematical Physics* (2011), S. Chand and Co, New Delhi.
2. Satya Prakash, *Mathematical Physics with Classical Mechanics* (Reprint 2019). New Delhi: Sultan Chand & Sons.
3. Gupta, B. D., *Mathematical Physics* (2009), 4th Edition, S. Chand and Co, New Delhi.

REFERENCEBOOKS

1. Spiegel, M.R., *Fourier Analysis* (2004), Tata McGraw-Hill.
2. Jain, J.C., *Vector space and Matrices* (2008) Narosa Publishing House Pvt. Ltd.

WEB RESOURCES

1. https://youtu.be/X4_K-XLUIB4
2. <https://www.youtube.com/watch?v=p075LPq3Eas>
3. https://www.youtube.com/watch?v=mH_pS6fruyg
4. <https://www.youtube.com/watch?v=tdkFc88Fw-M>

Course Code 24UPHE52	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	3	-	3	-	1	1	-	-	-	2
CO2	3	-	3		2	2	-	2	-	-
CO3	3	-	3	-	3	2	-	2	-	-
CO4	3	-	2	-	3	3	1	-	-	-
CO5	2	-	1	-	2	2	1	3		-

Strong (3) Medium (2) Low (1)

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B.Sc. PHYSICS

(2024 -2025 onwards)

Semester V	GENERAL PHYSICS PRACTICAL - II	Hours/Week: 3	
Elective Course DSEC - 2 Practical I		Credits: 2	
Course Code		Internal	External
24UPHE53P		40	60

COURSE OUTCOMES

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

CO1: understand the theoretical concepts in Electric, Electromagnetism and Optics, and

formulate the experimental procedure. [K2]

CO2: draw the circuit diagram / experimental set up with tabular column and write the formula to

calculate the required parameters. [K2]

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 and complete the record work.

[K3]

CO5: check/verify the accuracy of the result against standard value and to test whether the

principles of the experiment are understood. [K3]

List of Practical (Any Eight)

1. Characteristics of Solar Cell
2. Comparison of Magnetic moment of two bar magnets using deflection magnetometer
3. Figure of merit - voltage and current sensitivity of spot reflecting galvanometer
4. Spectrometer – Grating –Minimum Deviation –Wavelength of the mercury spectral lines
5. Determination of L using Maxwell's bridge
6. High resistance by leakage using spot reflecting galvanometer
7. L.C.R Parallel Resonance Circuit

8. i-i' curve by spectrometer
9. Determination of dielectric constant of a given material
10. Hartmann's Interpolation formula by spectrometer

Course Code 24UPHE53P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO
	1.a	1.b	2	3.a	3.b	4.a	4.b	5	6	7
CO 1	3	3	3	1	-	1	-	3	-	2
CO 2	-	3	3	2	2	2	2	-	-	-
CO 3	-	3	3	3	-	2	2	-	3	2
CO 4	-	3	3	3	2	2	1	-	-	2
CO 5	-	3	2	3	2	2	2	2	2	2

Strong (3) Medium (2) Low (1)

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B.Sc. PHYSICS

(2024-2025 onwards)

Semester V	LINEAR INTEGRATED CIRCUITS PRACTICAL	Hours/Week: 3	
Elective Course		Credits: 2	
DSEC - 2			
Practical I			
Course Code		Internal	External
24UPHE54P		40	60

COURSE OUTCOMES

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

CO1: understand the theoretical concepts in linear integrated circuits. [K2]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required necessary electrical parameters. [K2]

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: check/verify the accuracy of the result against standard value and to test whether the principles of the experiment are understood [K3]

List of Experiments: (Any Eight)

1. Characteristics of a transistor - (CB mode)
2. Bistable Multivibrator - IC 555
3. Operational amplifier - D/A converter by binary resistor method
4. Astable Multivibrator using IC 741
5. Schmitt trigger using IC 555
6. Dual power supply using IC
7. Operational amplifier - inverting amplifier & non-inverting amplifier
8. Logarithmic amplifier using IC 741

9. Integrator and Differentiator using Op Amp
10. Colpitt's oscillator transistor
11. Frequency Modulation.

Course Code 24UPHE54P	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	3	3	3	1	-	1	-	3	-	2
CO 2	-	3	3	2	2	2	2	-	-	-
CO 3	-	3	3	3	-	2	2	-	3	2
CO 4	-	3	3	3	2	2	1	-	-	2
CO 5	-	3	2	3	2	2	2	2	2	2

Strong (3)

Medium (2)

Low (1)

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B.Sc. PHYSICS

(2024-2025 onwards)

Semester V	INTERNSHIP	Hours/Week: -
Internship / Industrial Training		Credit: 1
Course Code 24UPHI51		Internal - 100

COURSE OUTCOMES

On completion of the Internship / Industrial Training students will be able to

CO1: relate their theoretical insights with hands-on experience. [K2]

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

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

CO4: exhibit the written communication skills acquired through internship / Industrial Training. [K3]

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

Guidelines/ Regulations

- ❖ Each student must go for Internship training in a reputed Industry / Company / Organization/ Educational Institution.
- ❖ Students should produce the completion certificate after the completion of Internship period.
- ❖ A report of 10-15 pages must be submitted by each student after the completion of the Internship period.
- ❖ Internal Viva-voce examination will be conducted.
- ❖ Students with diverse disabilities must complete a 10 day internship programme at their preferred places.

Course Code 24UPHI51	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	2	2	3	-
CO2	3	2	2	2	2	3	-
CO3	3	2	-	-	-	3	-
CO4	3	3	2	2	-	2	3
CO5	3	2	3	3	2	-	-

Strong (3) Medium (2) Low (1)

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Dr.M.Sankareswari
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B.Sc. PHYSICS (2024 -2025 onwards)

Semester V	BIOPHYSICS	Hours: 0
Extra Credit Course		Credits: 2
Course Code 24UPHO51		Internal: 100

COURSE OUTCOMES

On completion of the course students will be able to

CO1: understand the effect of mechanical forces on living systems.

CO2: explain the dynamics of fluid and effect of its viscosity appears in biological systems.

CO3: discuss the processes of transport and diffusion of gases in bio systems.

CO4: interpret the physical features of audition and mechanism of auditory system.

CO5: understand the functioning of retina and photoreceptors of eye.

UNIT I

Biomechanics: Biostatics - forces and torques - biophysics of muscle – muscle power – mass specific muscle power – biodynamics – Newton's laws - frictional forces and stoke's law - locomotion on land – walking - jumping.

UNIT II

Biophysics and Fluid Flow: Steady laminar flow – coefficient of viscosity - turbulence – hemodynamics – Fluid flow in plants.

UNIT III

Biophysics and Gas Transport: The Ideal Gas – Convective Transport of Gases – Diffusion of Gases: Fick's Laws – Physiology of Respiration.

UNIT IV

Physics of audition: Transverse and longitudinal waves - pressure waves – wave velocity – intensity of a wave - physiological characteristics of sound – human ear – Doppler effect.

UNIT V

Physics of vision: Wave nature of light – polarization - geometrical optics – refraction – gradient-index lens – spherical aberration – chromatic aberration - refractive power – refractive power of eye – reduced eye model – retina and photoreceptors – resolving power of eye – diffraction.

TEXT BOOKS

Elementary Biophysics, Srivastava, P.K., (2011) Narosa Publishing House Pvt. Ltd.,

REFERENCE BOOKS

Biomedical instrumentation, Arumugam, M., (2008) Anuradha Publications, Chennai,

Handbook of Biomedical instrumentation, Khandpur and Raghbir Khandpur R.S., (1987) TMH Publishers

Biomedical instrumentation and measurements, Ananda Natarajan, R., (1995)

PHI Publications, India.

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Dr. I. Rathinamala

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B.Sc. PHYSICS

(2024 -2025 onwards)

Semester VI	QUANTUM MECHANICS AND RELATIVITY	Hours/Week: 6	
Core Course – 14		Credits: 6	
Course Code 24UPHC61		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain concepts of wave mechanics and postulates of relativity. [K1]

CO2: derive the expression in quantum statistics and transform equations in relativity and discuss the properties of various operators. [K2]

CO3: obtain the expression for wave equations, eigen functions and eigen value of particles for various potentials. [K2]

CO4: illustrate the applications of matter waves and solve the different potential functions using Schrodinger equation. [K3].

CO5: apply learnt concepts to solve problems in wave mechanics and relativity. [K3]

UNIT I

Photons and Matter waves: difficulties of classical physics and origin of quantum theory - black body radiation - Planck's law - Einstein's photoelectric equation - Compton effect - pair production - De Broglie waves - phase velocity and group velocity - Davisson and Germer's experiment. (18 hours)

UNIT II

Operators and Schrödinger Equation: postulates of quantum mechanics - Wave function and its interpretation - Schrödinger's equation - linear operators - Eigenvalue - Hermitian operator - properties of Hermitian operator - observable - operators for position, linear Momentum, angular momentum components - commutator algebra - commutator between these operators - expectation values of position and momentum - Ehrenfest theorem. (18 hours)

UNIT III

Solving Schrodinger equation - One-dimensional eigen value problems: particle in a box - potential step - barrier penetration problem - quantum mechanical tunneling - linear harmonic oscillator (operator method) (18 hours)

UNIT IV

Relativity: Introduction - frames of reference - Newtonian principle of relativity- Galilean Transformation equations - The Ether hypothesis - Michelson-Morley experiment - special theory of relativity - Lorentz transformation equations - length contraction - time dilation - concept of simultaneity - variation of mass with velocity - Einstein's mass-energy relation - relativistic momentum-energy relation. (18 hours)

UNIT V

Relativity: Minkowski's four dimensional space - time continuum - General theory of relativity - particle-wave duality - photons and gravity - Gravitational Red shift. predictions of general relativity - rest mass of a photon - space-time diagrams - Geometrical representations of simultaneity, contraction and dilation. (18 hours)

Self-Study: Phase velocity and group velocity, commutator algebra, time dilation

TEXT BOOKS

1. Murugesan, R., and Kiruthiga Sivaprasath, (2018) *Modern Physics*, 18th Revised Edition, S.Chand & Company Pvt Ltd, New Delhi.
2. Arthur Biser, (2009) *Concepts of Modern Physics*, 6th Edition, McGraw – Hill International Book Company, New Delhi.

REFERENCE BOOKS

1. Gupta, A.B., (2015) *Foundation of Quantum Mechanics*, Books and Allied (P) Ltd, Calcutta.
2. Chattopadhyay, D., and Rakshit, P.C., (2008) *Quantum Mechanics Statistical Mechanics & Solid State Physics*, 8th Revised Edition, S. Chand & Company Ltd New Delhi.
3. Puri, S.P., (2013) *Special theory of Relativity*, 1st Edition Pearson Education, India.

Course Code 24UPHC61	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	3	-	2	1	-	1	-	-	-	-
CO 2	3	2	2	2	-	-	-	-	2	-
CO 3	3	3	2	-	2	2	-	-	-	2
CO 4	3	3	2	3	-	2	-	2	-	-
CO 5	3	-	2	-	3	-	-	-	-	-

Strong (3)

Medium (2)

Low (1)

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B.Sc. PHYSICS

(2024-2025 onwards)

Semester VI	SOLID STATE PHYSICS	Hours/Week: 6	
Core Course - 15		Credits: 5	
Course Code 24UPHC62		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the fundamental concepts in solid state physics. [K1]

CO2: explain the theories related to bonding in solids, crystal structure, lattice dynamics, magnetic and ferroelectric materials. [K2]

CO3: derive the lattice parameters for crystal systems and explain the parameters related to magnetic and ferroelectric materials. [K2]

CO4: apply the learned concepts to demonstrate experimental techniques to find the relevant physical parameters in solid state physics. [K3]

CO5: apply the learned concepts to solve the problems in solid state physics. [K3]

UNIT I

Crystal structure & Miller Indices: 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 – metallic crystal structures – diamond cubic structure- 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. (18 hours)

UNIT II

Bonding 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. (18 hours)

UNIT III

Elementary Lattice Dynamics: lattice vibrations and phonons: linear monoatomic and diatomic chains- acoustical and optical phonons –qualitative description of the phonon spectrum in solids –Dulong and Petit’s Law – Einstein and Debye theories of specific heat of solids – T^3 law (qualitative only). (18 hours)

UNIT IV

Magnetic Properties of Solids: permeability, susceptibility, relation between them – classification of magnetic materials – properties of dia, para, ferro, ferri and antiferromagnetism –Langevin’s theory of diamagnetism – Langevin’s theory of paramagnetism – Curie-Weiss law – Weiss theory of ferromagnetism(qualitative only) – Heisenberg’s quantum theory of ferromagnetism – domains – discussion of B-H curve – hysteresis and energy loss – soft and hard magnets – magnetic alloys. (18 hours)

UNIT V

Ferroelectric Properties of Materials: Curie-Weiss Law – ferroelectric domains, P-E hysteresis loop – elementary band theory: Kronig-Penny model – band gap(no derivation) – conductor, semiconductor (P and N type) and insulator –conductivity of semiconductor – mobility – Hall effect – measurement of conductivity (four probe method) - Hall coefficient. (18 hours)

Self-Study: Diamond cubic structure, Langevin’s theory of diamagnetism.

TEXT BOOKS

1. Pillai, S.O., (2017) *Solid State Physics*, 10th Edition, S.Chand and Co, New Delhi.
2. Arumugam, M., (2018) *Materials Science*, third edition, Anuradha Publications.

REFERENCE BOOKS

1. Kittel, (2019) *Introduction to Solid State Physics*, Willey Eastern Ltd.
2. Wahab, M.A., (2011) *Solid State Physics*, Narosa Publishing House.
3. Rita John, (2014) *Solid State Physics*, 1st edition, TataMcGraw Hill publishers.
4. Srivastava, J.P., (2006) *Elements of Solid State Physics*, 2nd Edition, Prentice-Hall of India.

Course Code 24UPHC62	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	3	-	3	1	-	1	-	-	-	3
CO 2	3	2	3	2	-	-	-	-	2	-
CO 3	3	3	3	-	2	2	-	2	-	3
CO 4	3	3	3	3	-	2	-	3	-	-
CO 5	3	-	2	-	3	3	2	-	-	-

Strong (3)

Medium (2)

Low (1)

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Dr.R. Hemalatha
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B.Sc. PHYSICS

(2024-2025 onwards)

Semester VI	DIGITAL ELECTRONICS AND MICROPROCESSOR 8085	Hours/Week: 5	
Core Course - 16		Credits: 5	
Course Code 24UPHC63		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the laws of Boolean algebra, basics of combinational circuits, sequential circuits and architecture of microprocessor 8085 and I/O interfacing. [K1]

CO2: discuss the working of arithmetic, combinational and sequential circuits. [K2]

CO3: describe the mechanism of various memory devices, logic families and explain the functions of instruction set of 8085 microprocessor. [K2]

CO4: apply the learned concepts to simplify the Boolean equations, conversion in various number systems and write the programs using 8085 microprocessor. [K3]

CO5: illustrate the applications of arithmetic, combinational and sequential circuits. [K3]

UNIT I

Number system and Boolean algebra: Decimal, binary, octal, hexadecimal numbers systems and their conversions – codes: BCD, gray and excess-3 codes –code conversions – complements (1's, 2's, 9's and 10's) –binary addition, binary subtraction using 1's and 2's complement methods – Boolean laws – De-Morgan's theorem –basic logic gates -universal logic gates (NAND and NOR) –standard representation of logic functions (SOP and POS) – minimization techniques (Karnaugh map: 2, 3, 4 variables). (15 Hours)

UNIT II

Arithmetic and Combinational circuits: Adders, half and full adder – subtractors, half and full subtractor –parallel binary adder – magnitude comparator – multiplexers (4:1) and demultiplexers (1:4), encoder (8-line-to-3- line) and decoder (3-line-to-8-line), BCD to seven segment decoder. (15 Hours)

UNIT III

Sequential Circuits: Flip-flops: S-R Flip-flop, J-K Flip-flop, T and D type flip-flops, master-slave flip-flop, truth tables, registers:- serial in serial out and parallel in and parallel out – counters asynchronous:-mod-8, mod-10, synchronous - 4-bit and ring counter. (15Hours)

UNIT IV

8085 Microprocessor: Introduction to microprocessor – INTEL 8085 architecture – register organization –pin configuration of 8085, interrupts and its priority – Program Status Word (PSW) –instruction set of 8085 –addressing modes of 8085. (15 Hours)

UNIT V

8085 Microprocessor Programming: Assembly language programming using 8085 – programmes for addition (8-Bit and 16-Bit) - subtraction (8-Bit and 16-Bit) - multiplication (8- Bit) - division (8- Bit) – largest and smallest number in an array – BCD to ASCII and ASCII to BCD. (15 Hours)

Self-Study: Serial in serial out shift register, MOD-10 counter.

TEXT BOOKS

1. Salivahanan, S. & Arivazhagan, S. (2019). Digital Circuits and Design, Fifth Edition. New Delhi: Oxford University Press.
2. Ramesh S.Gaonakar., (2013) *Microprocessor Architecture, Programming and Applications with the 8085*, 6th Edition, Penram International Publishing, Mumbai.

REFERENCE BOOKS

1. Morris Mano, M., (2018) *Digital Design*, 6th Edition, PHI, NewDelhi.
2. Donald P Leach, Albert Paul Malvino, Goutam Saha, (2014) *Digital Principles and Applications*, Mc Graw Hill Education Pvt Ltd.
3. Douglas V Hall, Rao, S.S.S.P., (2017) *Microprocessors and Interfacing*, Mc Graw Hill Education Pvt Ltd.

Course Code 24UPHC63	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	3	-	2	-	2	1	-	-	-	2
CO 2	3	3	3	2	-	2	1	-	-	-
CO 3	3	-	2	2	3	2	2	-	-	-
CO 4	3	1	2	2	3	3	2	2	-	-
CO 5	3	3	2	3	3	3	2	3	2	1

Strong (3) Medium (2) Low (1)

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B.Sc. PHYSICS

(2024 -2025 onwards)

Semester VI	ELECTRONICS PRACTICAL	Hours/Week: 3	
Core Course - 17 Practical VI		Credits: 2	
Course Code 24UPHC61P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the theoretical concepts in transistor, operational amplifier, oscillators, multivibrator and related experiments. [K2]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required necessary electrical parameters. [K2]

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: check/verify the accuracy of the result against standard value and to test whether the principles of the experiment are understood [K3]

List of Experiments: (Any Eight)

1. Characteristics of a transistor – (CE mode)
2. FET – characteristics
3. Zener voltage regulator
4. UJT –relaxation oscillator
5. Hartley oscillator – transistor
6. Voltage doubler and tripler
7. Verification of reciprocity theorem
8. Astable Multivibrator - transistor
9. Amplitude Modulation

10. RC coupled CE transistor amplifier - single stage

11. Adder and subtractor using IC 741

Course Code 24UPHC61P	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	3	3	3	1	-	1	-	3	-	2
CO 2	-	3	3	2	2	2	2	-	-	-
CO 3	-	3	3	3	-	2	2	-	3	2
CO 4	-	3	3	3	2	2	1	-	-	2
CO 5	-	3	2	3	2	2	2	2	2	2

Strong (3)

Medium (2)

Low (1)

Dr.A.Azhagu Parvathi
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VIRUDHUNAGAR

Quality Education with Wisdom and Values

B.Sc. PHYSICS

(2024-2025 onwards)

Semester VI	MATERIAL SCIENCE	Hours/Week: 5	
Elective Course DSEC - 3		Credits: 4	
Course Code 24UPHE61		Internal 25	External 75

COURSE OUTCOMES

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

CO1: List out the imperfections in crystals, mechanical deformation, classification of optical materials and different testing methods. [K1]

CO2: explain the structural defects in crystals, mechanical deformation, properties of optical materials and testing methods. [K2]

CO3: derive the physical parameters related to crystal imperfections, mechanical deformation and optical materials. [K2]

CO4: illustrate the applications related to crystal defects, optical materials and mechanical deformation. [K3]

CO5: use the learnt concepts to solve problems in crystal imperfections, mechanical deformation, optical materials and to study the various testing methods. [K3]

UNIT I

Crystal Imperfections: Introduction – point defects: vacancies (problems), interstitials, impurities, electronic defects – equilibrium concentration of point imperfections (problems) – application of point defects – line defects: edge dislocation (problems), screw dislocation – surface defects: extrinsic defects – intrinsic defects: grain boundaries, tilt & twist boundaries, twin boundaries, stacking faults – volume defects – effect of imperfections. (15 hours)

UNIT II

Material Deformation: Introduction – elastic behavior of materials – atomic model of elastic behavior – modulus as a parameter in design – rubber like elasticity – inelastic behavior of materials – relaxation process – viscoelastic behavior of materials – spring-Dash pot models of viscoelastic behavior of materials. (15 hours)

UNIT III

Permanent Deformation of Materials: Introduction - plastic deformation: tensile stress-strain curve - plastic deformation by slip – shear strength of perfect and real crystals – the stress to move a dislocation – effect of temperature on stress –effect of grain size, solute atoms, precipitate particles on dislocation motion - creep: mechanism of creep - creep resistant materials. (15 hours)

UNIT IV

Optical Materials: Classification of optical materials – optical absorption in metals, semiconductors and insulators – excitons – colour centres - Principle – Photoluminescence: fluorescence and phosphorescence – display devices and display materials: light emitting diodes –liquid crystal displays: principle, classification – comparison – applications – NLO materials and their applications. (15 hours)

UNIT V

Mechanical Testing: Destructive testing: tensile test compression test, hardness test – nondestructive testing (NDT): radiographic methods, comparison between X-ray and gamma ray radiography - ultrasonic methods – thermal methods of NDT: thermography – equipment used for NDT: metallurgical microscope. (15 hours)

Self-study: creep: mechanism of creep - creep resistant materials.

TEXT BOOKS

1. Raghavan, V., *Material Science and Engineering* (2023) 6th Edition, PHI Learning Private Limited, Delhi.
2. Rajendran, V., *Materials Science* (2011) McGraw Hill publishing Company Limited, New Delhi.
3. Arumugam, M., *Materials Science* (2013) Anuradha Publications, Kumbakonam.

REFERENCE BOOKS

1. William D. Callister, Jr., *Material Science & Engineering – An Introduction* (2007) 8th Edition, John Wiley & Sons, Inc.,
2. Donald, R., Askeland, Pradeep, and Phule, P., *The Science and Engineering of Materials* (2007) 5th Edition, Thomson Learning, First Indian Reprint.

Course Code 24UPHE61	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	3	-	2	-	2	2	-	3	-	2
CO 2	3	3	3	2	-	2	2	-	-	3
CO 3	3	-	2	1	2	3	1	-	-	-
CO 4	3	-	2	2	3	2	1	2	-	-
CO 5	3	2	2	3	3	3	3	3	-	1

Strong (3)

Medium (2)

Low (1)

Dr.A.Azhagu Parvathi
Head of the Department

Dr.I.Rathinamala
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(2024-2025 onwards)

Semester V	ENERGY PHYSICS	Hours/Week: 5	
Elective Course DSEC- 3		Credits: 4	
Course Code 24UPHE62		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the principle, classification of various forms of energy resources and energy storage devices. [K1]

CO2: explain the energy resources and their availability, energy conservation process in solar storage system and wind energy system. [K2]

CO3: discuss the energy conservation process in Biomass energy and energy storage devices. [K2]

CO4: compare conventional and nonconventional energy resources, illustrate the applications of solar and wind energy system. [K3]

CO5: illustrate the applications of Biomass and energy storage devices. [K3]

UNIT I

Introduction to Energy Sources: energy consumption as a measure of prosperity - world energy future - energy sources and their availability - conventional energy sources - non-conventional and renewable energy sources - comparison - merits and demerits - World Energy Status - Energy Scenario in India. (15 hours)

UNIT II

Solar Energy: solar energy storage systems - solar water heating - solar heating of building - solar cooling of building - solar pond - solar pumping - solar furnace - solar greenhouse - types of greenhouses. (15 hours)

UNIT III

Wind Energy: introduction - nature of the wind - basic principle of wind energy conversion - wind energy data and energy estimation - basic components of Wind Energy Conversion Systems (WECS) - advantages and disadvantages of WECS - applications - tidal energy. (15 hours)

UNIT IV

Biomass Energy: introduction - classification - biomass conversion technologies - photosynthesis - fermentation - biogas generation - classification of biogas plants - anaerobic digestion for biogas - wood gasification - advantages and disadvantages. (15 hours)

UNIT V

Energy Storage: importance of energy storage - batteries - lead acid battery - nickel-cadmium battery - fuel cells - types of fuel cells - advantages and disadvantages of fuel cells - applications of fuel cells - hydrogen storage. (15 hours)

Self-Study: Advantages and disadvantages of WECS, advantages and disadvantages of fuel cells, applications of fuel cells

TEXT BOOKS

Rai, G.D., (2014) *Solar Energy Utilization*, 5th Edition Khanna Publications, Delhi.

REFERENCE BOOKS

1. Khan, B.H., (2009) *Non-Conventional Energy Resources*, 2nd Edition, Tata McGraw - Hill Education Private Limited, New Delhi.
2. Sukhatme, S.P., (1998) *Solar Energy*, Tata McGraw Hill, Delhi.
3. Tiwari, G.N., (2006) *Solar Energy Fundamentals, Design, Modelling and Applications*, Narosa Publishing House Books, New Delhi.

Course Code 24UPHE62	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	3	-	3	1	-	1	-	-	-	2
CO 2	3	2	3	2	-	-	-	-	2	-
CO 3	3	-	3	-	2	2	-	2	-	1
CO 4	3	-	3	3	-	2	-	3	-	-
CO 5	3	-	2	-	2	2	2	-	-	-

Strong (3) Medium (2) Low (1)

Dr.A.Azhagu Parvathi
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Dr.G.Shanmuga Priya
Course Designer



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B.Sc. PHYSICS

(2024-2025 onwards)

Semester VI	DIGITAL ELECTRONICS PRACTICAL	Hours/Week: 3	
Elective Course DSEC - 4 Practical II		Credits: 2	
Course Code		Internal	External
24UPHE63P		40	60

COURSE OUTCOMES

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

CO1: understand the theoretical concepts in Digital Electronics and formulate the experimental procedure. [K2]

CO2: draw the circuit diagram / experimental set up with tabular column and write the formula to calculate the required parameters. [K2]

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 and complete the record work. [K3]

CO5: check/verify the accuracy of the result against standard value and to test whether the principles of the experiment are understood [K3]

List of Practicals (Any Eight)

1. Study of gate ICs – NOT, OR, AND, NOR, NAND, XOR, XNOR
2. Verification of De Morgan's theorem using ICs –NOT, OR, AND
3. NAND as universal building block
4. NOR as universal building block
5. Half adder / Half subtractor using basic logic gate ICs
6. Binary to Gray and Gray to Binary Conversion
7. Decade counter
8. 8-bit Ring Counter

9. Shift Register (serial in serial out and parallel in parallel out)

10. BCD to Seven Segment Decoder.

Course Code 24UPHE63P	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	3	3	3	1	-	1	-	3	-	2
CO 2	-	3	3	2	2	2	2	-	-	-
CO 3	-	3	3	3	-	2	2	-	3	2
CO 4	-	3	3	3	2	2	1	-	-	2
CO 5	-	3	2	3	2	2	2	2	2	2

Strong (3) Medium (2) Low (1)

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Dr.R.Hepzi Pramila Devamani
Course Designer



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B.Sc. PHYSICS

(2024-2025 onwards)

Semester VI	DIGITAL CIRCUITS SIMULATION PRACTICAL	Hours/Week: 3	
Elective Course DSEC - 4 Practical II		Credits: 2	
Course Code 24UPHE64P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the fundamental concepts of digital circuits and formulate the experimental procedure. [K2]

CO2: draw the circuit diagram with necessary logic expressions and truth table. [K2]

CO3: simulate logic, combinational and sequential circuits using digital tools. [K3]

CO4: verify the operation of the constructed circuits by simulation. [K3]

CO5: acquire simulation skills and entrepreneurial skills. [K3]

List of Practicals (Any Eight)

1. Basic Gates –AND, OR, NOT Gates
2. Universal Gates – NAND, NOR Gates
3. Universal Gates – Ex-OR, EX-NOR Gates
4. Adder – Half Adder and Full Adder
5. Subtractor – Half Subtractor and Full Subtractor
6. Flip Flop – RS Flip flop and D – Flip flop
7. Decoders – 2 – 4 decoder and 3-8 decoder
8. Multiplexer and Demultiplexer
9. Ring Counter and Decade Counter
10. Shift Register
11. BCD Seven Segment Display

Course Code 24UPHE64P	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	3	3	3	1	-	1	-	3	-	2
CO 2	-	3	3	2	2	2	2	-	-	-
CO 3	-	3	3	3	-	2	2	-	3	2
CO 4	-	3	3	3	2	2	1	-	-	2
CO 5	-	3	2	3	2	2	2	2	2	2

Strong (3) Medium (2) Low (1)

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(2024-2025 onwards)

Semester VI	MICROPROCESSOR PRACTICAL	Hours/Week: 2	
SEC – 7 (Professional Competency Skill)		Credits: 2	
Course Code 24UPHS61P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: understand the various instructions used in 8085 microprocessor. [K2]

CO2: write the programs related to the problems. [K2]

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: check/verify the accuracy of the result against standard value and to test whether the principles of the experiment are understood [K3]

List of Practicals (Any Eight)

1. Addition and Subtraction of two 8 bit binary numbers
2. Multiplication and Division of two 8 bit binary numbers
3. Square of a number
4. Square root of number
5. Block transfer of data
6. Generate and sum 15 Fibonacci series including carry
7. Largest number and Smallest number in an array of data
8. Ascending and Descending order
9. Palindrome number
10. Searching a number in an array and finding its parity.

Course Code 24UPHS61P	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	3	3	3	-	-	-	1	-	-	2
CO 2	-	3	3	2	-	2	-	-	-	1
CO 3	-	3	3	3	-	2	-	1	3	-
CO 4	-	3	2	3	3	2	-	1	2	-
CO 5	-	3	2	3	3	3	2	2	2	-

Strong (3) Medium (2) Low (1)

Dr.A.Azhagu Parvathi
Head of the Department

Dr.R.Hepzi Pramila Devamani
Course Designer