

Bachelor of Science – Physics – Syllabus 2024

4 Year, 8 Semester Full-Time Programme
Choice Based Credit System (CBCS) & Grading System
Outcome Based Education Pattern

1.0 Preamble: The New Education Policy (2020) has proved to be the real boon to the modern generation of students enabling to unleash their talent with opportunity to choose what to learn, how to learn, where to learn and when to learn by constituting their own personalized career foundation for personalized education. The main objective of the graduate syllabi for Bachelor of Science degree program is to create skilled minds with an objective to equip the students with knowledge and understanding of both fundamental and advanced concepts of physics in order to have comprehensive grasp of principles of physics. It is expected that the students studying physics will apply their knowledge through investigations and problem solving analytical aptitude to effectively communicate the theoretical concepts at global level platform.

1.0

2.0 Definitions

- 2.1 Bachelor Degree:** The Bachelor Degree means the degree conferred to the student after successfully earning 132 credits spread over the first 6 semesters of the programme.
- 2.2 Bachelor Degree (Hons.):** The Bachelor Degree (Hons.) means the degree conferred to the student after successfully earning 176 credits spread over the 8 semesters of the programme.
- 2.3 Choice Based Credit System:**
- 2.4 Credit:** In terms of credits, for a period of 1 semester of 15 weeks:
- every ONE hour session per week of Lecture amounts to 1 credit per semester,
 - a minimum of TWO hours per week of Tutorials amount to 1 credit per semester,
 - a minimum of TWO hours per week of Practice amount to 1 credit per semester,

Each credit is a combination of 3 components viz. Lecture (L) + Tutorial (T) + Practice (P) (Practical/ Project Work), i.e., LTP Pattern.

- 2.5 Course:** A course is specific subject in the academic programme taught in a particular semester for the specifically assigned number of credits.
- 2.6 Course Announcement:** The college shall announce the elective courses it proposes to offer to the students out of the wider course basket. It is not mandatory to offer all the electives. The decision of the Principal shall be final in this case. However, in the spirit of Choice Based Credit System, the college should offer choices to the students for the elective courses and not offer only the minimum number of electives.
- 2.7 Course Registration:** It is mandatory for every student, to register every semester, for the elective courses opted for that semester. Each student, on admission shall be assigned to a Faculty Advisor who shall advise her/him about the academic programs and counsel on the choice of courses considering the student's profile, career goals and courses taken in the earlier semesters. With the advice and consent of the Faculty Advisor, the student shall register for a set of courses he/she plans to take up for the Semester. Students shall have to register for the courses for the semester within first week of Semester I and immediately after conclusion of the preceding term for subsequent Semesters II, III, IV, V, VI, VII and VIII.
- 2.8 Course Outcomes:** The course outcomes are the specific and measurable attributes defining the knowledge, skills and attitude of the learners are expected to demonstrate by the completion of the course.
- 2.9 Grading System:** The Grading System is the 10-point standard scale system defined by the UGC comprising of the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA).
- 2.10 Graduate Attributes:** The Graduate Attributes are the generic abilities, attitudes and approaches expected to be demonstrated by the learner in the world around him/ her in a longer period of the life time.
- 2.11 Outcome Based Education (OBE):** OBE is the approach focusing on the performance outcome comprising of the following:
- The performer – the student (learner), not only the teacher
 - The performable (thus demonstrable or assessable) to perform

- c. The performance outcome, not the activity or task to be performed

2.12 Outcome Based Assessment: An assessment system that asks course teachers to first identify what it is that we expect students to be able to do once they have completed a course or program. It then asks course teachers to provide evidence that they are able to do so. In other words, how will each learning outcome be assessed? What **evidence of student learning** is most **relevant for each learning outcome** and **what standard or criteria** will be used to evaluate that evidence? Assessment is therefore a key part of outcome-based education and used to determine whether or not a qualification has been achieved.

2.13 Programme Educational Objectives: Programme Educational Objectives are a set of **broad future- focused student performance outcomes** that explicitly identify what students will be **able to do with what they have learned**, and **what they will be like** after they leave school and are **living full and productive lives**. Thus PEOs are what the programme is preparing graduates for in their **career and professional life** (to attain within a **few years** after graduation).

2.14 Programme Outcomes: Programme Outcomes are a set of **narrow statements** that describe what learners of the programme are expected to know and be able to perform or attain by the time of graduation.

2.15 Programme Specific Outcomes (PSOs): The PSOs are a set of narrow statements that describe what the learners of a particular specialization of the programme are expected to know and be able to perform or attain by the time of graduation. PSOs are also a function of the various course combinations offered by the college.

2.16 Semester: The Semester means the one half of the academic year comprising of the teaching days and examination & evaluation days as per the UGC/ University norms.

2.17 Teaching and Learning Activities: The set of **pedagogical tools and techniques** or the teaching and learning activities that aim to **help students to attain** the intended learning outcomes and engage them in these learning activities through the teaching process.

3.0 B.Sc.

3.1 Programme Educational Objectives (PEOs):

PEO 1

PEO 2:

PEO 3

PEO 4:

3.2 Programme Outcomes (POs): At the end of the B. Sc.- Physics Programme the learner will possess:

- PO1: Describe the nature and basic concepts of Physical sciences and understand their interrelationship with Physics. To help and develop an interest and create a strong knowledge in Physics .
- PO2: Develop skill of physics in students by solving problems occurring in day to day life , formulate and analyze complex problems related to physics .
- PO3: To train the students to operate various instruments , to understand research methodology, laboratory sessions and develop self directed study in physics.
- PO4 : A student should be able to understand the scientific problem at fundamental level and can frame scientific hypothesis and design the method to investigate and document the findings. They learn to analyze , apply & develop critical thinking to answer scientific challenges in interdisciplinary fields also.

- PO5: To apply appropriate tools & techniques in Physics to develop academic, professional, research competence so as to be able to pursue higher studies & join different industrial sectors.
- PO6: Ability to communicate and express scientific ideas. Develop interpersonal skills and other soft skills.
- PO7: Promoting ecological sustainability by understanding environmental, social & ethical responsibility.
- PO8: Nurturing creativity and human values.

4.0 B. Sc. –Physics Programme Course Types and Evaluation Pattern

Sr. No.	Course Type	Credits	Nature	CCE Marks	ECE Marks	Total Marks
1	Major Course	4	Compulsory	50	50	100
2	Minor (Elective) Course	4	Compulsory	50	50	100
3	Multidisciplinary Course	4	Elective	50	50	100
4	Skill Enhancement Course	2	Elective	25	25	50
5	Ability Enhancement Course	2	Elective	25	25	50
6	Indian Knowledge System	2	Elective	25	25	50
7	Value Added Courses	2	Elective	25	25	50

Course Types Definitions:

- 1. Major Course:** Major courses are the compulsory courses prescribed in various semesters of the programme. The learner shall have to acquire **68** credits (including 4 credits assigned to the Internship) in the Major courses in the Degree Programme and **92** credits (including 4 credits assigned to the Internship) in the Major courses in the Degree Programme with Hons.
- 2. Minor(Elective) Course:** Minor courses are the compulsory courses prescribed in various semesters of the programme. The learner shall have to acquire **24** credits in the Minor courses in the Degree Programme and **32** credits in the Minor courses in the Degree Programme with Hons.
- 3. Multidisciplinary Course:** Multidisciplinary courses are the elective courses from the other disciplines/faculties and are relevant to the academic programme under pursuit. The learner shall have to acquire **12** credits in the Multidisciplinary courses during the first 3 semesters of the programme.
- 4. Skill Enhancement Course:** Skill Enhancement courses are the elective courses purely aiming at developing various life skills and professional skills to be practiced by the learner. The learner shall have to acquire **10** credits in the SECs in the Degree Programme and **10** credits in the SECs in the Degree Programme with Hons.
- 5. Ability Enhancement Course:** Ability Enhancement courses are the elective courses aiming at -----
- 6. Indian Knowledge System (IKS):** IKS courses are the elective courses aiming at acquainting the learners with the Indian values, ethos, culture, arts and spirituality. The learner shall acquire **4** credits in the IKS as a part of the degree programme.
- 7. Value Added Courses (VAC):** Value Added courses are the elective courses aiming at empowerment of the learners with skills and knowledge, enabling them to apply what they have learnt to their professional and everyday lives. The learner shall acquire **4** credits in the VAC as a part of the degree programme.

5.0 The Programme Structure:

FIRST YEAR			SECOND YEAR		THIRD YEAR		FOURTH YEAR	
SEM I		SEM II	SEM III	SEM IV	SEM V	SEM VI	SEM VII	SEM VIII
Course	Course Classification	Course Classification	Course Classification	Course Classification	Course Classification	Course Classification	Course Classification	Course Classification
Major Course-1	Major 1 (4C)	Major 3 (4C)	Major 5 (4C)	Major 8 (4C)	Major 11 (4C)	Major 14 (4C)	Major 17 (4C)	Major 20 (4C)
Major Course-2	Major 2 (4C)	Major 4 (4C)	Major 6 (4C)	Major 9 (4C)	Major 12 (4C)	Major 15 (4C)	Major 18 (4C)	Major 21 (4C)
Minor Course-1	Minor 1 (4C)	Minor 2 (4C)	Major 7 (4C)	Major 10 (4C)	Major 13 (4C)	Major 16 (4C)	Major 19 (4C)	Major 22 (4C)
MDC – 1	MDC 1 (4C)	MDC 2 (4C)	MDC 3 (4C)	Minor 3 (4C)	Minor 4 (4C)	Minor 6 (4C)	Minor 7 (4C)	Minor 8 (4C)
AEC – 1	AEC 1 (2C)	AEC 2 (2C)	AEC 3 (2C)	AEC 4 (2C)	Minor 5 (4C)	AEC 5 (2C)	Research Project/ On the Job Training (6C)	Research Project/ On the Job Training (6C)
SEC – 1	SEC 1 (2C)	SEC 2 (2C)	SEC 3 (2C)	SEC 4 (2C)	SEC 5 (2C)	Internship (4C)		
IKS – 1	IKS 1 (2C)	VAC 1 (2C)	IKS 2 (2C)	VAC 2 (2C)				
TOTAL CREDITS	22	22	22	22	22	22	22	22

Total Credits for the Bachelor Degree programme: 132

Total Credits for the Bachelor Degree (Hons.) programme: 176

6.00 Multiple Entry-Exit Option: The B.Com. Banking and Financial Services programme is fully compliant with the *Curriculum and Credit Framework for Undergraduate Programmes* issued by the UGC. Accordingly, the programme provides the exit option to the learners at the end of the first year with UG Certificate awarded, at the end of the second year with UG Diploma awarded, at the end of the third year with UG Degree awarded and at the end of the fourth year with UG Honors Degree awarded. The learners choosing to exit the programme at the end of the first year or at the end of the second year will be allowed to, subject to successful completion of the relevant portion of the curriculum, shall be allowed to re-enter within a period of three years and complete the degree programme within a period of maximum seven years from the year of the first admission. All the other details are as provided in Sec.3.2.3 of the *Curriculum and Credit Framework for Undergraduate Programmes* issued by the UGC in December 2022.

7.00 Internship Project: Every learner must undergo and complete the internships/ apprenticeships in a firm/ industry/ organization or training in labs with faculty or researchers in their own or other college/ institute/ research institution during the summer term. Completion of the Summer Internship shall be mandatory for every learner choosing to exit at the end of the first year with UG Certificate or at the end of the second year with UG Diploma. The Internship Project shall carry the weightage of 4 credits. Since the internship is categorized as *Practice*, every learner will have to actually produce the work for 120 hours during the internship.

Evaluation of the Internship Project:

- 5.1 It is mandatory for the student to seek advance written approval from the faculty guide and the HOD for the internship and organization before commencing the internship.
- a. It is mandatory for the student to seek advance written approval from the faculty guide and the Director of the Institute about the topic and organization before commencing the SIP.
 - b. Students shall also seek a formal evaluation of their Internship Project from the external guide. The formal evaluation by the external guide shall be done for 50 marks and comment on the nature and quantum of work undertaken by the student, the effectiveness and overall professionalism. The learning outcomes of the Internship Project and utility of the project to the host organization must be specifically highlighted in the formal evaluation by the external guide. The Internship Project evaluation sheet duly signed and stamped by the external guide shall be included in the final Internship report.
 - c. The completion of the SIP shall be certified by the respective Faculty Guide & approved by the Director of the Institute.
 - d. The college level evaluation shall be for 50 marks through the Viva-Voce conducted by the faculty guide and HOD of the respective department.
 - e. Copies of SIP report and records of evaluation shall be maintained by the college for a period of 5 academic years.

8.00 Comprehensive Concurrent Evaluation (CCE)/ Concurrent Internal Evaluation (CIE):

1. The course teacher shall prepare the scheme of Comprehensive Concurrent Evaluation (Formative Assessment) before commencement of the term. The scheme of Comprehensive Concurrent Evaluation shall explicitly state the linkages of each CCE with the Course Outcomes and define the targeted attainment levels for each CO.
2. The Head of the Department shall approve the scheme of Comprehensive Concurrent Evaluation with or without modifications.
3. The course teacher shall display, on the notice board/ ERP, the approved CCE scheme of the course and the same shall also be hosted on the website, not later than the first week of the term.
4. Each CCE item shall be of minimum 25 marks.
5. For a 4 Credit Course there shall be a MINIMUM of three CCE items. The final scores shall be converted to 50, using an average or best two out of three formula.
6. For 2 Credit Course there shall be a MINIMUM of two CCE items. The final scores shall be converted to 50.
7. CCE shall be spread through the duration of course and shall be conceptualized, executed, assessed and documented by the course teacher along with student-wise and class-wise attainment levels of the COs and the attainment levels of the course.
8. The assessment outcome of each CCE shall be duly signed by the course teacher & the programme coordinator / HOD of the college.
9. A copy of the duly signed CCE *outcome* shall be displayed on the notice boards/ ERP, within a week of the assessment and course teachers shall guide the students on a need basis.
10. College may conduct additional make up / remedial CCE items at its discretion.
11. At the end of the term aggregate CCE scores / grades shall be calculated and the CO attainment levels shall be calculated by the course teacher. The same shall be displayed on the notice board/ ERP.
12. Records of CCE shall be retained for 5 years from the completion of the Academic Year. i.e. **Current Academic Year (CAY) + 4 years.**

9.00 End-Semester Evaluation:

1. The End Semester Evaluation (Summative Evaluation) for all the courses shall be conducted by the Examination Department/ Committee of the college headed by a full-time regular faculty member nominated by the Principal as Controller of the Examination.
2. The ESE for each course shall have the weightage as follows:

- For a 4 Credit Course: 50 marks
 - For a 2 Credit Course: 25 marks
3. The ESE for each course shall have 5 questions each of 10 marks. In case of 2 Credit courses the aggregate marks out of 50 shall be converted to the level proportionate to 25 marks.
 4. All questions shall be compulsory with internal choice within the questions.
 5. The broad structure of the ESE question paper shall be as follows:

Question Number	COGNITIVE ABILITIES EVALUATED	Nature
Q.1	REMEMBERING	Answer any 5 out of 8 (2 marks each)
Q.2	UNDERSTANDING	Answer any 2 out of 3 (5 marks each)
Q.3	APPLYING	Answer 3 (a) or 3 (b) (10 marks)
Q.4	ANALYSING	Answer 4 (a) or 4 (b) (10 marks)
Q.5	EVALUATING	Answer 5 (a) or 5 (b) (10 marks)
	CREATING	

10.00 Passing Standard

- A learner shall be said to have earned the credits for a course if he/she earns minimum 35% marks.
- Formative Evaluation and Summative Evaluation shall be separate heads of passing.

10.1 Grading System: The Indirect and Absolute Grading System shall be used, i.e. the assessment of individual Courses in the concerned examinations will be on the basis of marks. However the marks shall later be converted into Grades by a defined mechanism wherein the overall performance of the learners can be reflected after considering the Credit Points for any given course. The overall evaluation shall be designated in terms of Grade. The 10 point standard scale mandated by UGC shall be used.

The performance of a student will be evaluated in terms of two indices, viz.

- (a) Semester Grade Point Average (SGPA) which is the Grade Point Average for a semester
- (b) Cumulative Grade Point Average (CGPA) which is the Grade Point Average for all the completed semesters at any point in time

10.2 Degree Requirements: The degree requirements for the B.COM. - BANKING AND FINANCIAL SERVICES programme are completion of minimum 136 credits and 180 credits in case of Honours degree.

10.3 Maximum Duration for Completion of the Programme: The maximum duration for completion of the programme is 7 years.

11.00 Attendance: The student must meet the requirement of **75% attendance per semester per course** for grant of the term. The college may condone the shortage in attendance in exceptional circumstances, up to a maximum of 10%. The college shall have the right to withhold the student from appearing for examination of a specific course if the above requirement is not fulfilled.

12.00 Medium of Instruction: The medium of Instruction & Evaluation shall be English.

13.00 Detailed Course List (Annexure 1)

14.00 Detailed Syllabus for each course (Annexure 2)

**Annexure 1
Detailed Course List**

**Major Courses
(Compulsory Course – 4 Credits Each)**

Course No.	Course Code	Course Title	Semester
111	PHM 111(T)	Mechanics, Basic analog Electronics and Optics.	1
112	PHM 112(P)	Physics lab	1
121	PHM 121(T)	Digital electronics , Electricity magnetism and Nuclear Physics.	2
122	PHM 122(P)	Physics Lab	2
231	PHM 231(T)	Solid state Physics , Electronics, Plasma physics and Wave optics	3
232	PHM232(T)	Mathematical Physics, Classical mechanics, Nuclear physics, Method of images and electrostatic field in matter	3
233	PHM233(P)	Physics Lab	3
241	PHM 241(T)	Solid state physics ,Heat and Thermodynamic , Modern Physics and elementary and Quantum mechanics, Quantum mechanics,	4
242	PHM242(T)	Special theory of relativity , Sound and optics, Statistical mechanics, Electronics	4
243	PHM243(P)	Physics Lab	4
351	PHM351 (T)	Classical mechanics Statistical mechanics	5
352	PHM352 (T)	Mathematical physics and quantum mechanics	5
353	PHM353 (P)	Physics Lab	5
361	PHM361 (T)	Mathematical physics and Molecular spectroscopy	6
362	PHM362 (T)	Analog Electronics and Nuclear physics	6
363	363(P)	Physics Lab	6
INT.	INT.	Internship	6
			7
			7
			7
			8
			8
			8

**Minor(Elective) Courses
(Compulsory Course – 2 Credits Each)**

Course No.	Course Code	Course Title	Semester
113	PHE 113(T)	Mechanics and Basic analog electronics	1
113	PHE 113(P)	Physics Lab	1
123	PHE 123(T)	Digital electronics and electrostatics	2
123	PHE 123(P)	Physics Lab	2
244	244(T)	Solid state Physics and Heat and Thermodynamics	4
244	244 (P)	Physics Lab	4
354	PHE 354(T) *	Electro magnetism and Nuclear Physics	5
354	PHE 354(P) *	Physics lab	5
364	PHE 364(T)	Digital electronics	6
364	PHE 364(p)	Physics lab	6

(* = 4 CREDITS)

**Multidisciplinary Courses
(2 Credits Each)**

Course No.	Course Code	Course Title	Semester
114	PHMDC 114(T)	Laser and Plasma Physics	1
114	PHMDC 114(P)	Physics LAB	1
124	PHMDC 124(T)	Sound , Ultrasonic and Indian Astronomy.	2
124	PHMDC 124(P)	Physics Lab	2
234	PHMDC 234 (T)	Fibre Optics and Remote sensing	4
364	PHMDC 364(T)	Digital electronics	6

**Ability Enhancement Courses
(Elective Course – 2 Credits Each)**

Course No.	Course Code	Course Title	Semester
	AEC 365 (T)	Plasma physics	6

**Skill Enhancement Courses
(Elective Course – 2 Credits Each)**

Course No.	Course Code	Course Title	Semester
116	PHSEC 116(T+P)	Basic Instrumentation, Measurements and Analysis	1
126	PHSEC 126 (T+P)	Electrical and Electronics Skills.	2
236	PHSEC 236(T+P)	Application of AFO, function generator , Application of CRO Combinational circuit sequential circuits	3
246	PHSEC 246 (T+P)	MS Office And programming language	4
356	PHSEC 356 (T+P)	Solid state physics and Oscillators (Heartly and Collpits)	5

**Value Added Courses
(Elective Course – 2 Credits Each)**

Course No.	Course Code	Course Title	Semester

**Indian Knowledge System
(Elective Course – 2 Credits Each)**

Course No.	Course Code	Course Title	Semester

**Annexure 2
Detailed Syllabus for Each Course**

Semester: 1	Course No.: 111	Course Code: PHM 111(T) Course Title: Mechanics, Basic analog Electronics and Optics.
Credits: 4		Course Category: core paper

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Overview of some basic theories related to the subject and study of fundamental concepts in physics
CO111 T-2	UNDERSTANDING	Understanding essential to study various different fields in Physics will be developed .
CO111 T-3	APPLYING	Ability to apply concepts of physics in science engineering and technology will be developed that will strengthen student’s analytical abilities .
CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	Introduction, Applications of Vector Multiplication, Triple Scalar Product, Triple Vector Product, Differentiation of Vectors, Fields, Directional Derivative, Gradient, Some other expressions involving ∇ , Green’s Theorem in the plane, The Divergence and the Divergence theorem. Gauss’s law, The curl and Stoke’s theorem.	15
2	Diode: load line analysis of diode circuit Rectifier : Half wave rectifier circuit, Graphical analysis of half wave rectifier, Mathematical analysis of HW rectifier, Full wave rectifier circuits, Mathematical analysis of full wave rectifier circuit, Important aspects of rectifier circuits, comparison of half wave and full wave rectifier, Bridge rectifier Transistor: Transistor, Naming the transistor terminals, some facts about the transistor, transistor action, Transistor symbols, transistor as an amplifier, Transistor connections, CB connection, Characteristics of CB connection, CE connection, Measurement of leakage current, characteristics of CE connection, CC connection, comparison of transistor connections, commonly used transistor connection, Transistor as an amplifier in CE arrangement, Transistor load line analysis, operating point, Practical way of drawing CE circuit, output from transistor amplifier, Performance of transistor amplifier, cut off and saturation points, power rating of transistor, Determination of transistor configuration, semiconductor devices numbering system, transistor lead identification , Transistor testing	15
3	Farmat’s principle and its applications: Farmat’s principle of least time, laws at reflection, laws of refraction. Interference in thin films: Thin film, Plane parallel film, Interference due to transmitted light, Haidinger fringes, variable thickness (wedge-shaped) film, Newton’s ring. Michelson interferometer (Only construction and working) Matrix Method in Optics : Introduction, The matrix method, Unit planes, Nodal point planes, A system of two thin lenses.	15

4	Waves and oscillations Composition of two S.H.M. , Lissajous figures , Lissajous figures by C.R.O. , motion due to constant force , a particle executing S.H.M. acted upon by a harmonic force, motion in a resisting medium, forced vibration, amplitude resonance , maximum energy of the system , phase of the forced vibration , power supply in forced vibration. Velocity of plane longitudinal waves in gas , velocity of sound through gases , velocity of longitudinal wave in a solid medium , velocity of transverse wave along a stretched string .	15
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Suggested Text Books:

1. Mathematical methods in Physical Sciences By M.L. Boas , chapter 6 , articles 1 to 7 and 9 to 11 , 3rd edition ,2006, John Willey & Sons.
2. Fundamentals of Electronics by Anokh Singh Chapter-5, articles-5.1 to 5.9 4th Edition 1986, Khanna Publishers.
- 3 Principles of Electronics V. K. Mehta and Rohit Mehta , Chapter-8, 8.1 to 8.27 34th edition , 2017, S. Chand publication .
- 4 Electronics devices and circuits – An introduction Allen Mottershead Ch-2 , article 2.1 PHI learning privet Ltd. , 2011
- 5 A text book of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhanulu, Chapter 2 articles: 2.2, 2.5, 2.6, chapter 15 articles 15.1 to 15.6 ,15.7.1, 15.7.2, 15.7.3, 23rd edition , 2006 , S. Chand and company Ltd.
6. Optics – Ajoy Ghatak,,chapter 4 , articles 4.1 to 4.5, 3rd Edition, 2005, TMH Publication.
7. A text book on oscillations, waves & Acoustics by M. Ghosh, D. Bhattacharya . Chapter2 , articles 2.10 to 2.12 , chapter 3 , articles 3.2, 3.4 to 3.10 , chapter Chapter 9, articles 9.1 to 9.5. 3rd edition , 2006, S. Chand and Company limited.

Suggested Reference Books:

1. Mathematical Methods for Physicist, Arfken, Weber and Harris 7th Edition , 2012, Elsevier.
2. Basic Electronics and Linear Circuits , N.N,Bhargava , D.C. Kulshrestha and S.C.Gupta , 2nd Edition , 2017 , NITTR , Chandigahr.
- 3 Physics-volume 1 – 5th edition , 2002 , Robert Resnick, David Halliday, Kenneth Krane John Willey & Sons.
- 4 Optics by Satyaprakash, 8th edition, 2021 Pragati Prakshan

Semester: 1	Course No.: 112 (P)	Course Code: PHM 112(P) Course Title: : Physics lab
Credits: 4		Course Category: core paper

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Get acquainted and learn the use of different laboratory instruments
CO111 T-2	UNDERSTANDING	Hands on training to measure passive components required for any electronic circuits and to impart knowledge to study various basic electronic circuits.
CO111 T-3	APPLYING	To measure different physical quantities related to general physics , optics ,electronics and passive components of electronic circuits

CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	<p style="text-align: center;">GROUP A</p> <p>1. To find the prism angle and refractive index of a prism using spectrometer.</p> <p>2. Melde’s Experiment.</p> <p>(i) To prove P/L constant. (ii) To prove T/L^2 constant</p> <p>3. Resonator</p> <p>To test the accuracy of relation $n^2 (V + Kv) = \text{constant}$ and to determine the frequency of unknown fork.</p> <p>4. Flywheel</p> <p>To determine the moment of inertia.</p> <p>5. Radioactive decay</p> <p>Simulation of Nuclear Radioactive decay using Calculator.</p> <p>6. Study of travelling microscope</p> <p>To find distance between two given points, to find diameter of a ring, to find inner and outer diameter of a rubber tube.</p> <p>7. Graphical method to draw the Lissajous figure.</p> <p>8. Simple pendulum.</p> <p>To find the relaxation time and quality factor.</p> <p>9 ‘g’ by Bar pendulum</p> <p>To obtain the value of ‘g’ by bar pendulum.</p> <p>10. Liquid lens</p>	60

	<p>Find the refractive index of the given liquid</p> <p>11. Analysis of error</p>	
2	<p style="text-align: center;">GROUP: B</p> <p>1. Measurement of resistance, capacitor and inductance using LCR meter</p> <p>Study of diode using multimeter , Resistance value using colour code</p> <p>Testing of continuity of fuse</p> <p>2. Measurement of Boltzmann’s constant using Diode</p> <p>3. Thevenin’s Theorem</p> <p>4. Norton’s theorem</p> <p>5. Maximum power transfer theorem</p> <p>6. Value of capacitance</p> <p>For given two capacitors determine the value of capacitance for each of them</p> <p>(i) by connecting them in series and (ii) by connecting them parallel.</p> <p>7. Value of inductance</p> <p>For given two inductors determine the value of inductance for each of them</p> <p>(i) by connecting them in series and (ii) by connecting them parallel.</p> <p>8. Study of Transformer</p> <p>To determine (i) turn ratio (ii) percentage efficiency (iii) energy loss due to copper, for a given transformer.</p> <p>9. Logic Gates (AND, OR, NOT) (Using discrete components)</p> <p>Verification of truth tables and giving understanding of voltage level for ‘0’ and ‘1’ level.</p> <p>10. Half-Wave Rectifier</p> <p>Obtain load characteristic and % of regulation of Half-wave rectifier without filter and with capacitor filter. Determine ripple factor also.</p> <p>11. Series Resonance</p>	60

	To determine the frequency of a.c. emf by series resonance circuit varying capacitor.	
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Reference books

1. B. Sc. Practical Physics by C. L. Arora , 20th Edition , 2020 S. Chand and Company
2. Practical Physics by G. L. Squires. 4th edition , Cambridge , 2001.
3. Practical Physics with viva – voce Dr.S.L. Gupta and Dr.V.Kumar , 27th edition , 20210 Pragati Prakashan .

Semester: 1	Course No.: 113(T)	Course Code: : PHE 113(T) Course Title: Mathematical Physics and Basic analog Electronics
Credits: 2		Course Category: Minor paper

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Overview of some basic theories related to the subject and study of fundamental concepts in physics
CO111 T-2	UNDERSTANDING	Understanding essential to study various different fields in Physics will be developed .
CO111 T-3	APPLYING	Ability to apply concepts of physics in science engineering and technology will be developed that will strengthen student's analytical abilities .
CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	Introduction, Applications of Vector Multiplication, Triple Scalar Product, Triple Vector Product, Differentiation of Vectors, Fields, Directional Derivative, Gradient, Some other expressions involving ∇ , Green's Theorem in the plane, The Divergence and the Divergence theorem. Gauss's law, The curl and Stoke's theorem.	15
2	Diode: load line analysis of diode circuit Rectifier : Half wave rectifier circuit, Graphical analysis of half wave rectifier, Mathematical analysis of HW rectifier, Full wave rectifier circuits, Mathematical analysis of full wave rectifier circuit, Important aspects of rectifier circuits, comparison of half wave and full wave rectifier, Bridge rectifier Transistor: Transistor, Naming the transistor terminals, some facts about the transistor, transistor action, Transistor symbols, transistor as an amplifier, Transistor connections, CB connection, Characteristics of CB connection, CE connection, Measurement of leakage current, characteristics of CE connection, CC connection, comparison of transistor connections, commonly used transistor connection, Transistor as an amplifier in CE arrangement, Transistor load line analysis, operating point, Practical way of drawing CE circuit, output from transistor amplifier, Performance of transistor amplifier, cut off and	15

	saturation points, power rating of transistor, Determination of transistor configuration, semiconductor devices numbering system, transistor lead identification , Transistor testing	
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Suggested Text Books:

1. Mathematical methods in Physical Sciences By M.L. Boas , chapter 6 , articles 1 to 7 and 9 to 11 , 3rd edition ,2006, John Willey & Sons.
2. Fundamentals of Electronics by Anokh Singh Chapter-5, articles-5.1 to 5.9 4th Edition 1986, Khanna Publishers
- 3 Principles of Electronics V. K. Mehta and Rohit Mehta , Chapter-8, 8.1 to 8.27 34th edition , 2017, S. Chand publication.
- 4 Electronics devices and circuits – An introduction Allen Mottershead Ch-2 , article 2.1 PHI learning privet Ltd. , 2011.

Reference Books:

1. Mathematical Methods for Physicist , Arfken, Weber and Harris 7th Edition , 2012, Elsevier.
2. Basic Electronics and Linear Circuits , N.N,Bhargava , D.C. Kulshrestha and S.C.Gupta , 2nd Edition , 2017 , NITTR , Chandigarh.

Semester: 1	Course No.: 113 (P)	Course Code: PHE 113(P) Course Title: : Physics lab
Credits: 2		Course Category: Minor paper

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Get acquainted and learn the use of different laboratory instruments
CO111 T-2	UNDERSTANDING	Hands on training to measure passive components required for any electronic circuits and to impart knowledge to study fundamental principles in various electronic circuits.
CO111 T-3	APPLYING	To measure different physical quantities related to general physics , optics and passive components of electronic circuits
CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	GROUP A 1. To find the prism angle and refractive index of a prism using spectrometer. 2. Melde’s Experiment. (i) To prove P/L constant. (ii) To prove T/L ² constant 3. Resonator	30

	<p>To test the accuracy of relation $n^2 (V + Kv) = \text{constant}$ and to determine the frequency of unknown fork.</p> <p>4. Flywheel</p> <p>To determine the moment of inertia.</p> <p>5. Radioactive decay</p> <p>Simulation of Nuclear Radioactive decay using Calculator.</p> <p>6. Study of travelling microscope</p> <p>To find distance between two given points, to find diameter of a ring, to find inner and outer diameter of a rubber tube.</p>	
2	GROUP: B	30
	<p>1. Measurement of resistance, capacitor and inductance using LCR meter</p> <p>Study of diode using multimeter , Resistance value using colour code</p> <p>Testing of continuity of fuse</p> <p>2. Measurement of Boltzmann’s constant using Diode</p> <p>3. Thevenin Theorem</p> <p>4. Norton theorem</p> <p>5. Maximum power transfer theorem</p> <p>6. Value of capacitance</p> <p>For given two capacitors determine the value of capacitance for each of them</p> <p>(i) by connecting them in series and (ii) by connecting them parallel.</p>	

Reference books

1. B. Sc. Practical Physics by C. L. Arora , 20th Edition , 2020 S. Chand and Company.
2. Practical Physics by G. L. Squires. 4th edition , Cambridge , 2001.
3. Practical Physics with viva – voce Dr.S.L. Gupta and Dr.V.Kumar , 27th edition, 2010, Pragati Prakashan.

Semester: 1	Course No.: 114 (T)	Course Code: : PHMDC 114(T) Course Title: : Laser and Plasma Physics
Credits: 2		Course Category: Multidisciplinary

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Overview of some basic theories related to the subject and study of fundamental concepts in Laser and Plasma physics
CO111 T-2	UNDERSTANDING	Understanding essential to study Lasers and Plasma Physics will be developed .
CO111 T-3	APPLYING	Ability to apply concepts of physics in science engineering and technology will be developed that will strengthen student’s analytical abilities .
CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	LASERS Introduction, Attenuation of light in an optical medium, Thermal equilibrium, Interaction of light with matter, Einstein coefficients and their relations, Light amplification, Meeting the three requirements, Components of Laser, Lasing action, Principal pumping schemes, Type of lasers (excluding Carbon Dioxide Laser), Ruby laser ,Nd-YAG lase,He-Ne laser and Semiconductor laser, Laser beam characteristics, Applications	15
2	Unit-2 Plasma Physics: Introduction, Composition & characteristics of a plasma, Collisions, Surface phenomena, Transport (or transfer) phenomena, Diffusion & Mobility : Ambipolar Diffusion, Viscosity : Conductivity, Recombination, Ohm’s law, Gas Discharge, Comparison of various natural & man-made plasma, Plasma diagnostics, plasma waves & Instabilities confinement of plasma, space plasma.	15

Suggested text Books:

1. A text book of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhanulu, S. Chand Publication: Chapter 22, articles 22.1 to 22.12.1, 22.16.1 ,22.16.2,22.16.3 ,22.17. 23rd edition , 2006 , S. Chand and company Ltd.
2. Element of Plasma physics by S. N. Goswami, , chapter 1 , articles 1.1 to 1.14 , 1st edition 1995 , New Central Book Agency (P) Ltd.

Reference Books:

1. Optics by Ajoy Ghatak, 7th Edition , 2020 , McGraw Hill
- 2 Introduction to Plasma Physics and controlled fusion, F. F Chen , second edition ,1984 , Springer Science

Business Media LIC.

Semester: 1	Course No.: 114 (P)	Course Code: PHMDC 114(P) Course Title: : Physics lab
Credits: 2		Course Category: Multidisciplinary

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Get acquainted and learn the use of different laboratory instruments
CO111 T-2	UNDERSTANDING	To measure different physical quantities related to general physics , optics and electronics and understanding of some basic electronic circuits .
CO111 T-3	APPLYING	
CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	<p style="text-align: center;">GROUP A</p> <p>1. Study of travelling microscope</p> <p style="padding-left: 40px;">To find distance between two given points, to find diameter of a ring, to find inner and outer diameter of a rubber tube.</p> <p>2. Graphical method to draw the Lissajous figure.</p> <p>3. Simple pendulum.</p> <p style="padding-left: 40px;">To find the relaxation time and quality factor.</p> <p>4 'g' by Bar pendulum</p> <p style="padding-left: 40px;">To obtain the value of 'g' by bar pendulum.</p> <p>5. Liquid lens</p> <p style="padding-left: 40px;">Find the refractive index of the given liquid</p> <p>6. Analysis of error</p>	30
2	GROUP: B	30

	<p>1. Value of capacitance</p> <p>For given two capacitors determine the value of capacitance for each of them (i) by connecting them in series and (ii) by connecting them parallel.</p> <p>2. Value of inductance</p> <p>For given two inductors determine the value of inductance for each of them (i) by connecting them in series and (ii) by connecting them parallel.</p> <p>3. Study of Transformer</p> <p>To determine (i) turn ratio (ii) percentage efficiency (iii) energy loss due to copper, for a given transformer.</p> <p>4. Logic Gates (AND, OR, NOT) (Using discrete components)</p> <p>Verification of truth tables and giving understanding of voltage level for '0' and '1' level.</p> <p>5. Half-Wave Rectifier</p> <p>Obtain load characteristic and % regulation of Half-wave rectifier without filter and with capacitor filter. Determine ripple factor also.</p> <p>6. Series Resonance</p> <p>To determine the frequency of a.c. emf by series resonance circuit varying capacitor.</p>	
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Reference books:

1. B. Sc. Practical Physics by C. L. Arora , 20th Edition , 2020 S. Chand and Company.
2. Practical Physics by G. L. Squires. 4th edition , Cambridge , 2001.
3. Practical Physics with viva – voce Dr.S.L. Gupta and Dr.V.Kumar , 27th edition , 20210 Pragati Prakashan .

Semester: 1	Course No.: 116 (T+P)	Course Code: : PHSEC 116 (T+P) Course Title: Basic Instrumentation, Measurements and Analysis
Credits: 2		Course Category: Skill Enhancement course

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Skill for precise measurements required for evaluating different physical quantities will be developed
CO111 T-2	UNDERSTANDING	A student will also learn basic measurement instruments and the extent of error involved in the measurements by instrument.
CO111 T-3	APPLYING	
CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	<p>Vernier Calipers: Introduction, Theory, Figure, Description of the instrument, Detail study of least count, Error, Positive error, Negative error, Determination of magnitude of positive and negative errors. Some limitations of Venire Calipers . Application of Venire Calipers. Limitation</p> <p>Experiments: To measure thickness of given slab and other thing.</p> <p>Micromner screw: Introduction, theory, figure, description of the instrument, definition of pitch, and its determination. Study of least count, meaning of the error and explanation of positive and negative errors. Determination of positive and negative errors. Method of taking observation with the help of micrometer screw. Application of micrometer Screw. Some Limitations of screw gauge</p> <p>Experiments: To find diameter of wire and thickness of thin sheet and other things.</p>	15
2	<p>Travelling Microscope: Introduction, Construction and main part of travelling microscope , vertical and horizontal scale of microscope ,least count of scale. Application of travelling microscope, Precaution to be taken in measurement. Experiment :To Measure the diameter of Rubber tube .</p> <p>Spectrometer: Introduction, Description of the instrument, Construction and explanation of three main parts of spectrometer. Mercury discharge lamp, Sodium discharge lamp, study of least count, The Adjustment, levelling and method of recording the observation of spectrometer, application and experimental work.</p>	15

Reference Books

1.Fundamentals of Venire Callipers and Screw Gauge by Rajesh Mishra 2018, independently published.

2. Basics In Metrology And Measurements by Dr. R. Venkat Reddy ,2021.

Semester: 2	Course No.: 121(T)	Course Code: PHM 121(T) Course Title: Digital electronics , Electricity magnetism and Nuclear Physics.
Credits: 4		Course Category: core paper

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Overview of some basic theories related to the subject and study of fundamental concepts in physics
CO111 T-2	UNDERSTANDING	Understanding essential to study various different fields in Physics will be developed .
CO111 T-3	APPLYING	Ability to apply concepts of physics in science engineering and technology will be developed that will strengthen student's analytical abilities .
CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	DC Circuits: RL circuits (Growth and decay of current), RC circuit (Charging and discharging of capacitor) L-C-R circuit in series with DC source only the case if $R^2 / (4L^2) = 1/LC$ (i.e. up to the differential equation only). Digital Electronics Binary system, Binary to decimal and decimal to binary conversion, Binary arithmetic – addition and subtraction, unsigned numbers, signed numbers, 1's complement, arithmetic sums and subtraction using 2's complement, Logic gates: OR, AND, NOT gates, universal gates NOR and NAND gates, Boolean laws and theorem, De Morgan's theorem, Duality theorem .	15
2	Electrostatics Differential form of Gauss law, Poisson and Laplace Equation, Field between Two concentric spheres which have equal and opposite charges. A useful Theorem in electrostatics, electrostatic potential, Determination of potential Due to uniformly charged spherical shell. Determination of potential and field by a ring of charges at a point on the axis of the ring. Determination of field of a semicircular uniform distribution of line charge of linear charge density. Determination of a potential and field on the axis and rim of a uniformly charged disc. Electrostatic energy of a continuous distribution of charges, field of a dipole In plane polar coordinate, spherical polar coordinate, Cartesian coordinate System.	15
3	Magnetostatics: Electric current, and continuity equation, Magnetic effects, The magnetic field, force on a current, Biot Savart law, The laws of magnetostatics, the magnetic potentials, Magnetic dipole in non-uniform magnetic field, Magnetic vector potential due to a small current loop, Magnetic media, Magnetisation, Magnetic field vector, Magnetic susceptibility & permeability.	15
4	Nuclear physics Radioactivity : The law of radioactive decay (review), Radioactive growth and decay, ideal equilibrium, Transient equilibrium and secular equilibrium, Radio active series, Radioactive isotopes of lighter elements, Artificial radioactivity, Age of earth, Carbon dating (Archaeological time scale) The Q Equation : Types of Nuclear Reactions, The balance of mass and Energy in	15

	Nuclear reactions, The Q Equation, Solution of the Q Equation. Constituents of the nucleus properties: Measurements of Nuclear radius, Constituents of the nucleus and their properties.	
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Suggested Text Books:

1. Digital principles and applications by A P Malvino and D P Leach ,
Chapter 1, articles 1.3 to 1.7 , Chapter 4, articles 4.1 to 4.3 , Chapter 5,5.1 to 5.6, 4th edition,1986, Mc-Graw Hill Publication.
2. Electromagnetics, Chapter 1 articles 1.7 to 1.15 , B B Laud
third edition ,2011 , New Age International Publishers,
- 3 Electromagnetics by B. B. Laud, Chapter 4, articles : 4.1, 4.4 to 4.9, 4.11 to 4.17, third edition ,2011 , New Age International Publishers,
- 4 Nuclear Physics by S.B. Patel , chapter 2 , articles 2.1 to 2.13 , chapter 3 , articles 3.1 to 3.5 , 2nd edition , 2018, New age international (P) Ltd.

Reference books:

1. Digital electronics by G. K Kharate, 2nd edition, 2010, Oxford university press.
2. Introduction to electrodynamics by David J. Griffiths;
Cambridge University Press , 4th edition , 2013.
3. Classical electromagnetism by H. C. Verma; 1st edition -
Bharati Bhavan Publishers & Distributors.
4. Electrodynamics by Gupta, Kumar and Singh, 22nd edition, 2014 Pragati Prakashan.

Semester: 2	Course No.: 122 (P)	Course Code: PHM 122(P) Course Title: : Physics lab
Credits: 4		Course Category: core paper

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Get acquainted and learn the use of different laboratory instruments
CO111 T-2	UNDERSTANDING	A student will be imparted knowledge to understand principles involve in experiments of general physics , optics and electronics . He will study various basic electronic circuits.

CO111 T-3	APPLYING	To measure different physical quantities related to general physics , optics and electronics.
CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	<p style="text-align: center;">GROUP: A</p> <p>1. Stefan’s law To verify the Stefan Boltzmann’s fourth power law by using dc power source.</p> <p>2. Diagonalization of matrix.</p> <p>3. Newton’s rings To find the wave length of light of given monochromatic source To find the radius of curvature of given lens.</p> <p>4. Deflection Magnetometer To determine the magnetic moment (M) of given bar magnet using deflection magnetometer in Gauss A and B position.</p> <p>5. Spectrometer Calibration of spectrometer and find the wavelength of unknown line of a mercury spectrum</p> <p>6. To find the moment of inertia of a rolling body about an axis passing through the centre of the body on an inclined plane.</p> <p>7. Least Square Method</p> <p>8. Study of mass-spring system and find the force constant k</p> <p>9. Flywheel-To find the moment of inertia</p> <p>10. Study of probability distribution for two option system (coins)</p> <p>11. Vibration magnetometer Compare the magnetic moments of two bar magnets.</p>	30

2	GROUP: B	30
	<p>1. Activation energy of a diode.</p> <p>2. Decay Constant</p> <p>3. Projection Method</p> <p>To find the value of low resistance by the method of projection of potential.</p> <p>4. Absorption coefficient of liquid using photocell.</p> <p>5. LDR Characteristics</p> <p>Obtain IV characteristics of given LDR and calculate its resistance (for at least three different light levels).</p> <p>6. Full-wave Rectifier</p> <p>Obtain load characteristic and % of regulation of Full-wave rectifier without filter and with capacitor filter. Determine ripple factor also.</p> <p>7. Bridge Rectifier</p> <p>Obtain load characteristic and regulation for Bridge rectifier without using filter circuit and by using capacitor filter circuit. Obtain ripple factor without filter circuit.</p> <p>8. Voltage Doubler</p> <p>9. I-V Diode characteristics of a PN-junction diode and its load line analysis.</p> <p>10. Parallel Resonance</p> <p>To determine the frequency of a.c. emf by series resonance circuit by varying capacitor.</p> <p>11. Universal Logic Gates NAND, NOR (Using discrete components)</p> <p>Verification of truth tables and giving understanding of voltage level for '0' and '1' level.</p>	

Reference books.

1.B. Sc. Practical Physics by C. L. Arora , 20th Edition , 2020 S. Chand and

Company

2. Practical Physics by G. L. Squires. 4th edition , Cambridge , 2001.

3. Practical Physics with viva – voce Dr.S.L. Gupta and Dr.V.Kumar , 27th

edition , 20210 Pragati Prakashan .

Semester: 2	Course No.: 123 (T)	Course Code: : PHE 123(T) Course Title Digital electronics and Electrostatics
Credits: 2		Course Category: Minor paper

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Overview of some basic theories related to the subject and study of fundamental concepts in physics
CO111 T-2	UNDERSTANDING	Understanding essential to study various different fields in Physics will be developed .
CO111 T-3	APPLYING	Ability to apply concepts of physics in science engineering and technology will be developed that will strengthen student’s analytical abilities .
CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	DC Circuits: RL circuits (Growth and decay of current), RC circuit (Charging and discharging of capacitor) L-C-R circuit in series with DC source only the case if $R^2 / (4L^2) = 1/LC$ (i.e. up to the differential equation only). Digital Electronics Binary system, Binary to decimal and decimal to binary conversion, Binary arithmetic – addition and subtraction, unsigned numbers, signed numbers, 1’s complement, arithmetic sums and subtraction using 2’s complement, Logic gates: OR, AND, NOT gates, universal gates NOR and NAND gates Boolean laws and theorem, De Morgan’s theorem, Duality theorem.	15
2	Electrostatics Differential form of Gauss law, Poisson and Laplace Equation, Field between Two concentric spheres which have equal and opposite charges. A useful Theorem in electrostatics, electrostatic potential, Determination of potential Due to uniformly charged spherical shell. Determination of potential and field by a ring of charges at a point on the axis of the ring. Determination of field of a semicircular uniform distribution of line charge of linear charge density. Determination of a potential and field on the axis and rim of a uniformly charged disc. Electrostatic energy of a continuous distribution of charges, field of a dipole In plane polar coordinate, spherical polar coordinate, Cartesian coordinate System.	15

Suggested Text Books:

- Digital principles and applications by A P Malvino and D P Leach ,
Chapter 1, articles 1.3 to 1.7 , Chapter 4, articles 4.1 to 4.3 , Chapter 5,5.1 to 5.6, 4th edition,1986, Mc-Graw Hill Publication.
- Electromagnetics, Chapter 1 articles 1.7 to 1.15 , B B Laud , 3rd edition ,2011 , New Age

International, Publishers,

Reference books:

1. Digital electronics by G. K Kharate, 2nd edition, 2010, Oxford university press.
2. Introduction to electrodynamics by David J. Griffiths; Cambridge University Press, 4th edition, 2013.
3. Classical electromagnetism by H. C. Verma; 1st edition - Bharati Bhavan Publishers & Distributors.
4. Electrodynamics by Gupta, Kumar and Singh, 22nd edition, 2014 Pragati Prakashan.

Semester: 2	Course No.: 123 (P)	Course Code: PHE 123(P) Course Title : Physics lab
Credits: 2		Course Category: Minor paper

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Get acquainted and learn the use of different laboratory instruments
CO111 T-2	UNDERSTANDING	Understanding of the principles involved in general physics, optics and electronics will become clear.
CO111 T-3	APPLYING	Using experimentally measured data different physical quantities related to general physics, optics and electronics will be obtained.
CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	GROUP: A 1. Stefan's law. To verify the Stefan Boltzmann's fourth power law by using dc power source. 2. Diagonalization of matrix. 3. Newton's rings To find the wave length of light of given monochromatic source To find the radius of curvature of given lens. 4. Deflection Magnetometer To determine the magnetic moment (M) of given bar magnet using deflection	30

	<p>magnetometer in Gauss A and B position.</p> <p>5. Spectrometer</p> <p>Calibration of spectrometer and find the wavelength of unknown line of a mercury spectrum</p> <p>6. To find the moment of inertia of a rolling body about an axis passing through the centre of the body on an inclined plane.</p>	
2	GROUP: B	30
	<p>1. Activation energy of a diode.</p> <p>2. Decay Constant.</p> <p>3. Projection Method</p> <p>To find the value of low resistance by the method of projection of potential.</p> <p>4. Absorption coefficient of liquid using photocell.</p> <p>5. LDR Characteristics</p> <p>Obtain IV characteristics of given LDR and calculate its resistance (for at least three different light levels).</p> <p>6. Full-wave Rectifier</p> <p>Obtain load characteristic and % of regulation of Full-wave rectifier without filter and with capacitor filter. Determine ripple factor also.</p>	

Reference books:

1. B. Sc. Practical Physics by C. L. Arora , 20th Edition , 2020 S. Chand and Company
2. Practical Physics by G. L. Squires. 4th edition , Cambridge , 2001.
3. Practical Physics with viva – voce Dr.S.L. Gupta and Dr.V.Kumar , 27th edition , 20210 Pragati Prakashan .

Semester: 2	Course No.: 124 (T)	Course Code: : PHMDC 124(T) Course Title: : Sound , Ultrasonic and Indian Astronomy
Credits: 2		Course Category: Multidisciplinary

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Overview of some basic theories related to sound , ultra sonic and Indian astronomy
CO111 T-2	UNDERSTANDING	Understanding in fundamentals in sound , ultra sonic and Indian astronomy will be developed .
CO111 T-3	APPLYING	Ability to apply concepts of physics in science engineering and technology will be developed that will strengthen student's analytical abilities .
CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	Sound waves and Ultrasonic Introduction, Intensity & intensity level, Loudness & pitch radiation from a piston, diffraction, radiation efficiency of a sound source. Magnetostriction method, Piezo-electric oscillator, Piezo-electric detectors, Measurement of velocity of ultrasonic waves, diffraction effect & its application to determine the velocity of the waves, the ultrasonic waves & its use. Architectural Acoustics, Sabine's formula, Reverberation time-theoretical treatment, Reverberation time of a live room, Reverberation time of a dead room, optimum reverberation time.	15
2	Indian Astronomy Historical Introduction : Introduction, Ancient Indian Astronomy, The Vedic Period and Vedangajyotisa, Siddhanta, Aryabhata I, Astronomers after Aryabhata, Contents of the Siddhantas, Continuity in Astronomical Tradition. Celestial Sphere Introduction, Diurnal Motion of Celestial Bodies, Motion of Celestial Bodies Relative to Stars, Celestial Horizon, Meridian, Polar Star and Directions, Zodiac and Constellations, Equator and Poles, Latitude of a place and Altitude of Polar Star, Ecliptic and the Equinoxes. Co-ordinate Systems Introduction, Ecliptic System, Equatorial System, Horizontal System, Meridian System, Phenomenon of Precession of Equinoxes, Ancient Indian References to the Precession, Effects of Precession on Celestial Longitude, Tropical and Sidereal Longitudes. Rasi and Nakshatra Systems .	15

Suggested text Books:

1. A textbook on oscillations, waves & acoustics by M. Ghosh, D. Bhattacharya, Chapter 23 , articles 23.1 to 23.7 , Chapter 24 , articles 24.1 to 24.6 , 3rd edition , 2006 , S. Chand and Company Ltd.
2. Indian astronomy: An introduction , S. Balachandra Rao,.

Chapter 1 , articles: 1.1 to 1.8, Chapter 2 ,articles : 2.1 to 2.9,Chapter 3 , articles , 3.1 to 3.9, Chapter 4 , article 4.1. Distributed by Orient Longman Ltd, 1st edition, 2000.

Reference Books:

1. The Story of Astronomy in India by Chander Mohan, 2015.
2. Indian Astronomy a source book by B.V Subbaray Appa and K. V. Sharma , Nehru centre Bombay, 1985.

Semester: 2	Course No.: 124 (P)	Course Code: PHMDC 124(P) Course Title : Physics lab
Credits: 2		Course Category: Multidisciplinary

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	Get acquainted and learn the use of different laboratory instruments
CO111 T-2	UNDERSTANDING	Understanding of the principles involved in Astronomy, general physics , optics and electronics will become clear .
CO111 T-3	APPLYING	Using calculations and experimentally measured data different physical quantities related to general physics and electronics will be obtained and Astronomical Charts will be prepared.
CO111 T-4	ANALYSING	.
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	<p style="text-align: center;">GROUP: A</p> <p>1. (a) Draw the diagram of Zodiac and Rasis</p> <p>(b) Nakshtras and their range of Nirayan longitudes (Ch-4 Rasi and Nakshatra Systems , Indian astronomy: An introduction , S. Balachandra Rao,. Distributed by Orient Longman Ltd, 1st edition, 2000.)</p> <p>2. Least Square Method</p> <p>3. Study of mass-spring system and find the force constant k</p> <p>4. Flywheel-To find the moment of inertia</p> <p>5. Study of probability distribution for two option system (coins)</p> <p>6. Vibration magnetometer</p>	30

	Compare the magnetic moments of two bar magnets.	
2	<p style="text-align: center;">GROUP: B</p> <p>1. Full-wave Rectifier</p> <p>Obtain load characteristic and % regulation of Full-wave rectifier without filter and with capacitor filter. Determine ripple factor also.</p> <p>2. Bridge Rectifier</p> <p>Obtain load characteristic and regulation for Bridge rectifier without using filter circuit and by using capacitor filter circuit. Obtain ripple factor without filter circuit.</p> <p>3. Voltage Doubler</p> <p>4. I-V Diode characteristics of a PN-junction diode and its load line analysis.</p> <p>5. Parallel Resonance</p> <p>To determine the frequency of a.c. emf by series resonance circuit by varying capacitor.</p> <p>6. Universal Logic Gates NAND, NOR (Using discrete components)</p> <p>Verification of truth tables and giving understanding of voltage level for '0' and '1' level.</p>	30

Reference books:

1. B. Sc. Practical Physics by C. L. Arora , 20th Edition , 2020 S. Chand and Company
2. Practical Physics by G. L. Squires. 4th edition , Cambridge , 2001.
3. . Practical Physics with viva – voce Dr.S.L. Gupta and Dr.V.Kumar , 27th edition , 20210 Pragati Prakashan

Semester: 2	Course No.: 126(T+P)	Course Code: : PHSEC 126(T+P) Course Title: Electrical and Electronics Skills.
Credits: 2		Course Category: Skill Enhancement course

Course Outcomes: On successful completion of the course the learner will be able to

CO#	COGNITIVE ABILITIES	COURSE OUTCOMES
CO111 T-1	REMEMBERING	A student will enable to become familiar and experience with various electrical and electronic tools .
CO111 T-2	UNDERSTANDING	A student will get understanding in the circuit designing subject through hands on mode.
CO111 T-3	APPLYING	A student will be trained in circuit designing by various electronic components and electrical & electronic tools through hands on mode.
CO111 T-4	ANALYSING	
CO101.5	EVALUATING	

Unit No.	Unit Contents	Sessions Allotted
1	Basics of soldering 1. Understanding of soldering tools and materials (solder, flux, etc.) 2. Practicing soldering and de-soldering with proper method. 3. Practicing soldering of electrical circuit having discrete components (R, L, C, diode, transistor etc.) on printed circuit board (PCB). Power Supply 4. Designing of center tapped full wave rectifier without and with C-filter. 5. Designing and testing of a 9-volt power supply with Zener diode.	15
2	Opto-electronic devices 1. Light emitting diode LED (study of characteristics) 2. Solar cell or photo-voltaic cell (study of characteristics). Logic gates 3. Design of half adder using AND gate and EX-OR gate. Verify truth table. 4. Design of full adder using AND gate and EX-OR gate. Verify truth table.	15

Reference Books

- 1.A textbook of applied electronics , Dr. R.S.Sedha , 14th Edition , 2019 , S.Chand and Company Ltd.
- 2.A text book of digital electronics , Dr.R.S. Sedha , 3rd Edition , 2020, S.Chand and Company Ltd.

