BHARATHIDASAN GOVERNMENT COLLEGE FOR WOMEN, PUDUCHERRY

(AUTONOMOUS)

DEPARTMENT OF PHYSICS

REGULATIONS, CURRICULUM & SYLLABUS

For

B.Sc. Physics (Honors with Research)

&

B.Sc. Physics (Honors)

[Effective from the Academic Year (2024 – 2025)]

(Under the National Education Policy 2020)

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BHARATHIDASAN GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS), PUDUCHERRY

DEPARTMENT OF PHYSICS

Minutes of the meeting of Board of Studies

The meeting of Board of Studies in Physics was held on **06.12.2024** at 10 a.m in the Department of Physics, BGCW, Puducherry. The members in the enclosed list attended the board meeting.

The Chairman welcomed the members and presented the details of NEP Syllabus for B.Sc. Physics (honors) and requested the members to offer valuable suggestions in improving the syllabus. The model question paper and mark distribution for internal and external exams for theory and practicals are included in the curriculum.

The Board of Studies members are engaged in fruitful discussions on the contents of the syllabi and the recommendations were incorporated in the course structure and syllabus.

Two syllabus was approved by the BOS, One for the Students admitted during 2023-24 and other for 2024-25. The students admitted during 2023-24 will study three year B.Sc. (Physics) course under NEP regulations and those admitted during 2024-25 will be study B.Sc (Physics) (honors) course of 4 year duration under NEP regulations.

The practical lab sessions shall be conducted for 3 hours duration.

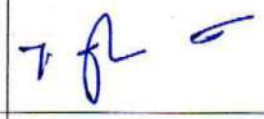
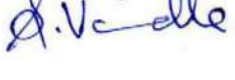
The total credits will be 120 for three year B.Sc Course and 160 for four year B.Sc (Honors) course. The syllabi of Physics Minor and multidisciplinary papers were also approved.

The BOS authorize the chairman to place the syllabus before academic council and for general body meeting for approval.

BOS MEMBER	NAME	SIGNATURE
Chairman	Dr. R. Madivanane	
VC Nominee	Dr. R. Sivakumar	
Subject Expert	Dr. R. Thilak Kumar	
Subject Expert	Dr. K.B. Renukadevi	
Alumna	Dr. S. Vanidha	
Industry Representative	Ms. A.Yokeswary	6/12/24
Faculty member	Dr. G. Shakila	
Faculty member	Dr. Rama Krishna Jammula	
Faculty member	Mr. K. Venkitachalapathy	
Faculty member	Dr. S. Sivakumar	

BOS MEMBER	NAME	DESIGNATION
Chairman	Dr. R. Madivanane	Head of the Department of Physics, Associate Professor, Bharathidasan Govt College for Women, Pondicherry.
VC Nominee	Dr. R. Sivakumar	Head of the Department of Physics, Professor, Pondicherry University, Pondicherry.
Subject Expert	Dr. R. Thilak Kumar	Associate Professor of Physics, Periyar Arts College, Cuddalore Tamilnadu- 607001.
Subject Expert	Dr. K.B. Renukadevi	Professor in Physics, Rajiv Gandhi College of Engineering and Technology, Kirumampakkam, Puducherry.
Alumna	Dr. S. Vanidha	Temporary Teaching Faculty, Dept of Physics, Bharathidasan Govt College for Women, Pondicherry.
Industry Representative	Ms. A. Yokeswary	Operations Executive, Infosys Ltd., Bangalore, (Doing Ph.D. in Robotics in PTU, Pondicherry).
Faculty member	Dr. G. Shakila	Assistant Professor of Physics, Bharathidasan Govt College for Women, Pondicherry.
Faculty member	Dr. Rama Krishna Jammula	Assistant Professor of Physics, Bharathidasan Govt College for Women, Pondicherry.
Faculty member	Mr. K. Venkitachalapathy	Assistant Professor of Physics, Bharathidasan Govt College for Women, Pondicherry.
Faculty member	Dr. S. Sivakumar	Assistant Professor of Physics, Bharathidasan Govt College for Women, Pondicherry.

The BOS authorize the chairmen to place the syllabus before academic council and for general body meeting for further approval.

BOS MEMBER	NAME	SIGNATURE
Chairman Head of the Department of Physics, Associate Professor, Bharathidasan Govt College for Women, Puducherry.	Dr. R. Madivanane	
VC Nominee Head of the Department of Physics, Professor, Pondicherry University, Puducherry.	Dr R Sivakumar	
Subject Expert Associate Professor of Physics, Periyar Arts College, Cuddalore Tamilnadu- 607001	Dr. R. Thilak Kumar	
Subject Expert Professor in Physics, Rajiv Gandhi college of Engineering and Technology, Kirumampakkam, Puducherry	Dr. K.B. Renukadevi	
Alumna Temporary Teaching Faculty, Dept of Physics, Bharathidasan Govt College for Women, Puducherry.	Dr. S. Vanidha	
Industry representative Operations Executive, Infosys Ltd., Bangalore, (Doing Ph.D. in Robotics in PTU, Puducherry)	Ms.A. Yokeswary	
Faculty member Assistant Professor of Physics, Bharathidasan Govt College for Women, Puducherry.	Dr. G. Shakila	
Faculty member Assistant Professor of Physics, Bharathidasan Govt College for Women, Puducherry.	Dr. Rama Krishna Jammula	
Faculty member Assistant Professor of Physics, Bharathidasan Govt College for Women, Puducherry.	Mr. K. Venkitachalapathy	
Faculty member Assistant Professor of Physics, Bharathidasan Govt College for Women, Puducherry.	Dr. S. Sivakumar	

B. Sc., (PHYSICS) UNDERGRADUATE DEGREE PROGRAM

PREAMBLE

Physics has been evolving through many centuries and has answered some of the oldest and most profound questions asked by human beings. The laws of physics are applicable from the largest of the entities of this universe to the smallest of particles known. The realm of Physics spans theory and application and it requires thinking both in abstract terms and concrete terms. The recent technological advances that have given us fiber optic communications, quantum computers, deep space probes, super capacitors, etc. are based on physics. Thus, the Undergraduate Board of Studies in Physics recognizing the global nature of the subject considers that course structure, syllabi and evaluation play an important role in imparting complete education in tune with the international trends in physics.

The BOS is of the view that the broad goals of this B.Sc. physics course is to impart basic knowledge of the physics discipline including principles, concepts, theories, techniques and relevant skills. The secondary aims are to encourage one to ask questions about the physics behind the nature and to find solutions to questions by the use of scientific reasoning and experimental investigation. The syllabi were modified to develop student traits such as the curiosity, creativity and scientific temper. Our course is tailored with the aim to understand the link between the physics and other disciplines and in addition encourage one to attempt to solve issues in society with the knowledge of physics. Hence, we aim to deliver a concrete foundation in all aspects of physics including classical development and modern trends in physics and to impart wide-ranging mathematical, computational and experimental skills.

PROGRAM EDUCATIONAL OBJECTIVES

Graduates program will be well-prepared to meet professional needs in a global environment. With a strong understanding of physics and problem-solving skills, they will be ready to work in research, industries, and education. They will be able to adapt to new technologies and scientific developments, making them valuable in different fields. The program encourages logical thinking and a research-focused approach, helping graduates solve complex problems and stay competitive in their careers.

Along with technical knowledge, graduates will follow strong moral values and honesty in their personal and professional lives. They will learn the importance of ethical behaviour, responsibility, and fairness in all their work. The program emphasizes truthfulness

in research, professional ethics, and accountability. By developing qualities like teamwork, leadership, and empathy, graduates will be responsible individuals who make good decisions and contribute positively to society.

The program also helps students appreciate and promote cultural diversity and inclusiveness in the workplace. In today's world, where people from different backgrounds work together, graduates will understand the importance of respect, equality, and effective communication. They will be encouraged to create a positive and welcoming work environment where everyone feels valued. By embracing diversity, they will help build a more inclusive and respectful scientific community.

Graduates will also develop strong communication and collaboration skills, enabling them to work effectively in teams and share their knowledge with others. They will be encouraged to think creatively, ask questions, and explore new ideas, which will help them contribute to scientific progress. The program will also prepare them for lifelong learning, ensuring they stay updated with advancements in physics and related fields. Whether pursuing higher education, research, or industry roles, graduates will have the confidence and skills to succeed in their chosen paths while making meaningful contributions to society.

PROGRAM SPECIFIC OBJECTIVES

Graduates program will develop strong academic knowledge with a keen interest in research and higher studies. The program provides a deep understanding of fundamental and advanced concepts in physics, enabling students to explore new scientific ideas and innovations. Through rigorous coursework, hands-on experiments, and research-oriented projects, graduates will be prepared to pursue postgraduate studies, contribute to scientific discoveries, and engage in meaningful research that advances technology and society.

Students will gain a deep understanding of materials like metals, semiconductors, and nanomaterials, exploring their real-world applications. This knowledge enables them to develop innovative technologies for energy, medicine, communication, and industry, addressing societal needs.

The program combines theory and experimentation to help graduates apply physics to real-world problems in research, industry, and daily life. Through labs, computational methods, and projects, they gain problem-solving skills to tackle scientific and technological challenges confidently.

SUMMARY OF PROGRAMME STRUCTURE

Semester	S. No.	Courses as per PU regulation	Course Tittle	Hrs/Wk	Credits	Internal Mark	External Mark	Total Mark
I	1	MJD - 1	Mechanics and Properties of matter	5	4	25	75	100
I	2	MID - 1	Maths-I: Mathematics for Physics - I	5	4	25	75	100
I	3	MLDC - 1	Offered by other Departments	4	3	25	75	100
I	4	AEC - 1	English	4	2	25	75	100
I	5	SEC - 1	Skill Based Physics - I	4	3	25	75	100
I	6	VAC - 1	Environmental Studies	4	2	25	75	100
I	7	VAC - 2	Understanding India	4	2	25	75	100
II	8	MJD - 2	Heat and Thermodynamics	5	4	25	75	100
II	9	MID - 2	Maths-II: Mathematics for Physics - II	5	4	25	75	100
II	10	MLDC - 2	Offered by other Departments	4	3	25	75	100
II	11	AEC - 2	Tamil / Hindi / French	4	2	25	75	100
II	12	SEC - 2	Skill Based Physics - II	4	3	25	75	100
II	13	VAC - 3	Health and Wellness, yoga education, sports and Fitness	4	2	25	75	100
II	14	VAC - 4	Digital Technologies	4	2	25	75	100
III	15	MJD - 3	Optics	6	4	25	75	100
III	16	MJD - 4	Eletromagnetism	6	4	25	75	100
III	17	MID - 3	Maths-III: Numerical Methods	6	4	25	75	100
III	18	MLDC - 3	Offered by other Departments	4	3	25	75	100
III	19	AEC - 3	English	4	2	25	75	100
III	20	SEC - 3	Skill Based Physics - III	4	3	25	75	100
IV	21	MJD - 5	Analog Electronics	6	4	25	75	100
IV	22	MJD - 6	Oscillations and waves	6	4	25	75	100
IV	23	MJD - 7	Experimental Physics - I	6	4	25	75	100
IV	24	MID - 4	Chem-I: Fundamentals of Chemistry - I	6	4	25	75	100
IV	25	AEC - 4	Tamil / Hindi / French	4	2	25	75	100
IV	26	Winter Project	Community Engagement	2	2	25	75	100
V	27	MJD - 8	Material Science	6	4	25	75	100
V	28	MJD - 9	Atomic physics and Relativity	6	4	25	75	100
V	29	MJD - 10	Experimental Physics - II	6	4	25	75	100
V	30	MID - 5	Chem-II: Fundamentals of Chemistry - II	6	4	25	75	100
V	31	MJD - 11	Summer Internship	6	4	25	75	100
VI	32	MJD - 12	Electronic Devices	6	4	25	75	100
VI	33	MJD - 13	Nuclear Physics	6	4	25	75	100
VI	34	MJD - 14	Quantum Physics	6	4	25	75	100
VI	35	MJD - 15	Experimental Physics - III	6	4	25	75	100
VI	36	MID - 6	Chem-III: Spectroscopic Techniques and Tools	6	4	25	75	100

VII	37	MJD - 16	Classical Mechanics	6	4	25	75	100
VII	38	MJD - 17	Quantum Mechanics	6	4	25	75	100
VII	39	MJD - 18	Advanced Experimental Physics - I	6	4	25	75	100
VII	40	MID - 7	Maths-IV: Advanced Mathematical Techniques	6	4	25	75	100
VII	41	MID - 8	Chem-IV: Molecular Spectroscopy	6	4	25	75	100
VIII	42	MJD - 19	Statistical Mechanics	6	4	25	75	100
VIII	43	MJD - 20	Electromagnetic Theory	6	4	25	75	100
VIII	44	MJD - 21	Solid State Physics (or)	6	4	25	75	100
VIII	45	MJD - 22	Astrophysics Project	6	4	25	75	100
VIII	46	MJD - 23	Advanced Experimental Physics - II	6	4	25	75	100
			Total	**240**	**160**			**4600**

COURSE DISTRIBUTION

The National Educational Policy 2020 is being implemented in the college from the Academic year 2023-24 as a three-year programme. From the Academic year 2024-25 the NEP is completely implemented with four-year honors programme and the following scheme was prepared on the model of the NEP 2020 scheme proposed by UGC.

Category	No. of Course	Credits/Course	Total Credits
MJD	19	4	76
MID	8	4	32
SEC	3	3	9
MLDC	3	3	9
Winter Project - Community Engagement	1	2	2
Summer Internship (MJD 11)	1	4	4
Project or 3 MJD Courses (MJD 21, 22 and 23)	1 / 3	12 / (3×4=12)	12
AEC	4	2	8
VAC	4	2	8
Total	44/46		160

COURSE DEFINITION

Major Discipline (MJD)

Major discipline here means to Physics courses under the programme. Students should secure the prescribed number of credits (not less than 50% of the total credits) in the major discipline courses. The major discipline would provide the opportunity for a student to pursue in-depth study of a particular subject or discipline.

Minor Discipline (MID)

Minor discipline means the allied subjects mandatory for the programme, which are offered by other departments. Minor discipline helps a student to gain a broader understanding beyond the major discipline. If necessary, 50% of the minor paper can be offered by the major department itself as recommended by the NEP 2020.

Skill Enhancement Courses (SEC)

These courses are aimed at imparting practical skills, hands-on training, soft skills, and other skills to enhance the employability of students. Courses are designed as per the students' needs with the available resources. Department running the program can choose these courses based on the availability of resources and faculty requirements..

Multidisciplinary courses (MLDC)

All undergraduate students are mandated to pursue 9 credits worth of courses in such Multi- disciplinary areas / Courses. BGCW identified 7 multiple disciplinary streams listed below based on availability of resources and manpower.

(a) Natural Sciences (Botany, Zoology and CND)
(b) Physical Sciences (Physics and Chemistry)
(c) Mathematics & Statistics (Mathematics)
(d) Computer Science/Applications (Computer Science)
(e) Social Sciences (Economics and History)
(f) Humanities (Tamil, English and French)
(g) Commerce & Management (Commerce and Corporate secretaryship)

Students are expected to learn basic/introductory courses designed by other departments for this purpose. College identified 3 introductory courses (among the seven streams listed above) for uniform adoption of all UG students and the courses for every programme will be communicated by the concerned head of the department.

Winter Project - Community Engagement

The curricular component of 'Community Engagement' seeks to expose students to the socio-economic issues in society so that the theoretical learning can be supplemented by actual life experiences to generate solutions to real-life problems. Community Engagement shall be performed for a minimum of 2 weeks after the 3rd semester till the end-of-the 4th semester.

Summer Internship

All students will undergo Internships / Apprenticeships in a firm, industry, or organization or Training in labs with faculty and researchers in their own or other Higher Education Institutions / Research institutions during the summer term.

Students will be provided with opportunities for internships to actively engage with the practical side of their learning. Such Summer Internship is to be conducted in between 4th Semester and 5th semester. A review report and award of grade based on Summer-Internship by students is to be recorded during the 5th Semester.

Research Project

Students choosing a 4 Year Bachelor's degree (Honors with Research) and secured equal to or greater than 75 % of aggregate marks in the first six semesters (7.5 CGPA) may take up research project under the guidance of a faculty member. The students are expected to complete the Research Project in the eighth semester.

Ability Enhancement Courses (AEC)

All Undergraduate (UG) students are mandated to complete at least 8 Credits worth of Courses which focus on Communication and Linguistic skills, Critical reading, and writing skills. These courses are expected to enhance the ability in articulation and presentation of their thoughts at workplace.

Value Added Courses (VAC)

Under NEP-2020, the UGC has proposed for 8 credits worth of common courses which are likely to add value to overall knowledge base of the students. These courses include:

(a) Understanding India
(b) Environmental Science
(c) Digital and Technological solutions
(d) Health & Wellness, Yoga Education, Sports, Fitness, Universal Human Values

The course structure and coverage of topics suggested by UGC and Pondicherry University was taken into consideration and a final syllabus was arrived. These value-added courses are uniform for all the major discipline. The detailed syllabus for each course is attached on the last page.

EXIT OPTIONS FOR CERTIFICATE, DIPLOMA AND DEGREE

The four-year B.Sc. Degree Programme offers multiple exit options, allowing candidates to earn a Certificate, Diploma, UG Degree, UG Degree (Honors), or UG Degree (Honors with Research) based on the credits earned and other conditions met. Candidates opting to exit at the end of the 2^{nd} or 4^{th} semester must have completed an internship of at least 8 weeks in addition to fulfilling the necessary credit requirements to qualify for the relevant certificate or diploma. Regardless of when a student exits or completes the full four-year programme, they must have completed at least one internship of a minimum duration of 8 weeks.

Exit after 2nd Semester

Students who choose to exit after completing the first year (2 semesters) and have earned a minimum of 40 credits will be awarded a UG Certificate, provided they have also completed Internship, for 4 to 6 weeks, worth 4 credits within 60 days after giving their exit option to the Principal. Student is mandated to give the exit option in writing to the principal. The exit-option letter should be forwarded by the Head of the Department of the Programme.

Exit after 4th Semester

Students who opt to exit after completing the second year (4 semesters) and have earned a minimum of 80 credits will be awarded a UG Diploma, provided they also complete a summer internship worth 4 credits, for 4 to 6 weeks, during the summer vacation of the second year. Student is mandated to give the exit option in writing to the principal. The exit-option letter should be forwarded by the Head of the Department of the Programme.

Exit after 6th Semester

Students who choose to exit after completing the three-year (6 semesters) UG programme and have earned a minimum of 120 credits will be awarded a UG Degree. Candidates in the Physics stream who exit after the 6th semester with at least 120 credits and have completed a summer internship of 4 credits for a minimum of 8 weeks during the summer vacation post 4^{th} semester will be awarded a UG Degree in Physics. Student is mandated to give the exit option in writing to the principal. The exit-option letter should be forwarded by the Head of the Department of the Programme.

Table: Exit Option

Exit after	Credits and other requirements	Awards
2^{nd} Semester	Min: 40 Credits & Internship	Certificate
4^{th} Semester	Min: 80 Credits & Internship	Diploma
6^{th} Semester	Min: 120 Credits & Internship	Degree

Four-year UG Degree (Honors or Honors with Research)

Students who wish to continue after 6 semesters may pursue the 4-year honor degree program. Those who successfully complete the above programme with a minimum of 160 credits, will be awarded a UG Degree (Honors).

Students who secure a minimum of 75 % marks (or 7.5 CGPA) in the aggregate of all the previous six semesters and wish to pursue research at the undergraduate level can opt for the research stream in the fourth year. Under the guidance of a faculty member from the College, they must undertake a research project in their major discipline (Physics). Students, who successfully complete the programme with a minimum of 160 credits, including 12 credits from the research project/dissertation, will be awarded a UG Degree (Honors with Research). Alternatively, students who do not opt for research can complete the programme

by selecting three Major Discipline (MJD) courses instead of the research project. Upon earning the required 160 credits, they will be awarded a UG Degree (Honors).

Note: Those who secure less than 75% in aggregate cannot opt for project and they can only pursue the 4-year honor degree program

Table: Condition for Honors / Honors with Research

Academic Conditions	Credits and other requirements	Awards
Secured less than 75 % in aggregate	160 credit	B.Sc (Honors)
Secured greater than or equal to 75 % in aggregate and opt for project work	160 credits with Project	B.Sc (Honors with research)
Secured greater than or equal to 75 % in aggregate and not opt for project work	160 credit	B.Sc (Honors)

SEMESTER-WISE PROGRAMME STRUCTURE

SEMESTER I				
S.No.	**Courses**	**Paper Tittle**	**Hrs/Wk**	**Credits**
1	MJD - 1	Mechanics and Properties of matter	5	4
2	MID - 1	Maths-I: Mathematics for Physics - I	5	4
3	MLDC - 1	Offered by other Departmnets	4	3
4	AEC - 1	English	4	2
5	SEC - 1	Skill Based Physics - I	4	3
6	VAC - 1	Environmental Studies	4	2
7	VAC - 2	Understanding India	4	2
		Total	**30**	**20**

SEMESTER II				
S.No.	**Courses**	**Paper Tittle**	**Hrs/Wk**	**Credits**
1	MJD - 2	Heat and Thermodynamics	5	4
2	MID - 2	Maths-II: Mathematics for Physics - II	5	4
3	MLDC - 2	Offered by other Departmnets	4	3
4	AEC - 2	Tamil / Hindi / French	4	2
5	SEC - 2	Skill Based Physics - II	4	3
6	VAC - 3	Health and Wellness, yoga education, sports and Fitness	4	2
7	VAC - 4	Digital Technologies	4	2
		Total	**30**	**20**

SEMESTER III				
S.No.	**Courses**	**Paper Tittle**	**Hrs/Wk**	**Credits**
1	MJD - 3	Optics	6	4
2	MJD - 4	Eletromagnetism	6	4
3	MID - 3	Maths-III: Numerical Methods	6	4
4	MLDC - 3	Offered by other Departmnets	4	3
5	AEC - 3	English	4	2
6	SEC - 3	Skill Based Physics - III	4	3
		Total	**30**	**20**

SEMESTER IV				
S.No.	**Courses**	**Paper Tittle**	**Hrs/Wk**	**Credits**
1	MJD - 5	Analog Electronics	6	4
2	MJD - 6	Oscillations and waves	6	4
3	MJD - 7	Experimental Physics - I	6	4
4	MID - 4	Chem-I: Fundamentals of Chemistry - I	6	4
5	AEC - 4	Tamil / Hindi / French	4	2
6	Winter Project	Community engagment	2	2
		Total	**30**	**20**

SEMESTER V				
S.No.	**Courses**	**Paper Tittle**	**Hrs/Wk**	**Credits**
1	MJD - 8	Material Science	6	4
2	MJD - 9	Atomic physics and Relativity	6	4
3	MJD - 10	Experimental Physics - II	6	4
4	MID - 5	Chem-II: Fundamentals of Chemistry - II	6	4
5	MJD - 11	Summer Internship	6	4
		Total	**30**	**20**

SEMESTER VI				
S.No.	**Courses**	**Paper Tittle**	**Hrs/Wk**	**Credits**
1	MJD - 12	Electronic Devices	6	4
2	MJD - 13	Nuclear Physics	6	4
3	MJD - 14	Quantum Physics	6	4
4	MJD - 15	Experimental Physics - III	6	4
5	MID - 6	Chem-III: Spectroscopic Techniques and Tools	6	4
		Total	**30**	**20**

SEMESTER VII				
S.No.	**Courses**	**Paper Tittle**	**Hrs/Wk**	**Credits**
1	MJD - 16	Classical Mechanics	6	4
2	MJD - 17	Quantum Mechnaics	6	4
3	MJD - 18	Advanced Experimental Physics - I	6	4
4	MID - 7	Maths-IV: Mathematical Physics	6	4
5	MID - 8	Chem-IV: Molecular Spectroscopy	6	4
		Total	**30**	**20**

SEMESTER VIII					
S.No.	**Courses**	**Paper Tittle**		**Hrs/Wk**	**Credits**
1	MJD - 19	Statistical Mechanics		6	4
2	MJD - 20	Electromagnetic Theory		6	4
3	MJD - 21	Solid State Physics	**(or) Project**	6	4
4	MJD - 22	Astrophysics		6	4
5	MJD - 23	Advanced Experimental Physics - II		6	4
			Total	**30**	**20**

COURSE OUTCOMES

COURSE OUTCOMES: MAJOR DISCIPLINE COURSES

MJD-1: MECHANICS

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

- ❖ The students would learn about the behaviour of physical bodies it provides the basic concepts related to the motion of all the objects around us in our daily life.
- ❖ They would be able to understand the differences between inertial and non-inertial frames and see how pseudo-forces arise in non-inertial frames.
- ❖ They would have a clear understanding of the dynamics of conservative and non-conservative forces in real life such as in gravitational fields or mechanical systems having friction etc.
- ❖ They would feel the thrill to know that the same set of gravitational laws that work for planetary and galactic motions also work in our daily life. Further, they would be able to do mathematical calculations with application of these laws to various objects and artificial satellites.
- ❖ Study the elastic behaviour and working of torsional pendulum. Understand the surface tension and viscosity of fluid.

MJD-2: HEAT AND THERMODYNAMICS

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

- ❖ The course makes the students able to understand the basic physics of heat and temperature and their relation with energy, work, radiation and matter.
- ❖ They will acquire the knowledge about the fundamentals of gas kinetic theory and transport phenomenon.
- ❖ The students will understand the fundamental principles of thermodynamics, including the first and second laws.
- ❖ The students also learn how laws of thermodynamics are used in a heat engine to transform heat into work.
- ❖ They would learn the idea of entropy and associated theorems, and the thermodynamic potentials and their physical meanings.
- ❖ Students will have an understanding of Maxwell's thermodynamic relations.

MJD-3: OPTICS

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

- ❖ The student will get an introduction to the discipline of optics and its role in daily life. Understands reflection and refraction from geometrical optical idea.
- ❖ They able to calculate focal length and magnification of thin, thick and combinational lens arrangement optics through matrix methods.
- ❖ They understand aberrations in image formation through lenses. They appreciated techniques behind the correction techniques used to reduce chromatic, spherical and other aberrations in practical devices like still cameras, digital cameras, etc.
- ❖ The student gains a strong knowledge of wave optics by learning phenomena interference, diffraction and polarization.
- ❖ The student will be able to analyze and calculate interference between light waves and application of the theory to various interferometers along with their practical applications.
- ❖ The student would know the conditions for near and far-field diffraction and be able to calculate the far-field diffraction from gratings and simple aperture functions.

- ❖ The student would understand how the polarization of light changes at reflection and transmission at interfaces.

MJD-4: **ELECTROMAGNETISM**

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

- ❖ It gives an opportunity for the students to learn about one of the fundamental interactions of electricity and magnetism, both as separate phenomena and as a singular electromagnetic force.
- ❖ The course contains vector analysis, electrostatics, magnetism, electromagnetic induction.
- ❖ Comprehend and apply the understanding of fundamental laws and concepts in electricity and magnetism, to explain natural physical processes and related technological advancements.
- ❖ Learn about the origin and basic properties of static as well as dynamic Electric and Magnetic fields.
- ❖ Account for the importance of electricity and magnetism in society, especially with regard to technological applications.
- ❖ Visualize and design experiments based on the basic concepts of electricity and magnetism, and obtain information in order to explore physical principles.

MJD-5: **ANALOG ELECTRONICS**

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

- ❖ Understand the basics of diode and working of rectifier circuits and its characteristics.
- ❖ Understand about analog passive and active components and how these can be exploited to construct amplifiers, oscillators, regulators and filters.
- ❖ Understanding and ability to analyze the characteristics of transistor and transistor biasing circuits.
- ❖ Understanding and ability to work with of single stage and multistage amplifier.
- ❖ Understand the concepts and analyses the analog circuits such as Amplifiers, cascaded amplifiers, Push Pull amplifier.
- ❖ They gain knowledge on the working of Junction Field Effect Transistor and MOS Field Effect Transistor and their applications
- ❖ Examine real time problems, implement with analog electronic circuits by employing modern tools.
- ❖ Assess the need of modern society with professional ethics in electronics and recommend solutions for the same.

MJD-6: **OSCILLATIONS AND WAVES**

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

- ❖ Acquire the knowledge of sound waves and its properties understand the concepts of wave motion
- ❖ Understand how several waves or parts of waves interact, and be able to calculate and analyze diffraction and interference phenomena, and explain the conditions required for such phenomena to appear.
- ❖ Able to solve wave equation and understand significance of transverse waves.
- ❖ Use Lissajous figures to understand simple harmonic vibrations of same frequency and different frequencies.
- ❖ Able to solve wave equation of a longitudinal vibration in bars free at one end and also fixed at both the ends.
- ❖ Gain knowledge on applications of transverse and longitudinal waves.

- ❖ Understand application of acoustics in noise and music, musical scale, and the comprehend the design of auditorium.

MJD-7: EXPERIMENTAL PHYSICS – I

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

- ◈ Students would perform experiments related to computing young's modulus, rigidity modulus.
- ◈ They will learn experiments related to optical devices: and carry out experiments using them to measure dispersive power of prisms through spectrometers.
- ◈ Experiments on spectrometers instill good skills in carry out optical measurements
- ◈ Students have practical knowledge about laws of resistance, measurement of resistivity, comparing the capacity of capacitors.
- ◈ They would also learn to measure the static characteristics of junction and zenor diodes, transistors, JFETs.
- ◈ Able to design rectifier circuits employing diodes and wave shaping circuits suing diodes.
- ◈ Computer simulation Experiments will give deep insight in the working of wave shaping circuits, they were capable of simulate working of rectifiers to convert AC into DC.
- ◈ By simulating study of Michelson Morley experiments they able understand and develop diligence in measurement and instrumental fine tuning.

MJD-8: MATERIAL SCIENCE

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

- ❖ Students would be able to understand various types of crystal structures and symmetries and understand the relationship between the real and reciprocal space and learn the Bragg's X-ray diffraction in crystals.
- ❖ Understand the basic concepts of force between atoms and bonding between molecules. Understanding of x-ray diffraction experiment and reciprocal lattice
- ❖ Comprehend crystal vibrations: phonon heat capacity and thermal conductivity
- ❖ Appreciate free electron Fermi gas model and related ideas such as density of states, Fermi level, and electrical conductivity
- ❖ Recognize the idea of electrons in periodic potential in addition they will understand energy bands theory classification of metals, semiconductors and insulators
- ❖ Comprehend the concept of band gap, effective masses, charge carrier distributions, doping, p-n junctions.
- ❖ Appreciate the relationship between conductors and insulators and super conductivity.

MJD-9: ATOMIC PHYSICS AND RELATIVITY

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

- ❖ Understand the properties of positive rays, experimental proof by frank and hertz method.
- ❖ Analyze the relationship between various types of orbital couplings
- ❖ Describe theories explaining the structure of atoms and the origin of the observed spectra. Understand the properties of x-ray and its generation.
- ❖ Explain the observed dependence of atomic spectral lines on externally applied electric and magnetic fields. Identify atomic effect such as Zeeman Effect and Stark Effect.
- ❖ Perform calculations using the Lorentz transformation formulae and define the notion of an inertial frame and the concept of an observer.
- ❖ State the principles of Special Relativity and use them to derive time dilation and length contraction.

- ❖ Define relativistic energy and momentum, and use these to solve problems in relativistic mechanics

MJD-10: EXPERIMENTAL PHYSICS – II

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

- ◈ Students would do advance experiments pertaining to the calibration of High range voltmeters, measuring current and voltage sensitiveness of galvanometers thereby acquire practical skills for such measurements.
- ◈ Students acquire practical understanding of the laws of resistance, resistivity measurement, and band gap of semiconductors.
- ◈ They are capable of using the optical interference effect to measure the focal length of lenses. They will study optical device experiments and use them to determine prism dispersive power using spectrometers.
- ◈ Laser measurements inculcate the idea of accuracy in measuring and the requirement of safety while performing such laser experiments. They developed the ability to construct oscillator circuits and measures the frequency of such oscillators using CROs and frequency counters.
- ◈ Through Logic gate construction they develop the understanding that gates are building block of digital circuits. They are capable of designing combinational logic circuits.
- ◈ They can able to simplify complex logic equations through k-map techniques and implement the simplified expressions using universal logic gates.
- ◈ Computer simulation of digital registers made them to understand the constructional necessities and constraints in designing such digital circuits.

MJD-11: SUMMER INTERNSHIP

- ◈ Students get familiarize with the real-world problems and situations. Motivated to work under guided atmosphere and as team member.
- ◈ To expose he students to various experimental and analytic techniques related to everyday problems.
- ◈ To enable the students to have a hands-on experience to work in their desired field.
- ◈ Understands how their course of study applies to the real world and build a valuable experience that makes them stronger candidates for jobs after graduation.

MJD-12: ELECTRONIC DEVICES

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

- ❖ Outline the concepts of op amp and its basic circuit operation and experimenting the configuration of Op-amp into its application to solve various circuit parameters.
- ❖ Understand the importance of the different types of the number systems, different types of the Logic gates, Boolean laws and K-map in the branch of digital electronics.
- ❖ Ability to use IC in different applications like, to verify laws and theorems of Boolean algebra, to study basic combinational circuits etc.
- ❖ Comprehend the functions and working of flipflop circuits registers and counters
- ❖ Understand synchronous sequential circuits, registers and multiplexer-demultiplexer. apply the working principle of various analog and digital instruments and analyse them in the measurement of physical parameters
- ❖ Assess the need of automatic electronics devices by the society and recommend solutions by inventing the circuits.
- ❖ Understands the design and working of 8085 microprocessor and ability to program them. They can evaluate the requirements of analog and digital circuits for social needs.

MJD-13: NUCLEAR PHYSICS

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

- After successful completion of the course on Nuclear Physics, students will:
- Grasp the knowledge about basic nuclear properties and nuclear models for a better understanding of nuclear reaction dynamics.
- Analyze quantum mechanical phenomena in nuclear physics and develop an understanding of quantum mechanics also.
- Comprehend the general understanding of phenomena like nuclear fusion and fission and develop the skills required for solving basic problems in nuclear physics at different nuclear energy ranges.
- Develop the basic understanding of accelerator physics and particle detectors.
- Acquire and apply basic nuclear physics knowledge in subjects such as medicinal, archaeology, geology, and other multidisciplinary fields of Physics and Chemistry.
- Understand the ideas of basics of nucleus and their energy. Grasp the fundamental procedures for nuclear fission and fusion.
- Ability to apply fundamental conservation laws and symmetries to judge the viability of production and decay processes for nuclei and elementary particles.
- Understand the roles of nuclear and particle physics in energy production, medicine, and astrophysics - for example how to search for dark matter and how to understand the origin of the elements in the universe.

MJD-14: QUANTUM PHYSICS

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

- Quantum mechanics provides a platform for the physicists to describe the behaviour of matter and energy at atomic and subatomic level. The course plays a fundamental role in explaining how things happen beyond our normal observations
- Student understands the inadequacies of classical Physics and the way in which it was overcome by various concepts and theoretical developments of modern Physics i.e. understand how major concepts developed and changed over time.
- Students comprehend the most modern concept of wave particle duality as to how a wave could behave like a particle and how a particle could behave like a wave.
- Students appreciate the Heisenberg's Uncertainty principle and its applications and will appreciate its importance in the development of quantum physics.
- An appreciation of the Schrödinger Wave Equation and its application to various problems in quantum mechanics will make students more analytical.
- They comprehend the tools needed to solve problems across science subjects as Schrödinger equation appears in multidisciplinary subjects.
- It will make students capable of analyzing and solving problems using reasoning skills based on the concepts of quantum physics.

MJD-15: EXPERIMENTAL PHYSICS – III

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

- Through advanced experiments related to thermo emf and temperature coefficient of resistance measurement, students gain practical skills for these measures.
- Students gain a hands-on training on measurement of temperature coefficient of a thermistors and understand the rise and fall of ac current in an LR circuit.
- They have the ability to use optical instruments to measure resolving power. They gain experience utilizing spectrometers to investigate the different characteristics of prisms and small angled prisms.

- They gained the skills to build circuits for amplifiers and oscillators and use frequency counters and CROs to measure the frequency and frequency response of these circuits.
- They learn that logic gates are the fundamental building blocks of digital circuits through the creation of logic gates and are able to create circuits using combinational logic.
- They were able to comprehend the constructional requirements and limitations in creating digital circuits by computer simulations of digital counters, encoders, and decoders.

MJD-16: CLASSICAL MECHANICS

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

- Understand the fundamental concepts of analytical mechanics such as generalized coordinates and moment, the Lagrange and Hamilton functions, the action, cyclic coordinates and the relation between symmetries and conserved quantities, as well as the use of Poisson brackets.
- Ability to use the Lagrange and Hamilton equations to solve complex mechanical problems, and to use phase-space based arguments to achieve a qualitative understanding of the existing solutions, as well as to apply variational calculus to more general problems.
- To solve the problems of classical Mechanics by applying Euler, Lagrangian, Hamiltonian and Legendre mechanisms.
- To evaluate the rotation of rigid bodies and develop the solution for problems based on rotational motion.
- Understand the fundamental concepts of special relativity and their physical consequences, such as the Lorentz transformation, invariant quantities, the metric, and four-vectors and more general tensors, as well as their use in covariant formulations of physical laws.
- Ability to perform calculations using relativistic mechanics and conservation laws, including Newton's second law on covariant form.

MJD-17: QUANTUM MECHANICS

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

- Students will learn the basic concepts of Quantum mechanics which applies to all the physical systems irrespective of their size and can be beautifully perceived at atomic and subatomic level.
- The Eigen values and Eigen functions of linear harmonic oscillator and Hydrogen atom will help students to understand the behaviour of microscopic systems.
- The students shall have a good exposure to the approximation methods.
- Develop knowledge and understanding of the concept that quantum states live in a vector space. Elate this abstract formulation to wave and matrix mechanics
- Develop a knowledge and understanding of perturbation theory, level splitting, and radiative transitions
- Develop a knowledge and understanding of the relation between conservation laws and symmetries.
- Understand the approximate methods for solving stationery and time-dependent problems. Develop a knowledge and understanding of the scattering matrix and partial wave analysis

MJD-18: ADVANCED EXPERIMENTAL PHYSICS – I

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

- Students gained practical skills for delicate measurements through sophisticated experiments carried to determine Cauchy's constants, the Planck constant, and the Rydberg constant.
- Students gain a practical skill in the measurement of refractive index of liquids by Abbe's refractometer and understand the rise and fall of ac current in an RC circuit.
- They have the hands-on skill to use optical bench to measure wavelength of monochromatic sources using Bi-prisms.
- They acquired the ability to perform mathematical operations like integration and differentiation as well as wave shaping with the help of Op-amp circuits.
- They possess the capability to design circuits utilizing combinational logic components, including XOR and XNOR gates. Additionally, they are proficient in constructing memory elements such as RS, D, JK, and master-slave flip-flops.
- Proficient in developing assembly language programs for the addition and subtraction of 8-bit numbers utilizing 8085 microprocessors.
- Capable of understanding the design specifications and constraints involved in the creation of digital circuits through computer simulations of digital multiplexers and demultiplexers.

MJD-19: STATISTICAL MECHANICS

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

- Acquires the knowledge of different laws of thermodynamics. Recognize the difference between macro-state and microstate.
- Understand about diverse thermodynamic potentials and their importance to deduce reciprocity relations and Bragg-William's approximation.
- Comprehend the concept of ensembles and partition function.
- Apply the Knowledge about Liouville's theorem and its importance to MB distribution law, BE and FD distribution law.
- Understands to apply Bose-Einstein and Fermi-Dirac distribution laws to problems in statistical mechanics, such as photon gas, electron gas, etc.
- Apply and analyze the statistical laws to study transport phenomena.
- Evaluate and check the knowledge from phase transitions of first and second type

MJD-20: ELECTROMAGNETIC THEORY

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

- Ability to use vector calculus to static electromagnetic fields in different engineering situations.
- Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
- Analyze the nature of electromagnetic wave propagation in guided medium which are used in microwave applications.
- Ability to formulate potential problems within electrostatics, magnetostatics and stationary current distributions in linear, isotropic media, and also solve such problems in simple geometries using separation of variables and the method of images.
- Ability to define and derive expressions for the energy both for the electrostatic and magnetostatic fields, and derive Pointing's theorem from Maxwell's equations and physical interpret.

- ❖ Ability to describe and make calculations of plane electromagnetic waves in homogeneous media, including reflection of such waves in plane boundaries between homogeneous media.
- ❖ Compare and summarize TE, TM, TEM waves, normal and oblique incidences for conductors.

MJD-21: SOLID STATE PHYSICS

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

- ❖ Acquire knowledge and understand the behaviour of electrons in solids based on classical and quantum theories.
- ❖ Apply the knowledge and analyses the available semiconducting and superconducting materials
- ❖ Able to differentiate between ferroelectric, anti-ferroelectric, piezoelectric, pyro electric materials.
- ❖ Develop and synthesize new materials for a requirement. Create an eco-friendly environment with lifelong development and usage of condensed matters.
- ❖ Understands Magnetic, dielectric and superconducting properties of solids along with capability of consulting recent published results in solid state physics by various researchers.

MJD-22: ASTRO PHYSICS

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

- ❖ To understand the technique in observational astronomy
- ❖ To understand the distance ladder in the context of the size of the Universe
- ❖ Comprehend the Sun and stellar synthesis. Interstellar medium and their importance in planet and star formation.
- ❖ Understand Galaxies and their morphology. They even comprehend the active galaxies and the unified model proposed for various types of AGNs
- ❖ Understands Smooth and clumpy universe. Grasp the basic mathematical machinery of the background Universe.
- ❖ Comprehend, apply, and analyze the most important scientific models governing modern astrophysics and be familiar with the astronomical objects studied by astronomers.

MJD-23: ADVANCED EXPERIMENTAL PHYSICS – II

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

- ❖ Students gained practical skills for delicate measurements through sophisticated experiments carried out to determine electronic charge, the e/k value and Hall coefficient.
- ❖ Students gain practical skill in the measurement of velocity of ultrasonic waves in liquids by ultrasonic Interferometer. They have the hands-on skill to study the characteristic of solar cells.
- ❖ They acquired the ability to perform mathematical operations like addition and subtraction as well as wave shaping with the help of Op-amp circuits.
- ❖ They possess the capability to design circuits utilizing combinational logic components, including parity generator and checker.
- ❖ Additionally, they are proficient in constructing half adder and full adder circuits and hence they can able to extend their ideas to similar circuits.

- ❖ Proficient in developing assembly language programs for the multiplication and division of 8-bit numbers utilizing 8085 microprocessors.
- ❖ Capable of writing assembly language programs for advance process, like Fibonacci series generation, learned through computer simulations of microprocessor.

PROJECT WORK: (Instead of MJD 21, 22 and 23)

- ◈ Through a supervised project, a student will get exposure to one of the areas of research, preferably of his own choice.
- ◈ During the project, the student will learn about the literature survey, identification of the research problem and then work on the problem during the project duration.
- ◈ The student will get the feel and methodology of the research work and rigorously do focused work in the area of the topic of the major research project chosen.
- ◈ The student will learn to focus and complete desired task within a specified time frame.
- ◈ The endeavor will be to prepare the student research-ready in the fourth year of graduation.
- ◈ The student will have motivation to directly enter into the Ph.D. programme immediately after the B.Sc.(honors with research) degree.

COURSE OUTCOMES: MINOR DISCIPLINE COURSES

MID-3: NUMERICAL METHODS

On completion of this course students will be able to

- Understand numerical techniques to find the roots of equations and solution of system of linear equations.
- Comprehend the difference operator, use of interpolation and matrices and applying numerical techniques to solve physics problems.
- Understand numerical differentiation and integration and numerical solutions of ordinary and partial differential equations.
- Be aware of the use of numerical methods in modern scientific computing, numerical interpolation and approximation of functions
- Apply numerical differentiation and integration whenever and wherever routine methods are not applicable.
- Able to write simple programs using built-in data types of Python and understands program codes to solve numerical integration, differentiation, etc., using Python.
- Evaluate the complex problems in physics based on specific theories, synthesis computational methods adapted to produce precise and accurate results on select problems

MID-6: SPECTROSCOPIC TECHNIQUES AND TOOLS

After completion of the course students will be able to understand the

- Understand rotational, spectra of molecules and their applications. Comprehend the fundamental laws of spectroscopy and selection rules. Appreciate the design of UV spectrophotometers.
- Understands different spectroscopic methods Fluorescence - phosphorescence techniques to identify structure of molecules. Understands the mass spectrometric method in identifying the elemental or isotopic signature of a sample.
- Comprehend different analytical methods (Thermogravimetry, Differential thermal analysis, and Differential scanning calorimetry.) to measure physical and chemical characteristics of chemicals.
- Gained knowledge about the working of electron microscopic technique (SEM and TEM) and other advanced methods such as AFM.
- Get a good knowledge of the principles, experimental techniques and broad chemical application of Rotational spectroscopy. Appreciate the design of Microwave spectrophotometers and able to explain the microwave spectra of simple molecules.
- The student understands the condition for laser oscillation in different types of optical resonators, their stability, and different kinds of laser systems.
- Understand basics of three-level and four-level lasers, Ruby, He-Ne and semiconductor lasers, laser as spectroscopic tool.

MID-7: ADVANCED MATHEMATICAL TECHNIQUES

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

- Understands advanced mathematical techniques that enable students to solve advanced problems in various fields of Physics.
- Acquire the knowledge about different mathematical methods like vector space and matrix spaces and Develop skills to deduce eigen vales, eigen vectors and can perform unitary transformations.

- Understands the techniques behind solving partial differential equations. Comprehends the use different types of coordinate systems for solving different physics problems.
- Identify complex-differentiable functions and compute line integrals using Cauchy's integral theorem for different physics problems, apply method of separation of variable in different coordinate systems.
- Apply matrix spaces, partial differential equations, integral transforms, special functions to obtain the solution for complex physics problems. construct Fourier series and integral transforms and special functions.
- Understands the use of Bessel Functions Legendre Polynomials and Hermite Polynomials. Analyses the solutions obtained by various mathematical methods.

MID-8: MOLECULAR SPECTROSCOPY

On completion of this course students will be able to

- Understand, vibrational and Raman spectra of molecules and their applications. Understand the working of IR spectrometer, Raman spectrometer.
- Gain knowledge of the salient features of IR spectra and its experimental arrangements. Able to identify functional groups from spectra of simple compounds.
- They appreciate the relation between the IR and Raman techniques and develop knowledge to use both IR and Raman spectra to determine the structure of some simple molecules.
- Acquired knowledge on electronic spectra of molecules and molecular photo electron spectroscopy
- Able to describe electron spin resonance and nuclear magnetic resonance spectroscopy and their applications.
- Understands the principles of electron spin resonance, NQR and Mossbauer spectroscopy. They able to apply their knowledge in explaining molecular structure and other properties f simple molecules.

COURSE OUTCOMES: SKILL ENHANCEMENT COURSES

SEC-1: SKILL BASED PHYSICS – I

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

- Students would perform basic experiments related to mechanics and also get familiar with various measuring instruments would learn the importance of accuracy of measurements.
- Students will better appreciate the theoretical concepts in mechanics, properties of matter, sound, electricity and optics through experiments.
- Capable of experimentally measuring properties like Youngs modulus, surface tension, viscosity, thermo emfs, specific heat capacities,
- Cabale of carryout calibration of voltmeters, diffraction grating
- Experimentally understands the laws of resistance, Fourier analysis, law of gravitation, laws of transverse vibration in strings.
- Computer simulation Experiments imparting them insight in the simulation techniques, and provide basis for modeling.

SEC-2: SKILL BASED PHYSICS – II

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

- Students will conduct fundamental experiments on the properties of matter, become acquainted with a range of measuring devices and understand the significance of measurement errors.
- Students will gain a deeper understanding of theoretical concepts in properties of matter, sound, electricity, and optics by conducting experiments.
- Experimentally measurable properties such as the rigidity modulus, specific heat capacities, thermal conductivity, and magnetic induction can be determined by students.
- Conduct a calibration of ammeters and a characteristic study of thermistors, in addition to using a diffraction grating to carryout measurements.
- Capable of comparing the viscosity of various liquids, they can also experimentally determine the wavelength of different sources using spectrometers
- Computer simulation experiments offer insights into simulation techniques, and serve as a basis for modeling.

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SEC-3: SKILL BASED PHYSICS - III

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

- Students would do simple experiments pertaining to elasticity and other properties of matter and also able to quantify the acceleration due to gravity at a location.
- Through a variety of experiments, students acquire hands-on experience with latent heat and radiation as well as magnetic moment measurements.
- Students do measurements like resistivity and earth's magnetic induction and possess practical knowledge of electricity and magnetism.
- Through experimental studies with electrically maintained tuning forks, they have a realistic understanding of wave motion. Additionally, they would use the optical interference effect to gauge the thickness of thin wires.
- Better methods for conducting optical testing are provided by experiments on polarization by reflection and interference by biprism.
- They were able to mimic how mirrors and lenses worked to focus light. By modeling interference, they are able to model other optical effects.

COURSE OUTCOMES FOR MINOR DISCIPLINE COURSES OFFERED TO OTHER DEPARTMENTS

CONCEPTUAL PHYSICS-1

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

- Understand and define the laws conservation of energy, linear momentum, angular momentum and their applications.
- Develop the knowledge about simple harmonic motion and its use in finding different quantities like g, MI, etc.
- Understand the concept of elasticity and to recognize their applications in various real problems.
- Comprehend the knowledge about the importance of material properties, - viscosity and surface tension and gain a well understanding of various physics concepts involved in day-to-day life.
- Understand and define the laws of thermodynamics, heat transfer, and their applications, develop knowledge of thermal properties of matter to solve problems in relevant field.

CONCEPTUAL PHYSICS-2

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

- Understand the concept of optics and related instruments, and gain a detailed idea about prisms and grating components.
- Students will understand the basic laws of electric current, fields, and potential, as well as polar and nonpolar molecules.
- Students will gain knowledge about magnetic behavior, magneto statics, and magnetic fields.
- Students will get an idea about modern physics concepts.
- Students will understand the phenomenon of stimulated emission, the laser concept, characterization, and types.

CONCEPTUAL PHYSICS PRACTICAL

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

- Capable of experimentally measuring properties like Young's modulus, surface tension, viscosity, thermo emfs, specific heat capacities,
- Capable of carryout calibration of voltmeters, diffraction grating
- Experimentally understands the laws of resistance, Fourier analysis, law of gravitation, laws of transverse vibration in strings.
- Experimentally measurable properties such as the rigidity modulus, specific heat capacities, thermal conductivity, and magnetic induction can be determined by students.
- Conduct a calibration of ammeters and a characteristic study of thermistors, in addition to using a diffraction grating to carryout measurements.
- Capable of comparing the viscosity of various liquids, they can also experimentally determine the wavelength of different sources using spectrometers
- Computer simulation Experiments imparting them insight in the simulation techniques, and provide basis for modeling.

SYLLABUS FOR MAJOR COURSES

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : I	MECHANICS AND PROPERTIES OF MATTER	SEMESTER: I
PAPER : MJD-01		CREDIT : 4

UNIT – I: Laws of motion (12 Hours)
Laws of motion - conservative forces and potential energy - law of conservation of momentum and energy for a system of particle-angular momentum and torque - law of conservation of angular momentum for system of particle - rotating frame of reference - centrifugal and Coriolis forces as fictitious forces -Foucault pendulum.

UNIT – II: Gravitation (12 Hours)
Newton's law of gravitation - motion under central force - Kepler's laws-proof for II and III law - gravitational field and intensity of: uniform solid and hollow sphere - gravitational self-energy of system of masses - rocket - rocket equation - weightlessness.

UNIT – III: Collision (12 Hours)
System of particles - equation of motion - center of mass -motion of two spheres- Direct impact of two smooth spheres, determination of final velocities and loss of kinetic energy - oblique impact of two smooth spheres – loss of kinetic energy due to oblique impact.

UNIT – IV: Rigid Body Dynamics (12 Hours)
Rigid body - degrees of freedom - angular momentum of a rigid body – proof of theorems of moment of inertia – moment of Inertia of: circular disc, cylinder and hollow sphere – moment of Inertia of a diatomic molecule - moment of inertia tensor-Euler's equation for rotating rigid body - precessional motion (qualitative) -Gyroscope.

UNIT – V: Elasticity, Viscosity & Surface Tension (12 Hours)
Modulus of elasticity and their inter-relation - work done in strains -torsion of a cylinder - torsion pendulum – bending of a beam - bending moment - expression for the depression of beams - non-uniform bending-determination of young's modules.
Streamline and turbulent flow - equation of continuity - Euler's equation - Bernoulli's theorem from Euler's equation. Surface tension – Molecular interpretation – Drop weight method.

Books for Study

1. Mechanics, P K Srivastava, 2nd ed., 2007, New Age International Publishers,
2. Introduction to Mechanics, Mahendra K. Verma, 2nd ed., 2016, Universities Press India Pvt Ltd.
3. Properties of Matter, D. S. Mathur, 1st Ed., 38th Reprint, 2010, S. Chand & Co.

Books for Reference

1. Classical Mechanics, David Morin, 1st ed, 2008, Cambridge University Press.
2. Mechanics, Durai Pandiyan P et al, 1st ed., 1995, S. Chand, Limited.
3. Fundamentals of Physics, Resnick, Halliday and Walker, 10th ed., 2013, John Wiley & Sons.
4. Feynman lectures on Physics, Volume - I, 1986, Narosa Publishing House.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : I	**SKILL BASED PHYSICS - I**	**SEMESTER: I**
PAPER : SEC-01		**CREDIT : 3**

*Choose any **Eight** experiments from the following list*

LIST OF EXPERIMENTS

1. Compound pendulum- determination of g, radius of gyration and moment of inertia.
2. Young's modulus - non-uniform bending – Scale and telescope method.
3. Rigidity modulus - Torsional oscillations without masses.
4. Surface tension of a liquid & interfacial surface tension by the drop weight method.
5. Stoke's method - determination of viscosity.
6. Specific heat capacity of a liquid and emissivity of a surface - method of cooling.
7. Spectrometer – velocity of light in a liquid - hollow prism.
8. Spectrometer calibration of grating - Normal incidence method.
9. Potentiometer - calibration of low range voltmeter (0 - 1.5 V).
10. P.O. box - resistivity and verification of laws of resistance.
11. Variation of period of oscillations of a spring with mass and spring constant.
12. Emf of thermocouple using digital multimeter.
13. Computer simulation of law of gravitation - PHET Sim.
14. Computer simulation -fluid flow - PHET Sim.
15. Computer simulation of Fourier analyses a given wave-PHET sim.
16. Computer simulation of Normal modes of vibration – PHET sim.

Books for Study:

1. Practical Physics and Electronics, C.C. Ouseph et al, 1st ed., 2009, S. Viswanathan Pvt. Ltd.
2. Practical Physics, M.N. Srinivasan et al, 1st ed., 2013, Sultan Chand and Sons.
3. A Textbook of Practical Physics, H.P. Shrivastava, 1st ed., 2008, ABD Publishers.

Books for Reference:

1. Practical Physics, G. L. Squires, 4th ed., 2001, Cambridge University Press (South Africa).
2. Practical Physics (for B.Sc. Physics), Dept of Physics, R ed., 2015, St Joseph college, Trichy.

Websites for Simulations:

1. PHET Simulations -https:/ /phet.colorado.edu/en/simulations/category/physics/
2. Physics Animations - http://www.vascak.cz/physicsanimations.php?l=en/

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : I	HEAT AND THERMODYNAMICS	SEMESTER: II
PAPER : MJD-02		CREDIT : 4

UNIT -I: Kinetic Theory (12 Hours)
Review of the kinetic model of an ideal gas – interpretation of temperature - law of equipartition of energy and its applications to specific heat of gases: mono-atomic and diatomic gases – molecular theory of mean free path (zeroth order)-derivation - transport phenomena: viscosity, conduction and diffusion – Wander walls equation of gas – critical constants.

UNIT -II: Introduction to Thermodynamics (12 Hours)
Zeroth Law of thermodynamics and temperature - first law and internal energy - various thermodynamical processes - applications of first law: general relation between C_P & C_V - work done during isothermal and adiabatic process - reversible & irreversible processes.

UNIT -III: Thermodynamic Laws (12 Hours)
Second law & entropy - Carnot's cycle - Carnot's theorem - refrigerator - entropy changes in reversible & irreversible processes - entropy-temperature diagrams - third law of thermodynamics - unattainability of absolute zero.

UNIT -IV: Thermodynamic Relations (12 Hours)
Maxwell's thermodynamic relations - applications of Maxwell's relations: Clausius-Clapeyron equation, expression for ($C_P - C_V$), TdS equations. Thermodynamic potentials - enthalpy, Gibbs, Helmholtz and internal energy functions - relation to thermodynamic variables.

UNIT -V: Radiation (12 Hours)
Blackbody radiation - spectral distribution - concept of energy density - Stefan law -Wein's law- Rayleigh jeans law-ultraviolet catastrophe - derivation of Planck's law - deduction of Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law.

Books for Study:

1. Heat, Thermodynamics and Statistical Physics, Brij Lal et al., 3rd ed., 2008, S. Chand & Co.
2. Thermal Physics, A.B.Gupta and H.Roy, 3rd ed., 2010, Books & Allied Ltd., New Delhi.
3. Thermal Physics, A. Kumar and S.P. Taneja, 1st ed., 2014, S. Chand &Co.

Books for Reference:

1. Thermodynamics, Kinetic theory & Statistical thermodynamics, F W Sears et al., 3rd ed., 1975, Pearson.
2. Heat and Thermodynamics, M W Zemasky and R. Dittman, 7th ed., 1996. McGraw Hill.
3. Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1st ed., 1993, Tata McGraw-Hill.
4. Statistical Mechanics, Gupta and Kumar, 24th ed., 2011, Pragati Prakashan.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : I	**SKILL BASED PHYSICS - II**	**SEMESTER: II**
PAPER : SEC-02		**CREDIT : 3**

*Choose any **Eight** experiments from the following list*

LIST OF EXPERIMENTS

1. Young's modulus - Uniform bending – Pin and microscope method.
2. Rigidity modulus - Torsional pendulum with masses.
3. Poiseuille's flow method – comparison of viscosity.
4. Specific Heat capacity of a liquid - Joule's calorimeter.
5. Thermal conductivity of a bad conductor - Lee's disc method.
6. Sonometer - determination of frequency and verification of laws of transverse vibrations.
7. Spectrometer- wavelengths of mercury spectrum - Minimum deviation method (I order)
8. Spectrometer: Grating - wavelength of sodium lines - normal incidence (I & II Order)
9. Potentiometer - calibration of low range ammeter (0-1.5 amps).
10. P.O. box - temperature coefficient of the material of a coil of wire.
11. Study of characteristics of a thermistor using digital multimeter.
12. Field along the axis of the circular coil carrying current - determination of B_H.
13. Computer simulation of circuit loops and verification of Kirchoff's law - Physics Animations.
14. Computer simulation of AC and DC circuits - PHET Sim.
15. Computer simulation - isothermal, adiabatic, isobaric and isochoric process. - PHET Sim.
16. Computer simulation of Blackbody radiation-PHET Sim

Books for Study

1. Practical Physics and Electronics, C.C. Ouseph et al, 1st ed., 2009, S. Viswanathan Pvt. Ltd.
2. Practical Physics, M.N. Srinivasan et al, 1st ed., 2013, Sultan Chand and Sons.
3. A Textbook of Practical Physics, H.P. Shrivastava, 1st ed., 2008, ABD Publishers.

Books for Reference:

1. Practical Physics, G. L. Squires, 4th ed., 2001, Cambridge University Press (South Africa).
2. Practical Physics (for B.Sc. Physics), Dept of Physics, R ed., 2015, St Joseph college, Trichy.

Websites for Simulations:

1. PHET Simulations -https:/ /phet.colorado.edu/en/simulations/category/physics/
2. Physics Animations - http://www.vascak.cz/physicsanimations.php?l=en/

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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : II	**OPTICS**	**SEMESTER: III**
PAPER : MJD-03		**CREDIT : 4**

UNIT – I: Matrix Optics (12 hours)

Fermat's principle - reflection and refraction - Matrix method - translation matrix - refraction matrix - system matrix for thick and thin lens – focal length of thin and thick lens - focal length of thin lens combination - magnification. Cardinal points - focal points, principal points and nodal points. Chromatic aberrations - achromatic combination of separated lenses- monochromatic aberrations and their reduction.

UNIT – II: Interference (12 hours)

Coherent sources - conditions for interference - principle of superposition - visibility of fringes - Fresnel's bi-prism - determination of wavelength of monochromatic light - Stoke's phase change on reflection – interference in thin films - air-wedge - Newton's rings, determination of wavelength and refractive index – Michelson's interferometer - principle, construction and working - formation of circular and straight fringes - determination of wavelength and thickness of transparent sheet.

UNIT – III: Fresnel Diffraction (12 hours)

Diffraction - comparison of Fresnel and Fraunhofer diffraction - Fresnel diffraction theory - Half-period element - zone plate - zone plate and concave lens Fresnel diffraction at circular aperture-diffraction at circular obstacle - Fresnel diffraction by straight edge - Cornu spiral.

UNIT – IV: Fraunhofer Diffraction (12 hours)

Fraunhofer diffraction at a single slit - Fraunhofer diffraction at a double slit - comparison of interference and diffraction - diffraction at N parallel slits - plane transmitting grating - wavelength determination using grating. Resolving power - Rayleigh criterion - resolving power of prism - resolving power of grating.

UNIT –V: Polarization (12 hours)

Transverse nature of light wave - plane polarized light - double refraction - Huygen's explanation of double refraction in uniaxial crystal - construction of wave fronts - quarter wave plate and half wave plate - production and analysis of polarized light – Biot's Law of optical rotation - specific rotation - Laurent's half shade polarimeter.

Books for Study:

1. A Textbook of Optics, Subrahmanyam, Brij Lal et al, 23rd ed., 2006, S. Chand & Co.
2. Introduction to Modern Optics, Ajoy Ghatak, 1st ed., 1971, Tata McGraw Hill.
3. Fundamentals of Optics, H. R. Gulati and D. R. Khanna, R.1st ed., R ed.-2011, R. Chand & Co.

Book for Reference:

1. Fundamentals of Optics, F.A. Jenkins and H.E. White, 4th ed., 2001, McGraw-Hill.
2. Introduction to Classical and Modern Optics, Jurgen R. Meyer-Arendt, 4th ed, 1994, Pearson.
3. Optics-Principles and Applications, K K Sharma, 1st ed., 2006, Academic Press Inc.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : II	ELECTROMAGNETISM	SEMESTER: III
PAPER : MJD-04		CREDIT : 4

UNIT -1: Electric Intensity, Potential & Dielectrics (12 Hours)

Electric field and flux - Gauss's law -proof – application: electric fields of spherical charge distribution. Electric potential - relation between electric field and potential - potential and field due to dipole - Poisson's equation - Laplace's equation –dielectric and polarization - Gauss law in dielectrics - relation connecting E, D and P – Capacitance – parallel plate capacitor with partially filled dielectric.

UNIT - II: Magnetism (12 Hours)

Magnetic field - Intensity of magnetization - relation connecting B, H and M vectors - magnetic permeability and susceptibility - magnetic properties and characteristics of dia. para and ferro magnetic materials – domain theory (qualitative idea) - M-H curve and hysteresis (qualitative).

UNIT - III: Magnetic Effect of Current (12 Hours)

Current and current density – equation of continuity - Lorentz force on a moving charge - torque on a rectangular current loop in magnetic field - construction and working of the moving coil ballistic galvanometer - Biot-Savart's law - Ampere's circuital law – application: field due to infinitely long straight conductor and solenoid- divergence and curl of magnetic field -magnetic vector potential.

UNIT - IV: Electromagnetic Induction (12 Hours)

Faraday's law of electromagnetic induction - Lenz's law - Faraday's law in integral and differential forms - Self and mutual inductances - L of solenoid - M of concentric solenoids - Energy stored in magnetic field - Measurement of L by Rayleigh's method - Measurement of mutual inductance by Kirchhoff's method.

UNIT - V: Alternating Current (12 Hours)

Alternating currents - series and parallel LCR circuits – series and parallel resonance - Q-factor - power dissipation and power factor - skin effect - Principle and working of AC generator -AC bridges - Balancing conditions – Anderson's bridge to find L – Wein's bridge to find C.

Books for Study:

1. Electricity and Magnetism, K.K. Tewari, 13th ed., 2006, S. Chand & Co.
2. Electricity and Magnetism, A.S. Mahajan and A.A. Rangawala, 1st ed., 2007, Tata McGraw Hill.
3. Fundamentals of Physics, Halliday, Resnick, 10th ed., 2013, Wiley.

Books for Reference:

1. Electricity and Magnetism, Edward M. Purcell, 3rd ed., 2013, Cambridge University Press.
2. D.J. Griffiths, Introduction to Electrodynamics, 3rd ed., 2007, Pearson Education.
3. Principles of Electromagnetics, M N O Sadiku, 6th ed., 2015, Oxford University Press.

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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : II	**SKILL BASED PHYSICS - III**	**SEMESTER: III**
PAPER : SEC-03		**CREDIT : 3**

*Choose any **Ten** experiments from the following list*

LIST OF EXPERIMENTS

1. Young's modulus - cantilever - pin & microscope method.
2. Melde's apparatus - determination of frequency.
3. Specific latent heat of fusion of ice.
4. Air wedge - Determination of the thickness of the wire.
5. Spectrometer: Dispersive power of the material of a prism.
6. Carry-Foster's bridge - Resistivity of the material of the coil of wire.
7. B.G - Comparison of emf of two cells.
8. Figure of merit of a periodic moving coil galvanometer.
9. **M** and $\mathbf{B_H}$ - using deflection and vibration magnetometer.
10. Kater's pendulum - determination of acceleration due to gravity at a place.
11. Study of interference fringes bi-prism arrangements.
12. Study of polarization of light by simple reflection.
13. Computer simulation of effect of electric field on charged particles -Physics lab simulator.
14. Computer simulation of field produced by electromagnets -PHET Sim.
15. Computer simulation of image formation in mirrors and lenses– PHET sim.
16. Computer simulation of interference of waves – PHET sim.

Books For Study

4. Practical Physics and Electronics, C.C. Ouseph et al, 1st ed., 2009, S. Viswanathan Pvt. Ltd.
5. Practical Physics, M.N. Srinivasan et al, 1st ed., 2013, Sultan Chand and Sons.
6. A Textbook of Practical Physics, H.P. Shrivastava, 1st ed., 2006, ABD Publishers.

Books For Reference

1. Practical Physics, G. L. Squires, 4th ed., 2001, Cambridge University Press (South Africa).
2. Practical Physics (for B.Sc. Physics), Dept of Physics, R ed., 2015, St Joseph college, Trichy.

Websites For Simulations

1. PHET Simulations -https:/ /phet.colorado.edu/en/simulations/category/physics/
2. Physics Animations - http://www.vascak.cz/physicsanimations.php?l=en/

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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : II	ANALOG ELECTRONICS	SEMESTER: IV
PAPER : MJD-05		CREDIT : 4

UNIT-I: Junction Diodes (12 hours)

PN Junction diodes - V-I Characteristics – Diode parameters - diode clippers and clampers- Half wave, Full-wave and Bridge rectifiers - expressions for efficiency and ripple factor - Avalanche and Zener breakdown - Zener diode characteristics- Zener diode as voltage regulator- characteristics and uses of LED, Photodiode and Solar cell.

UNIT-II: Bipolar Junction Transistor (BJT) (12 hours)

Working of NPN and PNP transistors- CB, CE and CC modes – AC and DC Load line concept - operating point– Base biasing and voltage divider biasing methods of BJTs - Stability factor and stabilization - Thermal run away – Two-Port analysis – Thevenin's and Norton's theorem-h-parameters of a transistor and their notation – hybrid equivalent circuits for CE and CB transistors modes.

UNIT -III: BJT Amplifiers (12 hours)

Classification of Amplifiers –Single stage CE Amplifier with voltage divider bias- h-parameter analysis and gain – Frequency response, band width– Multistage amplifiers - types - working of two-stage RC Coupled and Transformer coupled amplifiers - power amplifiers and their classification – working of class B Push-pull amplifiers.

UNIT -IV: BJT Oscillators (12 hours)

Feedback in amplifiers- positive and negative feedback - Barkhausen criterion - classification of oscillators – working and analysis of Hartley oscillator - tuned collector oscillator - phase shift Oscillator –Multi-vibrators -types- working of transistor bi-stable multi-vibrator.

UNIT -V: FET & MOSFETs (12 hours)

JFETs –types - Operation of n-channel JFET - characteristics study -JFET parameters - biasing of JFET- uses of JFETs - FET as VVR –Comparison between JFET and BJT- MOSFET – types – construction, working and characteristics of MOSFETs – CMOS (basic ideas)

Books for Study:

1. Electronics devices and circuit theory, R L Boylestad & Nashelsky, 10th ed., 2009, Person India.
2. Basic electronics, B L Theraja, 5th ed., 2005, S. Chand & Co.
3. Electronic Devices, Thomas Floyd, 10th ed., 2018, Person, United Kingdom.

Books for Reference:

1. Integrated electronics- Millman and Halkias, 2nd ed., 2017, McGraw Hill Education.
2. Microelectronic Circuits: Analysis and Design, Muhammad H. Rashid, 3rd ed., 2015, Cengage.
3. Electronics Circuits-I&II, Salivahanan and Suresh Kumar, 1st ed., 2015, McGraw Hill Education.

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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : II	OSCILLATIONS AND WAVES	SEMESTER: IV
PAPER : MJD-06		CREDIT : 4

UNIT – I: Simple Harmonic Oscillations (12 Hours)

Small oscillation about stable equilibrium, simple harmonic motion - differential equation of SHM and its solution - time period of loaded spring - compound pendulum - center of suspension and oscillation - two masses connected by spring – reduced mass – oscillations of: liquid in a U tube and floating body. Kinetic, potential and total energies of SHM.

UNIT – II: Damped Oscillations and Fourier Analysis (12 Hours)

Theory of Damped oscillations - relaxation time and Q factor- forced oscillations and resonance - power absorbed by the oscillator – two dimensional oscillators - pendulums coupled by a spring.
Fourier's Theorem – Fourier series - evaluation of Fourier coefficients - application to saw tooth wave and square wave.

UNIT – III: Superposition of Waves (12 Hours)

Superposition of two collinear harmonic oscillations - linearity and superposition principle - oscillations having equal frequencies (interference) - oscillations having different frequencies (beats) - superposition of two perpendicular harmonic oscillations - Lissajous figures with equal frequency (analytical method) - uses of Lissajous figures.

UNIT – IV: Propagation of Waves in a Medium (12 Hours)

Differential equation of transverse waves on a string - travelling and standing waves - transverse waves in a string - normal modes - speed of longitudinal waves in a fluid - normal modes vibrations of air columns (closed organ pipe).

UNIT – V: Music and Acoustics (12 Hours)

Intensity and loudness of sound - decibels - Intensity levels - musical notes - musical scale (basic ideas). Acoustics of buildings - reverberation and time of reverberation - absorption coefficient - Sabine's formula - acoustic aspects of halls and auditoria.

Books for Study:

1. Waves and Oscillations, N. K. Bajaj, 1st ed., 2017, Tata McGraw Hill.
2. Oscillations and Waves, J.C. Upadhyaya, 1st ed., 2017, Himalaya Pub. House, Bombay.
3. A Text Book of Oscillations, Waves and Acoustics, M. Ghosh, 5th ed., 2016, S. Chand & Co.

Books for Reference:

1. The Physics of Vibrations and Waves, H J Pain, 6th ed., 2005, Wiley.
2. Vibrations and waves, A P French, 1st ed., 2017, CRC Press,
3. Text book of Vibrations and Waves, S. P. Puri, 2nd ed., 2004, Macmillan India Ltd.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : II	EXPERIMENTAL PHYSICS - I	SEMESTER: IV
PAPER : MJD-07		CREDIT : 4

Carry out minimum of **Ten** experiments from the following list
(Choose at least **Four** from each list of experiments given below)

LIST OF GENERAL EXPERIMENTS

1. Young's modulus – Cantilever – Dynamic oscillation method.
2. Rigidity modulus - Static torsion-scale and telescope method.
3. Spectrometer - i-d curve.
4. Spectrometer: Dispersive power of a grating.
5. B.G. - Comparison of capacities.
6. Potentiometer: Verification of laws of resistance and resistivity of the material of a wire.
7. Comparison of magnetic moments of magnets in tan A and tan B positions.
8. Computer simulation – Atomic models and Hydrogen spectrum.
9. Computer simulation - Michelson Morley experiment.

LIST OF ELECTRONICS EXPERIMENTS

1. V- I Characteristics of junction diodes.
2. Breakdown characteristics of Zener diode.
3. Construction and study of half wave rectifier.
4. Transistor characteristics – CE mode – output characteristics.
5. Transistor characteristics – CB mode – output characteristics.
6. JFET Transfer characteristics.
7. Computer simulation – Clipper and clamper circuits -Electronic Circuit Simulator.
8. Computer simulation – Full wave Rectifiers- Electronic Circuit Simulator.

Books for Study

1. Practical Physics and Electronics, C.C. Ouseph et al, 1st ed., 2009, S. Visawanathan Pvt. Ltd.
2. Practical Physics, M.N. Srnivasan et al, 1st ed., 2013, Sultan Chand and Sons.
3. A Textbook of Practical Physics, H.P. Shrivastava, 1st ed., 2006, ABD Publishers

Books for Reference

3. Practical Physics, G. L. Squires, 4th ed., 2001, Cambridge University Press (South Africa).
4. Basic electronics – A Text-lab manual, Zbar et al, 7th ed., 2009, Tata McGraw Hill.
5. Experiments in Modern Physics, Adrian C. Melissinos, 2nd ed., 2003, Academic Press.

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1. PHET Simulations -https:/ /phet.colorado.edu/en/simulations/category/physics/
2. Physics Animations - http://www.vascak.cz/physicsanimations.php?l=en/
3. Electronic Circuit Simulator - http://www.falstad.com/circuit/

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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : II	**COMMUNITY ENGAGEMENT**	**SEMESTER: IV**
PAPER : Winter Project		**CREDIT : 2**

General Guidelines:

- The Project Coordinator (HOD) may divide the students in to a number of groups; maximum of 10 students depends upon the number of faculty available to guide.
- Each group of students will be guided by a faculty member (Project Advisor).
- The Project Coordinator (HOD) and Project Advisor (Faculty-in-charge) will support students in making the project a valuable and productive experience.
- With the approval of the Faculty-in-charge, a student may choose a project topic related to their residence.
- If the Students is/are absent, they should carry out the work for the allotted two weeks by extending the presence.
- Upon completing the winter project, students must submit a detailed report of 15-20 pages, neatly typed in Times New Roman, Font size 12 with 1.5 line spacing on single side A4 size white paper and neatly binded with paper cover Students are advised to adhere COE guidelines for any other relevant project documentation procedures.
- The project report comprising 15 – 20 pages must have include, map of the working location, photo collage (minimum of 4 images) made from GPS enabled images and signed by the faculty in charge.
- The Faculty-in-charge is fully responsible for the submission of the project report and he must ensure the project is submitted on time with relevant documents.

Evaluation of course:

- The Community Engagement Project carries a total of 100 marks and is worth 2 credits. Marks will be distributed for project report and viva-voce as 75:25 ratios respectively.
- The project is allocated 75 marks, with a minimum passing requirement of 30 marks or 40%.
- The viva-voce, conducted by the department with the assistance of the HOD and faculty in charge, carries 25 marks.
- There is no minimum mark required for the Viva-voce, but students must secure at least 40% in the aggregate of project report and viva-voce to pass.

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YEAR : III	**MATERIAL SCIENCE**	**SEMESTER: V**
PAPER : MJD-08		**CREDIT : 4**

UNIT-I: Crystals and Lattice (12 Hours)

Crystal and amorphous structure - crystal lattice – unit cell - primitive cell - lattice parameters- Bravais lattice in two and three dimensions - co-ordination number - Packing fraction - symmetry elements and symmetry operations - point group and space groups - crystal planes - Miller indices – reciprocal lattice (basic ideas). X-ray diffraction - Bragg's law - Laue's formulation - Laue experimental method - Rotating crystal method.

UNIT-II: Bonding in solids (12 Hours)

Types of chemical bonding - Ionic, Covalent, Metallic, Vander-wall's and Hydrogen bond and their properties - expression for lattice energy of ionic crystal - Madelung constant. Lattice vibrations - vibrations of one-dimensional mono-atomic Lattice – vibrations of diatomic lattice (qualitative ideas) - Phonons and their characteristics. Specific heat capacity - Einstein's theory of specific heat capacity – merits and demerits.

UNIT-III: **Conduction in solids (12 Hours)**

Conduction in solids - Drude-Lorentz theory - Conductivity, Resistivity and Mobility - Wiedemann-Franz law – Lorentz number – Sommerfeld's free electron theory - Fermi energy - Density of energy states in one dimension. Hall effect in metals - Hall coefficient - Hall angle - determination of Hall coefficient - applications of Hall effect.

UNIT-IV: Bands in solids (12 Hours)

Bands in solids - division of conductors, insulators and semiconductors on the basis of energy band diagram - mobility, drift velocity and conductivity of intrinsic semiconductor - carrier concentration and Fermi level for intrinsic and extrinsic (n-type) semiconductors.

UNIT-V: Imperfections in Crystals (12 Hours)

Point Defects - Types - Excitons - Line Imperfections: Dislocations - Shear Strength and Processes of Plastic Plow - Dislocation Types -Stress Fields of Dislocations - Planar Imperfections: Grain Boundaries - Role of Dislocations in Crystal Growth - Strength of Alloys.

Books for Study

1. Solid state physics, S.L.Gupta and V. Kumar, 9th ed., 2006, K.Nath & Co, Meerut.
2. Elements of Solid-state Physics, J.P. Srivastava, Prentice Hall of India Pvt Ltd.
3. Fundamentals of Solid-state physics, Saxena et al, 28th ed., 2016, Pragathi Prakashan, Meerut.

Books for Reference

1. Introduction to Solid state physics, C. Kittel, 8th ed., 2012, Wiley India.
2. Solid state physics, S.O. Pillai, 6th ed., 2006, New Age International Publishers.
3. Solid State Physics, W. Ashcroft & N. David Mermin, Holt, 1st ed., 2003, Cengage.

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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : III	ATOMIC PHYSICS AND RELATIVITY	SEMESTER: VI
PAPER : MJD-09		CREDIT : 4

UNIT - I: Atomic Models (12 Hours)
Sommerfeld's atom model - elliptical orbit and relativistic correction – critical potential - excitation potential - Frank-Hertz experiment - Electron spin - Stern and Gerlach experiment - vector atom model – quantum numbers – Pauli's exclusion principle - arrangement of elements in periodic table.

UNIT - II: Electronic Spectra (12 Hours)
Electronic spectra of atoms - Coupling schemes: L-S, J-J couplings - Spectral terms - s, p, d, f - notation - selection rules - fine structure of hydrogen lines - different series in alkali spectra and their features -- spectral series of sodium - fine structure of sodium lines.
X-ray spectra: The continuum and characteristic spectrum and their origin - Duane and Hunt limit; Moseley's law, fine structure of x-ray levels, X-ray absorption spectra, absorption edges.

UNIT - III: Atoms in Electric and Magnetic Fields (12 Hours)
Magnetic moment of electron due to orbital motion and spin motion – Bohr magneton - gyro magnetic ratios for orbital and spin motions - Normal Zeeman effect - Lande's 'g' factor - anomalous Zeeman effect - Normal and anomalous Zeeman effects with reference to sodium D-lines - theory and experiment - Paschen-Back effect - simple Theory and experiment- Stark effect (experimental study only).

UNIT - IV: Relativity-I (12 Hours)
Frame of reference - Newtonian relativity - Galilean transformations - Michelson-Morley experiment - Einstein's basic postulates - Lorentz transformations - length contraction - Time dilation - Twin paradox - Einstein's velocity addition rule - relativistic Doppler effect.

UNIT - V: Relativity-II (12 Hours)
Variation of mass with velocity - mass energy equivalence - relativistic formulae for momentum and energy - invariant mass - Minkowski's four-dimensional space - space-time diagrams - relativistic view of aberration of star light - general theory of relativity (basic ideas) and its important predictions.

Books for Study

1. Modern physics, R. Murugeshan, Kiruthiga Sivaprasath, 17th ed., 2014, S Chand and Co.
2. Atomic Physics, S.N. Ghosal, 7th ed., 2004, S. Chand and Company.
3. A Primer of Special Relativity, P. L. Sardesai, 1st ed., 2004, New Age International.

Books for Reference

1. Concepts of Modern Physics, Arthur Beiser, 4th ed., 2009, Tata McGraw – Hill.
2. Introduction to Modern Physics, R. B. Singh, 1st ed., 2002, New Age International.
3. Modern Atomic and Nuclear Physics, A B Gupta, 2nd R ed., 2009, S Books & Allied (p) Ltd.

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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : III	**EXPERIMENTAL PHYSICS - II**	**SEMESTER: V**
PAPER : MJD-10		**CREDIT : 4**

Carry out minimum of **Ten** experiments from the following list
(Choose at least **Four** from each list of experiments given below)

LIST OF GENERAL EXPERIMENTS

1. Spectrometer - i_1 - i_2 curve and determination of refractive index (I-method).
2. Newton's rings – determination of focal length of plano-convex lens.
3. Potentiometer - Resistance of the potentiometer and calibration of low range voltmeter
4. Potentiometer -Calibration of a high range voltmeter.
5. Study of the Series LCR circuit at varying frequencies to measure resonance
6. B.G - Current and voltage sensitivities.
7. Field along the axis of the coil Searl's vibration magnetometer.
8. Measurement of wavelength of a laser beam and particle size determination.
9. Determination of Band-gap of a semiconductor.
10. Simulation of 3-D models of a various kind of crystal – Crystal walk Animation
11. Computer simulation – Important astronomical phenomena – Astronomy simulator.

LIST OF ELECTRONICS EXPERIMENTS

1. Hartley oscillator – frequency measurement and determination of self-inductance.
2. Tuned collector oscillator - Frequency measurement by CRO and Frequency counter.
3. Bi-stable Multi-vibrator (transistors) - Measurement of Frequency by Frequency counter.
4. Single stage RC coupled - Frequency response curve.
5. Basic Logic and Universal gates using diodes and transistors components.
6. Basic and Universal logic gates using ICs
7. Implementation of logic expression and their simplification
8. Arithmetic circuits using discrete gates.
9. Computer simulation – Amplifiers analysis - Electronic Circuit Simulator.
10. Computer simulation of Registers – Logism simulator.

BOOKS FOR STUDY:

1. Practical Physics and Electronics, C. C. Ouseph et al, 1st ed., 2005, S.Visawanathan Pvt. Ltd.
2. Practical Physics, M. N. Srnivasan et al, 1st ed., 2005, Sultan Chand and Sons.
3. Digital Electronic Practice Using ICs, R.P. Jain and M.M.S. Anand, 1st ed, 1988, TMH.

BOOKS FOR REFERENCE:

6. Practical Physics, G. L. Squires, 4th ed., 2001, Cambridge University Press (South Africa).
7. Basic electronics – A Text-lab manual, Zbar et al, 7th ed., 2009, Tata McGraw Hill.
8. Experiments in Modern Physics, Adrian C. Melissinos, 2nd ed., 2003, Academic Press.

WEBSITES FOR SIMULATIONS:

1. crystallographic simulator: https://crystalwalk.herokuapp.com/
2. Electronic circuit simulator - http://www.falstad.com/circuit/
3. Logism software – digital electronic simulator - http://www.cburch.com/logisim/

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YEAR : III	**SUMMER INTERNSHIP**	**SEMESTER: V**
PAPER : MID-11		**CREDIT : 4**

General Guidelines:

- The Internship Coordinator (HOD) may divide the students in to a number of groups; maximum of 4 students depends upon the number of faculty available to guide.
- Each group of students will be guided by a faculty member (Internship Advisor).
- The Internship Coordinator (HOD) and Internship Advisor (Faculty-in-charge) will support students in making the Internship a valuable and productive experience.
- With the approval of the Faculty-in-charge, a student may choose a project topic related to the core or allied subject.
- If the Students is/are absent, they should carry out the work for the allotted four to six weeks by extending the presence.
- Upon completing the Internship, students must submit a detailed report of 30-40 pages, neatly typed in Times New Roman, Font size 12 with 1.5 line spacing on single side A4 size white paper and neatly binded with paper cover.
- The project report comprising 30 - 40 pages must have include, required graph, images, tabular column etc. Students are advised to adhere COE guidelines for any other relevant project documentation procedures.
- The Faculty-in-charge is fully responsible for the submission of the project report and he must ensure the project is submitted on time with relevant documents.

Evaluation of course:

- The Summer Internship carries a total of 100 marks and is worth 4 credits. Marks will be distributed for project report and viva-voce as 75:25 ratios respectively.
- The project is allocated 75 marks, with a minimum passing requirement of 38 marks or 50%.
- The viva-voce, conducted by the department with the assistance of the HOD and faculty in charge, carries 25 marks.
- There is no minimum mark required for the Viva-voce, but students must secure at least 50% in the aggregate of project report and viva-voce to pass.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : III	ELECTRONIC DEVICES	SEMESTER: VI
PAPER : MJD-12		CREDIT : 4

UNIT -I: Operational Amplifiers (12 Hours)

Differential amplifiers - principles of operational amplifiers - offset parameters, differential gain, CMRR - inverting and non-inverting amplifiers - Op-amp as summing amplifier and difference amplifier – Op-amp as differentiator, integrator and comparator - operational amplifier in solving differential equations.

UNIT -II: Boolean logic and Logic Families (12 Hours)

Number systems - inter conversion - binary arithmetic - basic gates and universal gate operations - Boolean algebraic theorems and properties - Karnaugh map: two, three and four variable maps - POS and SOP simplification - NAND and NOR implementation - don't care conditions. Types of logic families, characteristics and parameters - TTL gates - CMOS gates.

UNIT-III: Combinational Logic and memory elements (12 Hours)

Combinational logic -parity checker - half adder-full adder- decoders - Encoders. RS flip-flops - clocked RS flip-flop - edge-triggering - D-type flip-flops - JK flip-flop - JK master slave flip-flop - serial-in-serial out, serial-in-parallel out shift registers

UNIT-IV: Counters and Converters (12 Hours)

Counters - asynchronous counters - decade counter (Mod 10 counter). Principle of variable network and binary ladder type - four-bit D/A converter - A/D converter: counter method and successive approximation method - resolution and accuracy of D/A and A/D converter - frequency counters.

UNIT-V: Microprocessor 8085 (12 Hours)

Architecture of 8085(Block diagram) - Organization- Registers- Instruction types-Interrupts- Instruction groups with data formats- Addressing modes-Assembly language programming: Simple Programs using arithmetic and logical operations.

Books for Study

1. Basic electronics, B. L. Theraja, 5th ed., 2005, S. Chand & Co.
2. Digital Principles and Applications, Malvino & Leach, 7th ed., 2011, Tata McGraw Hill.
3. Modern Digital Electronics, R.P. Jain, 3rd ed., 2006, Tata McGraw-Hill, New Delhi.
4. Microprocessors and Microcontollers, Krishna Kant, 1st Ed., Prentice Hall of India, 2007.

Books for Reference:

1. Electronics devices and circuit theory, R. L. Boylestad & Nashelsky, 10th ed., 2009, Person India.
2. Digital fundamentals, Floyd L. Thomas, 8th ed., 2005, Pearson Education Pvt. Ltd.
3. Digital logic and computer design, M. Morris Mano, 4th ed., 2008, Prentice Hall of India.
4. Microprocessor Architecture, Programming, & Applications with the 8085, R. S. Gaonkar, 5th Ed., Prentice Hall, 2002.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : III	**NUCLEAR PHYSICS**	**SEMESTER: VI**
PAPER : MJD-13		**CREDIT : 4**

UNIT - I: Nuclear Properties (12 Hours)

Constituents of nucleus – classification of nuclei - nuclear properties: size, radius, volume, mass, density - nuclear charge, spin and magnetic moment- isotopes- applications – Dempster's Mass spectrograph - Mass defect - Binding energy - stability of the nucleus – binding energy curve – N-Z plot - Packing fraction.

UNIT-II: Nuclear forces (12 Hours)

Types of nuclear forces - properties of nuclear forces - Meson theory of nuclear forces – semi-empirical mass formula - nuclear models -Features of liquid drop model and shell model of the nucleus - merits and demerits evidence for nuclear shell structure- Magic numbers – collective model (basic ideas).

UNIT - III: Radioactivity (12 Hours)

Radioactivity – laws of radioactive disintegration and successive disintegration – secular and transient equilibrium – radioactive dating – Geiger-Nuttall law – alpha ray spectra – Gamow theory of alpha decay (qualitative ideas) – beta spectra – origin – neutrino theory of beta decay- gamma ray emission - internal conversion.

UNIT - IV: Nuclear reaction (12 Hours)

Nuclear reactions with examples – Q value of the reactions - threshold energy - conservation laws - concept of compound and direct reaction - resonance reaction - reaction cross section - Rutherford scattering. Particle accelerators: Betatron proton synchrotron. Radiation detectors: GM counters, scintillation counters.

UNIT - V: Nuclear Energy and Particle physics (12 Hours)

Nuclear fission - chain reaction - critical size - nuclear reactors – power and breeder reactors. Nuclear fusion - controlled thermo-nuclear reactions - stellar energy.

Types of particles and its families – quantum numbers of particles: Baryon number, Lepton number, Isospin, strangeness, parity - symmetries and conservation laws - quarks and their types - concept of quark model - color quantum number and gluons**.**

Books for Study:

1. Nuclear Physics, S.N. Ghosal, 1st ed., 2009, S. Chand & Co.
2. Concept of Modern physics, Arthur Beiser, 7th ed., 2017, McGraw Hill Education.
3. Introduction to Nuclear and Particle Physics, 4th ed., 2018, PHI Learning.

Books for Reference:

1. Nuclear Physics, S. B. Patel, 2nd ed., 2011, New Age International,
2. Concepts of Nuclear Physics, Bernard L. Cohen, 1st ed., 2008, Tata McGraw Hill.
3. Introductory Nuclear Physics, Kenneth S. Krane, 3rd ed., 2022, Wiley India Pvt Ltd.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : III	QUANTUM PHYSICS	SEMESTER: VI
PAPER : MJD-14		CREDIT : 4

UNIT - I: Old Quantum Theory (12 Hours)
Distribution of energy in the spectrum of black body – Planck's quantum concept- photo electric effect and Einstein's idea of light quanta – Compton effect - theory and experiment - atomic models- Bohrs atomic model (qualitative ideas) - Bohr's quantization rule - Drawbacks of old quantum theory.

UNIT - II: Matter Waves (12 Hours)
De Broglie's hypothesis - Matter waves - De Broglie wave length – matter wave as wave packets - wave velocity, group velocity of de Broglie waves - Davisson and Germer's experiment – De Broglie concept and Bohr's quantum condition - energy of particle in a potential well - Principle and working of electron microscope-TEM and SEM (qualitative Ideas).

UNIT - III: Introduction to Quantum Mechanics (12 Hours)
Heisenberg's uncertainty principle –elementary proof –gamma ray microscope thought experiment –- Schrödinger's one-dimensional time - dependent wave equation - Schrödinger's one-dimensional time-independent wave equation - physical significance of wave function - orthogonal and normalized wave functions - Eigen function, eigen value and eigen value equation.

UNIT - IV: Operators in Quantum Mechanics (12 Hours)
Bohr's correspondence principle - postulates of quantum mechanics – operators – operators for momentum, angular momentum, kinetic energy, total energy, - Hamiltonian and Hermitian operators - expectation values commuting and non-commuting operators - commutator for position and momentum operators

UNIT - V: Application of Schrodinger Equation (12 Hours)
Schrödinger's equation and solution for a free particle - particle in a one-dimensional box - eigen values and energy levels - particle in a rectangular three-dimensional box - degeneracy- Reflection at a step potential -Reflection and transmission coefficients - transmission across a potential barrier (Tunnel effect).

Books for Study:

1. Quantum Mechanics, Ghatak and Loganathan, 6th ed., 2022, Laxmi Publications Pvt Ltd.
2. Quantum Mechanics, Zettili Nouredine, 2nd ed., 2016, Wiley India Pvt. Ltd.
3. Quantum Mechanics, Gupta, Kumar & Sharma, 31st ed., 2012, Jai Prakash Nath Pub.

Books for Reference:

1. Quantum Mechanics, Satyaprakash and C.K. Singh, 1991, Kedarnath Ram Nath & Co.
2. Principles of Quantum Mechanics, R. Shankar, 2nd ed, 2014, Springer.
3. Introduction to Quantum Mechanics, David J. Griffiths, 3rd ed, 2018, Cambridge University Press.
4. Quantum Mechanics, E. Merzbacher, 3rd ed., 2011, Wiley India Pvt. Ltd.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : III	**EXPERIMENTAL PHYSICS - III**	**SEMESTER: VI**
PAPER : MJD-15		**CREDIT : 4**

Carry out minimum of **Ten** experiments from the following list
(Choose at least **Four** from each list of experiments given below)

LIST OF GENERAL EXPERIMENTS

1. Spectrometer - i_1 - i_2 curve for given angle of deviation (II method).
2. Spectrometer - small angled prism.
3. Potentiometer - Resistance of the potentiometer & measurement of emf of a thermocouple.
4. Potentiometer - Temperature coefficient of resistance of the material of a coil of wire.
5. B.G - Comparison of mutual inductance of two pairs of coils.
6. Study of the Parallel LCR circuit at varying frequencies to measure resonance
7. Field along the axis of a circular coil - Determination of moment of a magnet.
8. To determine the Fermi energy of copper using meter bridge.
9. Temperature co-efficient of a Thermistor.
10. Computer simulation of photo electric effect-PHET Sim.
11. Computer simulation of nuclear chain reactions and nuclear energy - PHET Sim.

LIST OF ELECTRONICS EXPERIMENTS

1. Power pack with bridge rectifier, Zener regulator and shunt capacitor filter.
2. Colpitt's oscillator - Frequency measurement by CRO and Frequency counter.
3. RC oscillator - Frequency measurement by CRO and Frequency counter.
4. Astable multi-vibrator - Using Transistor and 555 Timer- Frequency measurements
5. Two stage RC coupled amplifier and study of its frequency response and feedback.
6. Emitter follower.
7. Universal logic gates using RTL and DTL using discrete components.
8. NAND and NOR as universal gates using ICs
9. Computer simulation using Logism – counters.
10. Computer simulation using Logism – Encoder/decoders.

Books for Study:

1. Practical Physics and Electronics, C. C. Ouseph et al, 1st ed., 2005, S.Visawanathan Pvt. Ltd.
2. Practical Physics, M. N. Srnivasan et al, 1st ed., 2005, Sultan Chand and Sons.
3. A Textbook of Practical Physics, H.P. Shrivastava, 1st ed., 2006, ABD Publishers.
4. Digital Electronic Practice Using ICs, R.P. Jain and M.M.S. Anand, 1st ed., 1988, TMH.

Books for Reference:

1. Practical Physics, G. L. Squires, 3rd ed., 1985, Cambridge University Press.
2. Basic electronics – A Text-lab manual, Zbar et al, 7th ed., 2009, Tata McGraw Hill.

Websites for Simulations:

1. PHET Simulations: https://phet.colorado.edu/en/simulations/category/physics/
2. Logism software – digital electronic simulator - http://www.cburch.com/logisim/

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : IV	**CLASSICAL MECHANICS**	**SEMESTER: VII**
PAPER : MJD-16		**CREDIT : 4**

UNIT-I: Lagrangian formalisms (12 hours)
Coordinate system- Degrees of freedom-Constraints-classification- Examples of Constraints - generalised co-ordinates-Principle of Virtual work-D-Alembert's principle- Hamilton's least action principle – Derivation of Lagrange equations from Hamilton's principle - Applications: Simple pendulum, Atwood's machine.

UNIT-II: Hamiltonian formalism (12 hours)
Generalised momentum and Cyclic coordinates - conservation theorem - Hamilton's equations – Different coordinate system- Applications: Linear harmonic oscillator and particle in a central force field. Hamilton's variational principle - Hamilton's equation of motion from variational principle - Principle of least action.

UNIT-III: Canonical transformations (12 hours)
Legendre transformations –Generating function - Poisson's brackets-properties - Hamilton's equation of motion in Poisson's bracket - invariance of Poisson's bracket under canonical transformation.
Hamilton-Jacobi Theory: Hamilton-Jacobi equation - Hamilton-Jacobi equation for conservative systems -Hamilton's characteristic function- Separation of variables in the Hamilton -Jacobi equation - Action and Angle Variables – Application to Kepler's problem.

UNIT-IV: Rigid Body Dynamics, Non-Inertial Frames and Oscillatory Motion (12 hours)
Euler angles - Euler's theorem on the motion of the rigid body - moments and products of inertia - Euler's equations - symmetrical top - applications - non inertial frame of reference - pseudo and centrifugal force - uniform rotating frames - Coriolis force - theory of small oscillations and normal modes - frequencies of free vibration and normal coordinates - Linear tri-atomic molecule.

UNIT V: Relativistic mechanics (12 hours)
Lorentz transformations of energy-momentum, Force - Relativistic Lagrangian and Hamiltonian for a particle - Minkowski space and Lorentz transformations- four-vectors: four-velocity vector, four momentum vector and four-acceleration vector.

Books for Study

1. Classical Mechanics: B,D.Gupta, SatyaPrakash, 1st ed., 2020, Kedar Nath - Ram Nath Publication.
2. Classical Mechanics, J. C. Upadhyaya, 2nd ed., 2005, Himalaya Publishing House.
3. Classical Mechanics, G.Aruldhas, 1st ed., 2008, Prentice Hall of India Pvt. Ltd.

Books for Reference

1. Classical Mechanics: H Goldstein, Poole, Safko, 3rd ed., 2011, Pearson Education.
2. Classical Mechanics: N C Rana and P S Joag, 1st ed., 2017, McGraw Hill Education (India),
3. Classical Dynamics of Particles and Systems, Thornton, Marion, 5th ed., 2012, Cengage Learning,

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : IV	QUANTUM MECHANICS	SEMESTER: VII
PAPER : MJD-17		CREDIT : 4

UNIT I: Application of Wave mechanics (12 Hours)

One-dimensional simple harmonic oscillator - eigen values and energy levels - Hydrogen atom – separation of variables – azimuthal, polar and radial wave equations- solution of radial equation in the ground state – interpretation of quantum numbers in the solution.

UNIT II: Matrix formulation and spin matrices (12 Hours)

Hilbert space – Operators as matrices – Schrodinger Picture – Heisenberg Picture – interaction picture - Dirac's Bra and Ket notation — Projection operator – Matrix theory of harmonic oscillator.
Spin matrix (Pauli) for electron – Commutation relations – Pauli operator – Pauli Eigenvalues and Eigenfunction – Electron-spin formulation– Spin matrices and Eigenfunctions.

UNIT III: Angular Momentum States (12 Hours)

Angular momentum operators – The rotation operator and angular momentum – Spin angular momentum – Total angular momentum operator – Commutation relation of J^2, J_z, J_+, J- - Eigen Values of J^2, J_z - matrix representation of J^2, J_z, J_+, J-, – Addition of angular momentum – Clebsch-Gordan coefficients – properties and evaluation - coupling of orbital and spin angular momenta.

UNIT IV: Approximation Methods (12 Hours)

Time independent perturbation theory for non-degenerate energy levels – Degenerate energy levels – Stark effect in Hydrogen atom – Ground and excited state – Variation method – Ground state of Helium atom – WKB approximation – Connection formulae – validity - application of WKB: Barrier penetration.

UNIT V: Time-dependent perturbation (12 Hours)

Time-dependent perturbation theory - first order transitions - constant perturbation - Transition probability - Harmonic perturbation - Fermi- Golden rule - Radiative transition in atoms - Dipole transition - Selection rules - Sudden and adiabatic approximation.

Books for Study

1. Quantum Mechanics, R.K.Srivastava, 1st ed., 2007, Printice Hall of India Pvt. Ltd.
2. Quantum Mechanics, Ghatak and Loganathan, 6th ed., 2022, Laxmi Publications Pvt Ltd.
3. Nouredine Zettile, Quantum Mechanics, 2nd ed, 2009, John Wiley & Sons.

Books for Reference

1. Quantum Mechanics, Sathya Prakash, 1st ed., 2007, Pragati Prakashan,
2. Introduction to Quantum Mechanics, David J. Griffiths, 3rd ed, 2018, Cambridge University Press.
3. Quantum Mechanics, E. Merzbacher, 3rd ed., 2011, Wiley India Pvt. Ltd.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : IV	**ADVANCED EXPERIMENTAL PHYSICS -I**	**SEMESTER: VII**
PAPER : MJD-18		**CREDIT : 4**

Carry out minimum of **Ten** experiments from the following list
(Choose at least **Four** from each list of experiments given below)

LIST OF GENERAL EXPERIMENTS

1. Spectrometer - Determination of Cauchy's constants.
2. Study of the rise and decay of current in a RC circuit
3. B.G - Absolute capacity of a condenser.
4. Determination of Planck's constant
5. Determination of refractive index - Abbe's refractometer.
6. To determine the Rydberg's constant - spectrometer & hydrogen gas discharge tube.
7. Dielectric constant - Dielectric material of a capacitor - method of charging and discharging.
8. Determination of wavelength of sodium light using Bi-prism.
9. Computer simulation – quantum tunneling and wave packets-PHET sim.
10. Computer simulation Davisson-Germer Electron Diffraction experiment -PHET sim.

LIST OF ELECTRONICS EXPERIMENTS

1. Clipping and Clamping circuits using diodes.
2. Basic OP-AMP circuits - Half-wave rectifier, Clipper, Clamper, Comparator,
3. OP-AMP Integration and differentiation.
4. XOR and XNOR logic gates using NAND and NOR gates
5. Encoders-using ICs
6. RS, D, JK and Master Slave flip-flops
7. Shift Registers using ICs
8. Intel 8085 – 8-bit Addition and subtraction,
9. Intel 8085 – addition of two 8-bit numbers having 16-bit sum.
10. Computer simulation of intel 8085 – bubble sorting.
11. Computer simulation using Logism – Multiplexer and de-multiplexers.

Books for Study

1. Practical Physics and Electronics, C.C. Ouseph et al, 1st ed., 2009, S. Visawanathan Pvt. Ltd.
2. Practical Physics, M.N. Srnivasan et al, 1st ed., 2013, Sultan Chand and Sons.
3. A Textbook of Practical Physics, H.P. Shrivastava, 1st ed., 2006, ABD Publishers.

Books for Reference

1. Practical Physics, G. L. Squires, 4th ed., 2001, Cambridge University Press (South Africa).
2. Basic electronics – A Text-lab manual, Zbar et al, 7th ed., 2009, Tata McGraw Hill.
3. Experiments in Modern Physics, Adrian C. Melissinos, 2nd ed., 2003, Academic Press.

Websites for Simulations

1. PHET Simulations - https://phet.colorado.edu/en/simulations/category/physics/
2. Electronic Circuit Simulator. http://www.falstad.com/circuit/
3. Logism software – digital electronic simulator - http://www.cburch.com/logisim/

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : IV	STATISTICAL MECHANICS	SEMESTER: VIII
PAPER : MJD-19		CREDIT : 4

UNIT -I: Introduction to Statistical Mechanics (12 Hours)
Phase space - volume in phase space - Density distribution in phase space - Liouville's theorem - Postulate of equal a priori probabilities - statistical equilibrium – other kinds of equilibrium-– connection between entropy and thermodynamic probability - Microstates and macrostates – Stirling's approximation – general statistical distribution law - Division of phase space into cells.

Unit-II: Classical Statistical Mechanics (12 Hours)
Classical Maxwell-Boltzmann distribution law - Evaluation of constants in the Maxwell Boltzmann distribution law - Maxwell's law of distribution of velocities - most probable speed, rms speed, average speed - Principle of equipartition of energy - Calculation of gas pressure - Boltzmann's entropy relation.

Unit-III: Method of Ensembles (12 Hours)
Concept of ensembles - micro canonical -canonical - grand canonical -Perfect gas in Microcanonical Ensemble - Partition Function - Gibb's paradox - Gibbs canonical ensemble- Perfect Monoatomic gas in Canonical Ensemble - Grand Canonical Ensemble - Comparison of Various Ensembles - Classical real gas - Cluster expansion - Virial theorem- equation of state.

Unit-IV: Quantum Statistical Mechanics (12 Hours)
Need for quantum statistics - Indistinguishability and quantum statistics – Bose-Einstein statistics - Fermi-Dirac statistics - MB statistics - Limit of their applicability - Statistical weight - density matrix - Thermodynamic behavior of ideal Bose and Fermi gas - Bose-Einstein condensation - Liquid Helium - Super fluidity - Ideal FD gas - electron gas of metals.

Unit - V: Transport Properties and Fluctuation (12 Hours)
Boltzmann transport equations - Boltzmann transport equations for electrons and Lorentz solution - chambers equation - thermal conductivity of metals - mean square deviation - fluctuations in energy, Probability of one-dimensional random walk - Brownian movement - Fokker Planck equation - Nyquist's theorem.

Book for Study

1. Statistical Mechanics, S.L Gupta & V Kumar, 12th ed., 2006, Pragati Prakashan, Meerut.
2. Statistical Mechanics, SatyaPrakash, 10th ed, 2021, KedarNath Ram Nath & Co, Meerut.
3. Statistical Thermodynamics, M.C. Gupta, 2nd ed., 1998, New Age International Publishers.

Books For References

1. Statistical Mechanics, Kerson Huang, 2nd ed., 2008, Wiley Eastern Ltd.
2. Fundamentals of statistical Mechanics, B B Laud, 2nd ed., 2020, New Age International Pub.
3. Statistical Mechanics, R.K. Srivastava & J. Ashok, 1st ed., 2005, Prentice Hall of India.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : IV	ELECTROMAGNETIC THEORY	SEMESTER: VIII
PAPER : MJD-20		CREDIT : 4

Unit-I: Electrostatics (12 Hours)
Gauss's law - Divergence of E - curl of E - Electric potential - Poisson's and Laplace's Equation - Potential of a localized charge distribution - Electrostatic Boundary conditions - Uniqueness theorems - Method of images: Classic image problem - induced surface charge - Force and energy - other image problems - boundary value problems on spherical symmetry and plane symmetry.

Unit-II: Magnetostatics (12 Hours)
Biot-Savart Law - The Divergence and Curl of B - Applications of Ampere's Law - magnetic potential - uniform surface current of a long solenoid - toroidal coil - large parallel plate capacitor - magnetic field inside and outside a cylindrical wire - magnetic field inside and outside the slab - Magnetic vector potential - magnetostatic boundary conditions.

Unit-III: Field Equations and Conservation Laws (12 Hours)
Faraday's law - induced electric field - Inductance - Energy in magnetic fields - Maxwell's equations in free space and linear isotropic media - Boundary conditions on fields at interface - continuity equations - Poynting's theorem - Potential formulation - Lorentz and Coulomb Gauge transformations - retarded potentials

Unit-IV: Electromagnetic Waves (12 Hours)
Waves in one dimension - Reflection, transmission and polarization - wave equation for E and B - monochromatic plane waves - Energy and momentum in EM waves - Propagation in linear media - Reflection and transmission at normal and oblique incidence - EM waves in conductors - Absorption, dispersion and reflection at a conducting surface

Unit - V: Guided Waves and Radiation (12 Hours)
Wave guides - TE and TM waves in a rectangular wave guide - Coaxial transmission line - Electric dipole radiation - Magnetic dipole radiation - Radiation from an arbitrary source -power radiated by a point charge - Radiation reaction - radiation damping of a charged particle - Physical basis of the radiation reaction.

Books for Study

1. David J. Griffiths, Introduction to Electrodynamics, 4th edition, 2018, Pearson.
2. Principles of Electromagnetics, N O Sadiku, 6th ed., 2015, Oxford University Press.
3. Electrodynamics, S L Gupta, V Kumar, S P Singh, 10th ed, 2002, Pragati Prakashan.

Books for Reference

1. J.D. Jackson, Classical Electrodynamics, 3rd Edition, 1999, John Wiley, New York.
2. Electromagnetic fields and waves, Paul Lorrain and Dale Corson, 2rd ed., 2003, CBS Publishers.
3. Foundations of Electromagnetic Theory: J.R. Reitz and R.W.Milford, 4th ed., 2010, Pearson India.
4. Electromagnetic Theory & Electro Dynamics, Satya Prakash, 21st ed., 2020, KedarNath RamNath.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : IV	SOLID STATE PHYSICS	SEMESTER: VIII
PAPER : MJD-21		CREDIT : 4

UNIT-I: Lattice Vibrations (12 hours)

Vibration of monoatomic lattices - Lattices with two atoms per primitive cell - Quantization of lattice vibrations - Phonon momentum - inelastic scattering of neutrons by phonons. Lattice heat capacity - density of mode in one-dimension and three-dimension - Debye model of the lattice heat capacity - Thermal conductivity - Umklapp process.

UNIT -II: Band Theory of solids (12 hours)

Electron levels in a periodic potential - Bloch's theorem - von Karman boundary condition - Fermi surface and density of states - Kronig-Pemiy model - Electrons in a weak periodic potential - Energy bands in one dimension - Formation of energy gap - General formulation for determination of band structure - Tight binding method - Experimental methods to study band structure.

UNIT - III: Dielectric Properties (12 hours)

Maxwell's equations for dielectrics - Local field theory for insulators - Derivation of Clausius-Mossotti relation - Theory of polarizability – Polarizability types - Derivation of expression for atomic polarizability and displacement polarizability - Frequency dependence of dielectric polarizability - Application of ionic crystals to optical properties - Pyroelectricity and Ferroelectricity.

UNIT - IV: Magnetic Properties (12 hours)

Classical theory of diamagnetism and paramagnetism - Weiss theory - Quantum theory of paramagnetism - demagnetization of paramagnetic salt - Ferroelectric order - Curie point and the exchange integral - Magnons - thermal excitation of magnons - Ferromagnetic order -Ferromagnetic domains - Origin of domains- Coercive force and hysteresis. Antiferromagnetic and Ferrimagnetic order.

UNIT - V: Superconductors (12 hours)

Superconductivity - Meissner effect - Critical field - Derivation of London equation - Isotope effect - Elementary BCS theory - Coherence length - Specific heat capacity and energy gap of superconductors Type-I and Type-II superconductors - Basics of high-temperature superconductors - Supercurrent tunneling - Qualitative treatment of DC and AC Josephson effect.

Books For Study

1. Solid state physics, S.L.Gupta and V. Kumar, 9th ed., 2006, K.Nath & Co, Meerut.
2. Elements of Solid-state Physics: J.P. Srivastava, 4th ed., 2014, Prentice Hall of India- Private Ltd.
3. Solid State Physics: S.O.Pillai, 10th ed., 2024, New Age International Publishers, New Delhi.

Books For Reference

1. Introduction to Solid State Physics: C. Kittel, 8th ed., 2018, Wiley India Edition,
2. Solid State Physics: N.W.Ashcroft and N. David Mermin, it ed., 2021, Brooks/Cole.
3. Fundamentals of Solid-State physics, Saxena et al, 28th ed., 2016, Pragathi Prakashan, Meerut.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : IV	ASTRO PHYSICS	SEMESTER: VIII
PAPER : MJD-22		CREDIT : 4

UNIT-I: Surveying the Cosmos (12 Hours)
Reflection telescope - refraction telescope – types of reflecting telescopes – radio telescope - radio interferometry – principle of gamma ray and X- ray telescopes – Hubble space telescope (block diagram), space coordinates - right ascension and declination.

UNIT-II: Solar System (12 Hours)
Rotation and revolution of the Earth - Precession of the Earth - seasons on earth - Phases and the features of Moon – solar and lunar eclipses - general properties of terrestrial & Jovian planets - dwarf planets - origin of solar system - Kupier's Proto-planet theory.

UNIT-III: Sun and Stars (12 Hours)
Different regions of sun and their characteristics - Sun Spots - Solar Flares and Prominences - Solar Wind and its effect on Earth - Aurora. Constellations - Binary stars - star clusters - absolute and apparent magnitudes of stars - Hertzsprung-Russel diagram - outline of Saha's ionization theory.

UNIT-IV: Stellar Evolution (12 Hours)
Nebulas as stellar nurseries – proto-star – Main-sequence stars – energy production in stars – Red Giants – HR diagram pathways - White dwarfs - Chandrasekar's mass limit (qualitative ideas) - heavy element synthesis – Supernova – Neutron stars - Black holes.

UNIT -V: Galaxy and Cosmology (12 Hours)
Hubble classification of galaxies- galaxy clusters and super clusters- Milky way galaxy-Radio galaxies – characteristics - Active galaxies- Unified model of active galaxies.
Expanding universe - Hubble's law - Big-Bang theory -standard model - inflation, evidences in favor of Big-bang theory – Pulsating theory- dark matter - future of the universe.

Books for Study:

1. Unfolding our Universe, Ion Nicolson, 1st ed, 1999, Cambridge University Press, UK.
2. Explorations-An Introduction to Astronomy, Thomas T. Arny, 8th ed., 2016, McGraw-Hill.
3. Astrophysics -Stars and Galaxies, K. D. Abhyankar, 1st ed, 2001, Universities Press.

Books for Reference:

1. An Introduction to Astrophysics, Baidyanath and Basu, 1st ed., 2010, Prentice Hall of India.
2. Universe, Roger A Freedman et al., 10th ed., 2015, W. H. Freeman and Company, New York.
3. Dynamic Astronomy, Robert T. Dixen, 5th ed., 1989, Prentice Hall International.
4. Introduction to Cosmology, J. V. Narlikar, 3rd ed, 2002, Cambridge University Press, UK.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : IV	**ADVANCED EXPERIMENTAL PHYSICS - II**	**SEMESTER: VIII**
PAPER : MJD-23		**CREDIT : 4**

Carry out minimum of **Ten** experiments from the following list
(Choose at least **Four** from each list of experiments given below)

LIST OF GENERAL EXPERIMENTS

1. B.G - Quantity or charge sensitivity
2. Measurement of charge on an electron by Milliken's method.
3. Characteristics of a solar cell.
4. Measurement of e/k, using a transistor and hence determining the Boltzmann constant - k.
5. Hall probe in magnetic field measurement.
6. Ultrasonic velocity and compressibility of the liquids -Interferometer method.
7. To verify Stefan's law from the power dissipated across the bulb as a function of resistance.
8. Study of optical rotation by solutions.
9. Computer simulation of quantum bound states- PHET Sim.
10. Computer simulation of quantum wave interference - PHET Sim.

LIST OF ELECTRONICS EXPERIMENTS

1. OP-AMP adder and subtractor.
2. Schmitt trigger – Conversion of sine wave to square wave.
3. Transistor Amplitude modulator and measurement of percentage of modulation.
4. IC Half adder and Full adder.
5. Parity generator / checker.
6. Decoders-using ICs.
7. Asynchronous counters using ICs.
8. Intel 8085 – 8-bit multiplication and division.
9. Intel 8085 – subtraction of two 8-bit number with borrow.
10. Computer simulation – oscillator working - Electronic Circuit Simulator.
11. Computer simulation of intel 8085 – generating Fibonacci series.

Books for Study

1. Practical Physics and Electronics, C.C. Ouseph et al, 1st ed., 2009, S. Visawanathan Pvt. Ltd.
2. Practical Physics, M.N. Srnivasan et al, 1st ed., 2013, Sultan Chand and Sons.
3. A Textbook of Practical Physics, H.P. Shrivastava, 1st ed., 2006, ABD Publishers.

Books for Reference

1. Practical Physics, G. L. Squires, 4th ed., 2001, Cambridge University Press (South Africa).
2. Basic electronics – A Text-lab manual, Zbar et al, 7th ed., 2009, Tata McGraw Hill.
3. Experiments in Modern Physics, Adrian C. Melissinos, 2nd ed., 2003, Academic Press.

Websites for Simulations:

1. PHET Simulations - https://phet.colorado.edu/en/simulations/category/physics/
2. Electronic Circuit Simulator. http://www.falstad.com/circuit/
3. Logism software – digital electronic simulator - http://www.cburch.com/logisim/

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : IV	**RESEARCH PROJECT**	**SEMESTER: VIII**
PAPER : Research Project		**CREDIT : 12**

Research Project Guidelines

1. Project Type

- Each student must undertake the research project individually; joint projects are strictly not allowed.
- The project must be aligned with the curriculum and contribute to the student's knowledge in physics.
- Topics should be selected based on the student's interest and must be approved by the Research Supervisor (faculty in charge).

2. Faculty Support and Supervision

- The Research Project Coordinator (HOD) and Research Supervisor (Faculty in charge) will guide students throughout the project.
- Regular meetings with the Research Supervisor must be scheduled to discuss progress, challenges, and findings.
- If required, students may work under an external research supervisor, with prior approval from the Research Project Coordinator (HOD) and Research Supervisor (Faculty in charge).

3. Research Objectives and Knowledge Demonstration

- Students must clearly define their research objectives at the beginning of the project.
- The project should involve a scientific investigation, experimental work, theoretical analysis, or computational modelling in physics.
- Students must demonstrate the additional or enhanced knowledge gained through the research.
- Credit will not be granted for routine laboratory tasks that do not contribute to academic learning.

4. Research Methodology and Reporting

- The project must follow a structured methodology, including literature review, data collection, experimentation, and analysis.
- Students must maintain a research logbook to record daily progress, experimental setups, observations, and challenges faced.
- Students must submit periodic progress reports to their Research Supervisor (Faculty in charge).

5. Final Report Submission and Evaluation

- Upon completion of the project, students must submit a detailed research report (minimum 40-50 pages) to the department.
- Upon completing the Project, students must submit a detailed report of 40-50 pages, neatly typed in Times New Roman, Font size 12 with 1.5 line spacing on single side A4 size white paper and neatly binded with paper cover.
- The project report comprising 40 - 50 pages must have include, an introduction, methodology, results, discussions, conclusion, graph, images, tabular column etc. Students are advised to adhere COE guidelines for any other relevant project documentation procedures.
- Students will undergo a viva voce conducted by the department, with evaluation by the Head of the Department (HOD), External Project Evaluator and Research Supervisor (Faculty in charge).
- For evaluation and viva-voce the students must explain the work through a power point presentation. Comprising the maximum of 10 to 15 slides.
- The total marks for the research project will be 300, with 200 marks for project work and 100 marks for presentation and viva-voce. The students should secure a minimum of 50% marks in each component.

6. Additional Guidelines

- Plagiarism is strictly prohibited. Students must ensure that their work is original and properly cite all references. Any form of data fabrication or falsification will lead to project disqualification.
- Students must adhere to all ethical guidelines while conducting experiments, especially those involving hazardous materials or live subjects.
- Students are encouraged to present their research findings at conferences or submit their work for publication, with guidance from faculty members.

SYLLABUS FOR MINOR COURSES

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : II	NUMERICAL METHODS	SEMESTER: III
PAPER : MID-03		CREDIT : 4

Unit – I: Solution of Equations and Eigen value Problems (12 Hours)

Solution of Algebraic and Transcendental Equations – Iteration method of method of successive approximation – Newton – Raphson method – Regula Falsi method – Solution of linear algebraic equation: Jacobi's iteration method, Gauss-Seidal iterative method - Eigen value and vectors of a matrix by Power method and Jacobi method for symmetric matrices.

Unit – II: Interpolation and Approximation (12 Hours)

Finite differences – Interpolation – Newton's Forward interpolation formula – Backward differences - Newton's Backward interpolation formula – Central differences – Gauss's Forward Formula – Gauss's Backward formula - Stirling's formula – Missing terms (Equal intervals) – interpolation with unequal intervels – Newton's divided difference formula.

Unit – III: Numerical differentiation and Integration (12 Hours)

Numerical differentiation – Forward difference formula; Backward difference formula; Central difference formula to computing the derivatives.

Initial value problem for ordinary differential equation – The Runge – Kutta method: Second order, Third order and Fourth order Numerical Integration – Trapezoidal Rule – Simpson's 1/3 Rule - Simpson's 3/8 Rule – Gauss Quadrature formula – Gauss two point formula – Gauss three point formula.

Unit – IV: Introduction to Python (12 Hours)

Python for Data science – Basic syntax – Input and output operation – Comments – variables - Data types - Operators – Arithmetic, Assignment, Logical, Comparison, Identity, Membership and Bitwise operators - Illustrative programs: Addition, Subtraction, Multiplication and Division of two numbers, find the largest of three numbers, Factorial of a given number, Prime numbers, convert the temperature from one unit to other.

Unit – V: Python Conditional statements and Loops (12 Hours)

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass - SciPy and NumPy - arrays - array operations-Illustrative programs: simple calculator, power of number, solution of quadratic equation. sum of infinite series (exp(x), sin(x), cos(x)), addition and multiplication of matrix.

BOOKS FOR STUDY

1. Numerical Methods in Science & Engineering, M.K. Venkataraman, National Pub. Co., 2013.
2. Introduction to Numerical Analysis, S.S. Sastry, 5th Edn., PHI Learning Pvt. Ltd, 2012
3. Python for Physical modelling, Jesse M Knder, Philip Nelson, Princeton University Press, 2015.

BOOKS FOR REFERENCE

1. Elementary Numerical Analysis, K.E. Atkinson, 3rd Edn., 2007, Wiley India Edition.
2. Programming for Computation-Python, Svein Linge, et al., Springer, 2nd Ed., 2020.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : IV	**SPECTROSCOPIC TECHNIQUES & TOOLS**	**SEMESTER: VIII**
PAPER : MID-06		**CREDIT : 4**

Unit -I: Visible and UV spectroscopy (12 Hours)

Theory of spectrophotometry and calorimeter- Lamberts laws -beers law –- instruments and components- -photo electric calorimeter – single beam spectrophotometers-applications.

Origin and theory of UV spectra - instrumentation – UV spectrophotometers -application: quantity-qualitative analysis –detection of impurities.

Unit -II: Fluorimetry, Phosphorimetry and Mass spectrometry (12 Hours)

Fluorescence - phosphorescence – theory-single let and triplet states – excited state process-factors affects fluorescence - phosphorescence – relation between them – instrumentation - single beam fluorimeters — comparison – applications. intensity and concentration. Mass spectrometry: components of mass spectrometers - interpretation of mass spectra (simple cases).

Unit -III: Thermal and Elemental Analysis (12 Hours)

Thermal analysis: Thermogravimetry - Differential thermal analysis - Differential scanning calorimetry.

Elemental analysis: Electron microscope - distinction between optical microscope and electron microscope - Resolving power of SEM versus TEM - Energy dispersive X-ray spectroscopy- X-ray photoelectron spectroscopy - Scanning tunneling microscopy - Atomic force microscopy.

Unit -IV: Rotational Spectroscopy (12 Hours)

Molecular spectrum - types of molecular energies - types of molecular spectra - Rotational spectrum – theory of rigid diatomic rotator - spectrum of CO - non-rigid rotator - types of molecules and their moments of inertia –spectrum of carbon oxysulphide - microwave spectrophotometer (block diagram).

Unit -IV: Laser as spectroscopic tool (12 Hours)

The width of spectral lines – types of line broadening - Spontaneous & stimulated emission - Einstein's A and B coefficients - conditions for light amplification and large stimulated emissions - pumping - three level and four level pumping schemes - Laser resonators – laser modes - Types of Lasers - design and operation of: Nd:YAG laser, He-Ne Laser, semiconductor diode laser-application: laser as spectrometric source.

BOOKS FOR STUDY:

1. Spectroscopy, Gurdeep & Chatwal, 5th Rev. Ed., Himalaya Publishing House, 2019.
2. Materials Characterization Techniques, Sam Zhang, Lin Li, Ashok Kumar, CRC press, 2008.
3. An introduction to Lasers, M.N. Avadhanulu, 1st Ed., S. Chand & Co., 2012.

BOOKS FOR REFERENCE:

1. Organic Spectroscopy, William Kemp, 3rd Ed., Macmillan (Indian edition), 2019.
2. Laser Fundamentals, W.T. Silfvast, 2nd Ed., Cambridge University Press, 2004.
3. Concise Encyclopedia of materials characterization, Robert W Cahn, etal, 1st Ed, Pergamon Press Ltd, New York, 2016.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : IV	ADVANCED MATHEMATICAL TECHNIQUES	SEMESTER: VIII
PAPER : MID-07		CREDIT : 4

Unit -I: Mathematical Tools of Vector and Matrix Spaces (12 Hours)

The Hilbert space and wave functions: Dirac Notation - Operators: Hermitian, Projection, commutator algebra, uncertainty relation between two operators, functions of operators. Eigenvalues and Eigenvectors of an operator, infinitesimal and finite unitary transformations. Representation in Discrete bases: Matrix representation of Kets, Bras and operators, change of bases and unitary transformations. Matrix representation of the Eigenvalues problems.

Unit -II: Partial Differential Equations (12 Hours)

First-Order equations: general PDEs, more than two independent variables - Second-Order equations: classes of PDEs. more than two independent variables - boundary conditions -Separation of variables: Cartesian coordinates, circular & cylindrical coordinates, spherical & polar coordinates - Laplace and Poisson equations - Wave equations: D'Alembert's solution - Diffusion PDE.

Unit-III: Complex Analysis (12 Hours)

Cauchy - Riemann conditions - Cauchy's integral theorem - applications to multiply connected region - Cauchy's II integral theorem - derivatives of analytic complex function - singular points and their classification - Laurent series - Cauchy's residue theorem - calculation of residue at a point - evolution of definite integrals: (i) around the unit circle, (ii) around a semi-circular contour.

Unit-IV: Fourier and Integral Transforms (12 Hours)

Fourier Transform: FT of a time dependent function - some important theorems: Parseval's, linearity, derivatives, shifting of origin and convolution, use of FT in solving partial differential equation for heat conduction.

Laplace transform: Theorems - inverse transform - solution to ordinary differential equations -solving equations for LCR circuit.

Unit-V: Special Functions (12 Hours)

Gamma and Beta functions - properties and their basic relations - DE and series solution of Legendre and Hermite - their polynomial - Rodrigues' formula - generating function - recurrent relation - orthogonality relations.

BOOKS FOR STUDY

1. Quantum Mechanics: Concepts and Applications, N Zettile, 2nd Ed, John Wiley & Sons, UK. 2009.
2. Mathematical Methods for Engineers & Physicists, Mukhopadhyay, 2nd Ed., Dreamtech Press, 2020.
3. Mathematical Physics, H.K Dass and Rama Verma, 8th Ed., S. Chand Pub. India, 2019.

BOOKS FOR REFERENCE

1. Mathematical Methods for Physicists, Arfken. Weber and Harris, 7th Ed. Academic Press, 2013.
2. Mathematical Methods in the Physical Sciences, M. L. Boas, 3rd Edn, John Wiley & Sons, 2006.
3. Advanced Engineering Mathematics, E. Kreyszig, 10th Edn, Wiley, 2017.
3. P.K. Chattopadhyay, Mathematical Physics, NEW AGE International Pvt Ltd, 3rd Ed., 2023.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : IV	MOLECULAR SPECTROSCOPY	SEMESTER: VIII
PAPER : MID-08		CREDIT : 4

Unit - I: IR Spectroscopy (12 Hours)

Modes of vibrations of a molecule - Regions of IR absorption spectroscopy - conditions for absorption of IR radiation -theory of diatomic harmonic oscillator –anharmonic oscillator (basic idea) - Description and working of a double beam IR spectrophotometer - Fourier transform IR spectroscopy (basic ideas) – modes of vibration of polyatomic molecules- molecular structure of H_2O and CO_2 using IR spectroscopy.

Unit - II: Raman Spectroscopy (12 Hours)

Raman effect - stokes and anti-stokes lines - Classical & Quantum theory of Raman effect – Laser as Raman source - Design and working of Laser Raman spectrophotometer - Types of Raman spectrum - Rule of mutual exclusion - Raman spectrum to study molecular structure of CO_2, H_2O and N_2O - comparison between IR and Raman spectra.

Unit - III: Electronic Spectroscopy of Molecules (12 Hours)

Electronic spectra of Diatomic molecules - Bom Oppenheimer approximation - vibrational coarse structure, Frank-Condon Principle - Intensity of vibrational - electronic spectra – dissociation energy and dissociation products - Rotational Fine Structure of Electronic -Vibration Transitions -Molecular photo-electron spectroscopy - X-ray photoelectron spectroscopy.

Unit - IV: NMR and ESR spectroscopy (12 Hours)

Principle of NMR- Magnetic properties of nuclei-resonance condition - Relaxation processes - NMR instrumentation-chemical shift- spin-spin coupling -NMR spectra of solids-NMR imaging-interpretation of NMR spectra- Electron Spin Resonance Spectroscopy: Basic principles -ESR spectrometer - Hyperfine structure-ESR spectra of Free radicals -g-factor - line widths -applications.

Unit -V: NQR and Mossbauer spectroscopy (12 Hours)

Quadrupole Hamiltonian- Nuclear Quadrupole energy level for axial and non-axial symmetry - Experimental techniques and applications - Mossbauer Spectroscopy: Principles of Mossbauer spectroscopy -Chemical shifts - Quadrupole splitting and Zeeman splitting - applications of Mossbauer spectroscopy.

BOOKS FOR STUDY:

1. Fundamentals of molecular spectroscopy, Colin N. Banwell, 4th Ed, Tata McGraw-Hill Ltd, 2023.
2. Spectroscopy, Gurdeep & Chatwal, 5th Ed., Himalaya Publishing House, 2016.

BOOKS FOR REFERENCE:

1. Spectroscopy, B.K. Sharma, 20th Ed., Krishna Prakashan Media P. Ltd, 2015.
2. Organic Spectroscopy, William Kemp, 3rd Ed., Macmillan (Indian edition), 2019.
3. Molecular Structure and Spectroscopy, G. Aruldhas, 2nd Ed, PHI Learning Private Ltd, 2014.

SYLLABUS FOR MINOR COURSES

OFFERED TO OTHER DEPARTMENTS

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : II	**CONCEPTUAL PHYSICS-I (For Chemistry Main Students)**	**SEMESTER: VI**
PAPER : MID-01		**CREDIT : 4**

UNIT -1: Mechanics (9 Hours)

Laws of motion - conservative and non-conservative forces - conservative forces and potential energy - law of conservation of momentum and energy for a system of particle - angular momentum and torque - law of conservation of angular momentum for system of particle – centre of mass – velocity and acceleration of center of mass.

UNIT - I1: Simple Harmonic Motion (9 Hours)

Simple harmonic motion - differential equation and its solution - period of SHM - simple pendulum - vertical oscillations of mass attached to spring - Compound pendulum - center of oscillation and center of suspension - determination of acceleration due to gravity using compound pendulum.

UNIT - III: Elasticity (9 Hours)

Hooke's law - stress and strain - Elastic moduli - Poison's ratio - expression for bending moment of a beam - Cantilever - expression for depression - determination of Young's modulus of a rectangular bar - non-uniform bending - pin and microscope method with theory - torsion - expression for couple per unit twist - determination of rigidity modulus - torsion pendulum

UNIT - IV: Viscosity and Surface Tension (9 Hours)

Viscosity - coefficient of viscosity - equation of continuity -Streamline flow and turbulent flow - Poiseuille's formula (analytical method), comparison of viscosity experiment - Stoke's law. determination of viscosity. Surface tension and surface energy' - interfacial surface tension - experimental determination of surface tension by drop weight method - with theory.

UNIT - V: Heat and Thermodynamics (9 Hours)

Review of the kinetic model of an ideal gas – interpretation of temperature - law of equipartition of energy and its applications to specific heat of gases: mono-atomic and diatomic gases – molecular theory of mean free path (zeroth order) - derivation. First law of thermodynamics and second law of thermodynamics - Isothermal and adiabatic process - Indicator diagram - Camot's engine - efficiency.

BOOKS FOR STUDY:

1. Allied Physics, R. Murugeasn, 1st Ed., S. Chand & Co., 2006.
2. Properties of Matter and Acoustics, Kiruthiga Sivaprasath et al., S. Chand & Co., 2005.
3. Mechanics and Properties of Matter, D.C.Tayal, 1st Edn., 2023.

BOOKS FOR REFERENCE:

1. Fundamentals of Physics, Halliday, Resnik. Walker, 12th Ed. Wiley., 2023.
2. Refresher Course in Physics -Vol-I and Vol-II. C.L Arora, 19th Ed.. S Chand and Co., 2021.
3. Mechanics and Properties of Matter 5th Edn., A B Gupta, Books &Allied (P) Ltd., 2020.

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : III	**CONCEPTUAL PHYSICS-II (For Chemistry Main Students)**	**SEMESTER: V**
PAPER : MID-02		**CREDIT : 4**

UNIT - I: Optics (9 Hours)

Defects in images -chromatic aberration-spherical aberration- Determination of refractive index using spectrometer -Newton's rings-determination of wavelength and refractive index of liquid-plane transmission grating-resolving power of diffraction grating-determination of wavelength- Nicol prism -double refraction

UNIT -II: Electricity (9 Hours)

Gauss's law with proof- Electric intensity and potential due to a uniformly charged hollow conductor at a point outside, on the surface and inside a spherical conductor - capacity of a parallel plate condenser with and without a dielectric slab - dielectric polarization - polar and nonpolar molecules.

UNIT -III: Magnetism & Electromagnetism (9 Hours)

Magnetic properties of materials - relation between - the three magnetic vectors - susceptibility and permeability - para, dia and ferromagnetism (qualitative ideas) - magnetic hysteresis. Biot & Savart's law - field along the axis of a circular coil carrying current - Ampere's circuital law – application: field due to infinitely long solenoid.

UNIT- IV: Modern physics (9 Hours)

Einstein's photo electric equation - verification of Einstein's photo electric equation by Millikan's experiment - photo electric cells - applications

Wave mechanics: De Broglie concept of matter waves - Davison-Germer - experiment characteristics and calculation of De Broglie wave length -Heisenberg uncertainty principle

UNIT - V: Laser Physics (9 Hours)

Spontaneous and Stimulated emission - population inversion - pumping - active medium -laser cavity-characteristics of lasers - He-Ne laser - Nd-YAG Laser- application of lasers.

BOOKS FOR STUDY:

1. Allied Physics, R. Murugeasn, 1st Ed.. S. Chand & Co., 2005.
2. Thermal Physics Paperback, Kiruthiga Sivaprasath, 1st Ed.. S. Chand & Co., 2013
3. A Text Book Physical Optics & Laser, Dr. R.S. Baghel et al., Utkarsh Prakashan, 2023
4. Electricity and Magnetism, R Murugeshan, 10th Edn., S. Chand & Co., 2019.

BOOKS FOR REFERENCE:

1. Fundamentals of Physics, Halliday, Resnik. Walker, 12th Ed. Wiley., 2023.
2. Refresher Course in Physics -Vol-I and Vol-II. C.L Arora, 19th Ed.. S Chand and Co., 2021.

CONCEPTUAL PHYSICS PRACTICAL

Choose any **TEN** experiments from the following list

List of Experiments

LIST OF EXPERIMENTS

1. Compound determination of acceleration due to gravity.
2. Young's modulus-non-uniform bending - Scale and Telescope.
3. Rigidity Modulus-Torsional oscillations without masses.
4. Spectrometer -Grating-N determination by normal incidence method.
5. Field along the axis of the circular coil carrying current- Determination of B.
6. Potentiometer - calibration of low range voltmeter (0-1.5 volts).
7. Potentiometer - calibration of ammeter (0-1.5 amps).
8. Melde's apparatus-Determination of frequency.
9. Newtons law of cooling - specific heat capacity- of liquid.
10. Meter Bridge – verification of laws of resistance.
11. Surface tension of a liquid and interfacial surface tension by drop weight method.
12. Sonometer-verification of law of transverse vibration in strings
13. Joule' s calorimeter - determination of specific heat of liquid.
14. Stoke' s method - determination of viscosity.
15. Meter Bridge - specific resistance of given coil of wire.
16. Computer simulation of law of gravitation- PHET Sim.
17. Computer simulation of oscillating mass - measurement of time period and energy- PHET Sim.
18. Computer simulation of AC and DC circuits - PHET Sim

BOOKS FOR STUDY:

1. Practical Physics and Electronics, C.C. Ouseph et al., 1st Ed.. Viswanathan Printers, 2005.
2. Practical Physics, M.N.Srnivasan et al., 2nd Ed.. Sultan Chand and Sons, 2005.
3. A Textbook of Practical Physics, H.P. Shrivastava, 1st Ed., ABD Publishers, 2006.

SYLLABUS FOR MLDC COURSES

OFFERED TO OTHER DEPARTMENTS

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : I / II	**EVERYDAY PHYSICS (For Other Main Students)**	**SEMESTER: I/II/III**
PAPER : MLDC		**CREDIT : 3**

UNIT-I: Mechanics (9 Hours)

Importance of Measurement– unit of length and time- special units- astronomical unit - light year- speed and velocity - speedometer– Inertia - moving in a bus - newtons law- motion of bullock cart- potential and kinetic energy-types of friction – reducing friction.

UNIT-II: Fluids (9 Hours)

Pressure - weather and pressure - buoyancy and floating of ship - Surface tension – bubbles - capillary rise –roots of plants – oil lamp working. Waves –Longitudinal and Transverse -characteristic of sounds – types of musical instruments.

UNIT-III: Heat and Light (9 Hours)

Heat and temperature - temperature scales - basics of thermometers-working of pressure cookers - specific heat – land and sea breeze - heat engines – four stoke engine. Reflection – periscope – refraction - total internal reflection – rainbow- mirage- lenses – Magnifying glass.

UNIT-IV- Electricity (9 Hours)

Basics of potential difference, current and watt - testing line with tester – working of lamps-tube lights-basics of LED lamps- Working of motor-basics of Grinder - Ac-Dc differences- Basics of watt meters - fuse - battery – battery powered automobile.

UNIT-V Solar system and beyond (9 Hours)

Earth - rotation and revolution - seasons - solar and lunar Eclipses- Introduction to solar system – comets – meteors - constellation - Idea of Rocket launching – space probes - Extraterrestrial life possibilities and search - UFOs.

BOOK FOR STUDY:

1. W. Thomas Griffith, Juliet Wain Brosing - The Physics of Everyday Phenomena- A Conceptual Introduction to Physics (6th Edition)-McGraw-Hill (2008).
2. Louis Bloomfield - How things work - the physics of everyday life-Wiley (2010).
3. Iain Nicolson - Introducing Astronomy-Dunedin Academic Press Ltd (2021)

BOOKS AND WEBSITES FOR REFRERENCE:

1. James Kakalios - The Physics of Everyday Things-The Extraordinary Science Behind an Ordinary Day-Crown (2017).
2. https://auto.howstuffworks.com -Learn How Everything Works.
3. https://howthingswork.org/ - Science and Technologies Explained for Everyone
4. https://phet.colorado.edu/ - Interactive Simulations for Science

SYLLABUS FOR VAC COURSES

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : I	**ENVIROMENTAL STUDIES**	**SEMESTER: I**
PAPER : VAC-1		**CREDIT : 2**

UNIT-I: Multidisciplinary nature of environmental studies
1. Definition, scope and importance; Need for public awareness.
2. Environmental ethics: Issues and possible solutions.
3. Environment Protection Act.

UNIT-II: Natural Resources, Renewable and Non-renewable Resources
1. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction.
2. Water resources: Use and over-utilization of surface and ground water, floods, drought, dams benefits and problems.
3. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture.
4. Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources.
5. Land resources: Land as a resource, land degradation, soil erosion and desertification.

UNIT-III Ecosystems
1. Concept of an ecosystem.
2. Structure and function of an ecosystem.
3. Energy flow in the ecosystem.
4. Food chains, food webs and ecological pyramids.
5. Characteristic features, structure and function of
   a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems.

UNIT-IV: Biodiversity and its conservation
1. Introduction – Definition: genetic, species and ecosystem diversity.
2. Bio-geographical classification of India, India as a mega-diversity nation.
3. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic values.
4. Hot-sports of biodiversity.
5. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
6. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-I Environmental Pollution
1. Definition, Cause, effects and control measures of:
   a. Air pollution b. Water pollution c. Soil pollution d. Noise pollution e. Thermal pollution f. Nuclear hazards.
2. Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
3. Disaster management: floods, earthquake, cyclone and landslides.

BOOKS FOR REFERENCE:

1. Odum, E. P., Barrett G., W., 2011, Fundamentals of Ecology, 5ed., Cengage Learning, ISBN-13: 978-8131500200
2. Sharma, P. D., 2011. Ecology and Environment, Rastogi Publications. ISBN-13: 978-817133965

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
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SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : I	**UNDERSTANDING INDIA**	**SEMESTER: I**
PAPER : VAC-2		**CREDIT : 2**

UNIT I: Geography of India

- India on the map of the world and its neighboring countries
- Geographical diversities

UNIT II History of India

- India's Freedom Struggle.
- An introduction to Indian knowledge systems.

UNIT III: Communicating Culture

- Oral narratives: Myths, tales and folklore.
- Introduction to the Tribal Cultures of India.

UNIT IV: Indian Social Structure

- Continuity and change of the Indian Social Structure: Caste, Community, Class and Gender.

UNIT V: Understanding Indian Polity

- The evolution of State in India: Nature and origin.
- Interpretating India: Traditional, Modern and Contemporary.
- Constitution as a living document.

BOOKS FOR REFERENCE:

1. Tiwari, R.C. (2007) Geography of India. Prayag Pustak Bhawan, Allahabad 12. Sharma, T.C. (2013) Economic Geography of India. Rawat Publication, Jaipur
2. Chandra, Bipan, Amales Tripathi & Barun De (1972), Freedom Struggle, National BookTrust, New Delhi.
3. Beatrix Hauser, "From Oral Tradition to "Folk Art": Reevaluating Bengali Scroll Paintings", in Asian Folklore Studies, Vol. 61, No. 1 (2002), pp. 105-122.
4. Komal Kothari, "Myths, Tales and Folklore: Exploring the Substratum of Cinema" pdf.
5. Singh, Y. (1986). Modernization of Indian Tradition: A Systemic Study of Social Change. India: Rawat Publications.
6. Madhav Khosla. The Indian Constitution. New Delhi, Oxford University Press, 2012

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : II	**DIGITAL TECHNOLOGY**	**SEMESTER: II**
PAPER : VAC-3		**CREDIT : 2**

UNIT -I:
Introduction and Evolution of Digital Systems. Role and Significance of Digital Technology. Computer System & its working, Software and its types. Operating Systems; Types and Functions. Problem Solving; Algorithms and Flowcharts.

UNIT -II:
Computer Networks & Internet; Concepts & Applications, WWW, Web Browsers, Search Engines, Messaging, Email, Social Networking. Computer Based Information System; Significance & Types. E- Commerce; Basic Concepts, Benefits & Challenges.

UNIT-III:
Digital India & e-Governance: Initiatives, Infrastructure, Digital Financial Tools: Unified Payment Interface, Aadhar Enabled Payment System, Credit/Debit Cards, e-Wallets, Internet Banking, NEFT/RTGS and IMPS, Online Bill Payments and PoS. Cyber Security: Threats, Significance, Challenges, Precautions.

UNIT -IV:
Emerging Technologies & their applications: Overview of Cloud Computing, Big Data, Internet of Things.

UNIT-V:
Emerging Technologies & their applications: Blockchain & Cryptocurrency, Machine Learning & Artificial Intelligence. Digital Signatures.

BOOKS FOR REFERENCE:

1. Tutorials compiled by Dept. of Computer Science staffs
2. Pramod Kumar, Anuradha Tomar, R. Sharmila, "Emerging Technologies in Computing- Theory, Practice, and Advances", Chapman and Hall/CRC, 1st Edition, 2021, eBook ISBN: 9781003121466

BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)
(For the students admitted from the academic year 2024 - 2025)
SYLLABUS FOR B.Sc. PHYSICS (Honors) (NEP)

YEAR : I	**HEALTH AND WELLNESS, YOGA EDUCATION, SPORTS AND FITNESS**	**SEMESTER: II**
PAPER : VAC-4		**CREDIT : 2**

UNIT-I HEALTH & WELLNESS

Define and differentiate health and wellness - Components of health wellness and their relationship between physical activity - Local, demographic, societal issues and factors affecting health and wellness.

Diet and nutrition for health & wellness - Essential components of bill juiced diet lor healthy living with specific reference to the role of carbohydrates, proteins, fats, vitamins & minerals malnutrition, under nutrition and over nutrition.

UNIT-II MANAGEMENT OF HEALTH AND WELLNESS

Meaning and importance of various dimensions of wellness. Relationship of physical fitness in achieving wellness. Drugs, doping and wellness. Role of diet and exercise in health management.

UNIT-III YOGA EDUCATION

Meaning and definition of yoga and its aims and objectives - Basic principles of yoga and its importance in our daily life - Yoga for mental attitude - Mind, body, breath and emotional level for higher plan of living.

UNIT-IV YOGA PRACTICES

Types and limbs of yoga - Yoga postures - .Asana - Breathing Practices - Pranayama -Relaxation- Meditation - Mudra.

UNIT-V FITNESS ACTIVITIES

Types of fitness activities - Outdoor activities - Basic movement patterns. Indoor activity - Aerobics/Dance Fitness. Resistance Training for fitness.

BOOKS FOR REFERENCE:

1. Physical Activity and Health by Claude Bouchard. Steven N. Blair. William L. Haskell. Human Kinetics, 2012,
2. Mental Health Workbook by Emily Attached & Marzia Fernandez. Independently Published, 2021.
3. Mental Health Workbook for Women: Exercises to Transform Negative Thoughts and Improve Well Being by Nashav Lorick, Rockridge Press, 2022
4. Lifestyle Diseases: Lifestyle Disease Management, by C. Nvambichu & Jeff Lumiri, Kindle edition, 2018.

QUESTION PAPER PATTERN

QUESTION PAPER PATTERN AND DISTRIBUTION OF MARKS FOR MJD COURSES

Marks Distribution

For Major Discipline Courses – each paper 100 marks is allotted. They were divided into internal component – 25 marks and External component - 75 marks i.e.

Component	Marks
Internal	25
External	75
Total	100

Note: There is no minimum mark required for passing the internal component, but students must secure at least 40% in the aggregate of internal and External component to pass.

Marks Distribution-Internal

The internal marks are subdivided as follows,

Component	Marks
Mid semester Test	20
Attendance	5
Total	25

Marks Distribution and Question Paper Pattern-External

The External component is 75 Marks and question paper pattern is as shown below:

Course: B.Sc. (Physics) **Duration: 3 Hours**

Course Code: 02 **Max. Marks: 75**

Section	No. of Question to be Asked	No. of Questions to be answered	Marks	Total
A	12	10	2	20
B	8	5	5	25
C	5	3	10	30
			Total	75

Special Instructions:

Note 1: Questions should be distributed uniformly in all the units.

Note 2: Section A and B may contain maximum of two problems only.

Note 3: One question in Section C may have a problem carrying 5 marks only.

QUESTION PAPER PATTERN AND DISTRIBUTION OF MARKS FOR PRACTICAL COURSES

Marks Distribution

For B.Sc. Practical courses – each paper 100 marks is allotted. They were divided into internal component – 50 marks and External component - 50 marks i.e.,

Component	Marks
Internal	50
External	50
Total	100

Note: There is no minimum mark required for passing the Internal component, but students must secure at least 40% in the aggregate of internal and External component to pass.

Marks Distribution-Internal

The internal marks are subdivided as follows,

Component	Marks
Attendance	5
Observation Note	15
Record	10
Model Exam	20
Total	50

Note: Observation Note and Record must be preserved for academic auditing.

Marks Distribution -External

The External marks are subdivided as follows,

Component	Marks
Experiment write up	15
Observation &Tabulation	20
Calculation & Graph	10
Result	05
Total	50