UNIVERSITY OF KOTA

SCHEME OF EXAMINATION

AND

COURSES OF STUDY

Faculty of Science

Bachelor of Science (B.Sc.)
Physics-Course Code PHY9600P

First Semester (July-December, 2024)
Second Semester (January-June, 2025)

UNIVERSITY OF KOTA

MBS Marg, Near Kabir Circle, KOTA (Rajasthan)-324 005

INDIA

Edition: 2024

B.Sc. (Physics) Semester Scheme
Course Code PHY9600P

B.Sc. (Physics) I and II Semester

Year / Semester	Serial Number, Code & Nomenclature of Paper			Duration of Exam	Teaching Hrs/Week & Credit			Distribution of Marks			Min. Pass Marks	
	Number	Code	Nomenclature		L	P	C	Internal Assess.	Sem. Assess.	Total Marks	Internal Assess.	Sem. Assess.
I Year I Semester	PHY101	DCC	Mechanics	3 Hrs	4	--	4	30	70	100	12	28
	PHY102	DCC	Physics Practical I	6 Hrs		4	2	--	50	50	--	25
	Total				**04**	**02**	**06**	**30**	**120**	**150**	--	
I Year II Semester	PHY201	DCC	Electromagnetism	3 Hrs	4	--	4	30	70	100	12	28
	PHY202	DCC	Physics Practical II	6 Hrs		4	2	--	50	50	--	25
					04	**02**	**06**	**30**	**120**	**150**	--	
First Year Total					**08**	**04**	**12**	**60**	**240**	**300**	--	
Option for exit with Certificate in Science (40 Credit Score)												

B.Sc. (Physics) III and IV Semester

Year / Semester	Serial Number, Code & Nomenclature of Paper			Duration of Exam	Teaching Hrs/Week & Credit			Distribution of Marks			Min. Pass Marks	
	Number	Code	Nomenclature		L	P	C	Internal Assess.	Sem. Assess.	Total Marks	Internal Assess.	Sem. Assess.
II Year III Semester	PHY301	DCC	Thermal and Statistical Physics	3 Hrs	4	--	4	30	70	100	12	28
	PHY302	DCC	Physics Practical III	6 Hrs		4	2	--	50	50	--	25
	Total				**04**	**02**	**06**	**30**	**120**	**150**	--	
II Year IV Semester	PHY401	DCC	Electronics	3 Hrs	4	--	4	30	70	100	12	28
	PHY402	DCC	Physics Practical IV	6 Hrs		4	2	--	50	50	--	25
					04	**02**	**06**	**30**	**120**	**150**	--	
Second Year Total					**08**	**04**	**12**	**60**	**240**	**300**	--	
Option for exit with Diploma in Science (40 Credit Score)												

B.Sc. (Physics) V and VI Semester

Year / Semester	Serial Number, Code & Nomenclature of Paper			Duration of Exam	Teaching Hrs/Week & Credit			Distribution of Marks			Min. Pass Marks	
	Number	Code	Nomenclature		L	P	C	Internal Assess.	Sem. Assess.	Total Marks	Internal Assess.	Sem. Assess.
III Year V Semester	PHY501	DSE	Electives: A. Elementary Quantum Mechanics and Spectroscopy B. Nuclear and Particle Physics C. Optics	3 Hrs	4	--	4	30	70	100	12	28
	PHY502	DSE	Physics Practical I	6 Hrs		4	2	--	50	50	--	25
	Total				**04**	**02**	**06**	**30**	**120**	**150**	--	
III Year VI Semester	PHY601	DSE	Electives: A. Mathematical Physics B. Solid State Physics C. Basic Instrumentation Techniques	3 Hrs	4	--	4	30	70	100	12	28
	PHY602	DSE	Physics Practical II	6 Hrs		4	2	--	50	50	--	25
					04	**02**	**06**	**30**	**120**	**150**	--	
First Year Total					**08**	**04**	**12**	**60**	**240**	**300**	--	
Option for exit with Degree in Science (40 Credit Score)												

Objectives of the Course:

Innovation and Employability-Science is concerned with the study of the universe from the smallest to the largest scale, why it is the way it is and how it works. Such knowledge is basic to scientific progress. Scientist have to be able to design and build new instruments, from satellites to measure the properties of planetary atmospheres to record-breaking intense magnetic fields for the study of condensed matter. Many of the conveniences of modern life are based very directly on the understanding provided by physics. Many techniques used in medical imaging are derived directly from physics instrumentation. Even the internet was a spin-off from the information processing and communications requirement of high-energy particle physics.

This Bachelor of Science programme of university is a pioneering model in Indian science and education, imparting education in Physics while simultaneously encouraging a participation in research. This course shall provide the thorough knowledge of branches of Physics with extensive theoretical and experimental knowledgein major areas of Physics such as Material science, Plasma science, Advanced Electronics, Energy Studies etc. at Masters' level. This course also emphasizes on the Communication & Presentation skills of the students.The students after completing the course shallbe placed in premier research institutes and companies in India and abroad, qualify NET/GATE/JEST examinations and eligible for M.Tech., Ph.D. and teaching.

Duration of the Course:

The B.Sc. [Bachelor of Science] program consists of three academic years separated into six semesters. Students who pass the first and second semester examinations have the option of graduating with a science certificate. Additionally, students have the choice to graduate with a diploma in science after completing the examinations for the third and fourth semesters. The student will receive a Bachelor of Science (B.Sc.) degree after successfully completing the three-year curriculum.

Eligibility for Admission:

The basic eligibility for admission to the course is XII with Physics, Chemistry and Mathematics for B.Sc. (Mathematics)/ XII with Physics, Chemistry and Bilogy with minimum marks for GEN category candidates of Rajasthan-50%; Other state-60%; SC/STOBC/SOBC-Minimum Pass Marks. The admission in the course is based on merit of XII class.

Structure of the Programme:

The B.Sc. programme consists of:

(i) Core and applied courses of theory as well as practical papers which are compulsory for all students.

Maximum Marks:

Maximum marks of a theory and practical paper shall be decided on the basis of their contact hours/credit per week. One teaching hour per week shall equal to one credit and carry 25 maximum marks and therefore, four teaching hours per paper per week shall carry 100 maximum marks for each theory paper/course. Each four contact hours per week for laboratory or practical work shall be equal to two credits per week and carry 50 maximum marks.

Scheme of Examinations:

The examination shall be divided into two parts in which first part is internal assessment and second part is semester assessment or external assessment. The schemes for the internal and external examinations shall be as under:

a) The assessment of the student for theory paper shall be divided into two parts in which first part is internal assessment (30% of maximum marks) and second part is semester assessment or external assessment (70% of maximum marks). For practical papers there will be only one external assessment (100% of maximum marks).

b) The internal assessment for each theory paper shall be taken by the teacher concerned in the Department during each semester. There will be twocomponents of internal assessment; one by test having 2/3 weightage (20 marks) and another by seminar / assignment / presentation / quiz /

group discussion / viva-voce of 1/3 weightage (10 marks), for theory papers in each semester. Internal assessment test shall be of one hour duration for each paper and shall be taken according to academic calendar notified by the University / Departments. There will be no internal examination in the practical paper.

c) A student who remains absent (defaulter) or fails or wants to improve the marks in the internal assessment may be permitted to appear in the desired paper(s) (only one time) in the same semester with the permission of the concerned Head of the Department. A defaulter / improvement fee of Rupees 250/- per paper shall be charged from such candidates. Duly forwarded application of such candidates by the teacher concerned shall be submitted to HOD who may permit the candidate to appear in the internal assessment after depositing the defaulter/ improvement fee. A record of such candidates shall be kept in the Department.

d) The external assessment shall be of three hours duration for each theory paper and six hours duration for practical paper. The practical examination shall be taken by the panel of at least one external and one internal examiner at the end of each semester.

e) **Also proposed to include the one hour of practical is equivalent to one hour teaching workload of the faculty member (i.e. practical load of faculty members will not be multiplied by ¾ factor, as it was used to be).**

f) The syllabus for each theory paper is divided into five independent units and each theory question paper will have the format as mentioned below:

Section A: Compulsory Part-*There will be ten short answer type questions covering all units but not more than two questions from each unit.*

Section B:*long answer type questions* covering all units but not more than two questions from each unit, descriptive type. *Students have to attempt* 5 questions in Section B, taking one from each unit. *Paper setter shall be instructed to design question paper covering from all five units.*

g) The pattern of question paper of internal and external shall be as follows:

(A) Continuous or Internal Assessment-30% weightage of Maximum Marks

The internal assessment for each theory paper shall be taken by the teacher concerned in the Department during each semester as,

Continuous Assessment Weightage					External Assessment Weightage	Total Marks (Total credits)
Regular Students		Private Student		Total	Paper based External Evaluation (End term examination)	
Mid-Term	Seminar/ project report/ presentation	Report Writing	Viva-voce			
20	10	20	10	30	70	100 (04)

- The 30 marks of continuous assessment for each Physics paper will have a mid-term test of 20 marks and remaining 10 marks will be devoted to seminar/project report/presentation. Also, only one chance to improve his/her marks of continuous assessment (mid-term) will also be given to the student in the same semester with a fee of Rs. 250/- per paper, after the approval of the competent authority of Department/College. For private students of B.Sc. program is also divided into two component as report writing (20 marks) and Viva-voce (10 marks) as mentioned above.
- **Report writing and Viva-voce:** Each private student of B.Sc. program will prepare a report on any topic of each course in minimum 1000 words from the prescribed syllabus of the concerned theory paper/course. The student needs to report the Concerned College at the time prescribed by the College/University to submit the report and the College will arrange a Viva-voce on that report. It is proposed that the engaged teacher will be paid at the rate of per answer book per student charges. The

examination section will generate an option of bill when the teacher fills the continuous assessment marks on examination portal (like done for external answer book evaluation). The various components of the report may be:

- Name of Course/Class:
- Name of Student:
- Father's/Husband Name:
- Examination Form No:
- Enroll. No:
- Name of College (Center):
- Name of Paper:
- Title of topic:
- No. of Unit of topic (as per prescribed syllabus):
- Introduction about the topic:
- Details/Analysis about the topic
- Conclusion of the topic:
- References:

(B) Semester or External Assessment-70% weightage of Max. Marks

Semester or External Assessment:

Duration of Examination: 3 Hours **Max. Marks: 70**

SECTION-A: 10x2=20
(Answer all questions)
(Two question from each unit with no internal choice)
Q. No. 1

(i) ……..…… **2 Mark**
(ii) ……..…… **2 Mark**
(iii) ……..…… **2 Mark**
(iv)……..…… **2 Mark**
(v)……..…… **2 Mark**
(vi)……..…… **2 Mark**
(vii)……..…… **2 Mark**
(viii)……..…… **2 Mark**
(ix)……..…… **2 Mark**
(x)……..…… **2 Mark**

SECTION-B: 5x 10 =50
(Answer all questions)
(One question from each unit with internal choice)
(Maximum two sub-divisions only)
Q. No. 2. . ……..……

Or

……..…….

10 Marks

Q. No. 3. ……..……

Or

……..……...

10 Marks

Q. No. 4. ……..……

Or

…….....……

10 Marks

Q. No. 5. …….....……

Or

…….....……...

10 Marks

Q. No. 6. …….....

Or

…….....

10 Marks

(c) Distribution of Marks for Practical Examinations:

Duration of Exam: 06 Hours **Maximum Marks: 50**

S. No.	Name of Exercise	Marks
1.	Exercise No. 1	30
2.	Viva-voce	10
3.	Practical Record	10
	Total Marks	**50**

Rules regarding determination of results:

Each semester shall be regarded as a unit for working out the result of the candidates. The result of each semester examination shall be worked out separately (even if he/she has appeared at the paper of the lower semester along with the papers of higher semester) in accordance with the following conditions:

a) The candidate shall be declared as pass in a semester examination, if he/she secures at least 40% marks in each theory paper separately in external & internal examination and 50% marks in each practical paper/project/dissertation with 40% aggregate marks in that semester.

b) A candidate declared as fail/absent in one or more papers at any odd semester examination shall be permitted to take admission in the next higher semester (even semester) of the same academic session.

c) A candidate may be promoted in the next academic session (odd semester) if he/she has cleared collectively at least 50% of the papers of both semesters of previous academic session. The candidate who does not fulfill the above condition will remain as an ex-student and will reappear in the due papers along with next odd/even semester exams.

d) If any student who is provisionally admitted in higher odd semester but could not secure prescribed minimum marks in previous semesters will be treated as ex-student and his/her admission fee will be carry forwarded to the next odd semester of forthcoming academic session.

e) If a candidate,who is declared as pass, wishes to improve his/her performance in the theory papers of previous semester, he/she may re-appear only one time in these papers in next odd/even semester examinations.

f) Candidate shall not be permitted to re-appear or improve the marks obtained in the external examination of practical / dissertation in any condition.

g) If the number of papers prescribed in a semester examination is an odd number, it shall be increased by one for the purpose of reckoning 50% of the papers for considering the student pass/fail.

h) A candidate may be given only two additional chances for passing the semester thus maximum tenure for completing for three years under-graduate programme up to five years and so on.

i) The marks secured in the Gen Hindi, Gen English, Elementary Computer applications and Environment studies shall be counted in awarding the division to a candidate.The candidate shall have to clear the compulsory subjects in the additionalthree chances and non-appearance or absence in the examination of compulsory subjects shall be counted as chance and shall be declared fail in that examination.

j) The grace marks scheme shall be applicable as per university norms.

Classification of Successful Candidates:

The classification of successful candidates after last semester examination shall be as under:

Description of Marks Obtained	Division / Result
• 75% and above marks in a paper.	Distinction in that paper.
• A candidate who has secured aggregate 60% and above marks	First Division
• A candidate who has secured aggregate 50% and above but less than 60% marks	Second Division
• A candidate who has secured aggregate 40% and above but less than 50% marks	Pass

Course Outcomes:

Students will have developed a strong understanding of classical mechanics, special relativity, and selected topics in elasticity. They will be able to apply fundamental principles and laws to analyze various physical phenomena, solve problems related to motion and forces, and make connections between different concepts within the field ofmechanics.By the end of this course, students will have developed a strong understandingof vector fields, electrostatics, magnetostatics, electricfieldsinmatter,andelectromagnetic induction.They will beable to apply the principles and mathematical techniques learned to analyze and solve complex problems in these areas. Additionally, they will be able to make connections between different concepts within electromagnetism and apply them to real-world scenarios.

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PHY101- MECHANICS

Duration 3 hrs. Max. Marks: 70

Note:The question paper will contain three sections as under –

Section-A: One compulsory question with 10 parts, having 2 parts from each unit. (**Total marks : 10 x 2 = 20)**

Section-B: 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit (**Total marks : 10 x 5 = 50)**

Lecture- Sixty Lectures including diagnostic and formative assessments during lecture hours.

Unit-I- (Physical Laws and Frame of References)

Inertial & non-inertial frames, Galilean transformations and invariance of physical laws, fictious force, uniformly rotating frames and transformation of displacement, velocity and acceleration, Coriolis force, motion relative to earth, effect of rotation of earth on 'g', Focault's pendulum and its time period.

Unit-II - (Conservation Laws and Dynamics of Particles)

Concept of centre of mass, Centre of mass of a system of particles, equation of motion, conservation of linear momentum, Relationship between (Lab and center of Mass frames of in 1-D and 2-D reference) elastic and inelastic collision, Motion of a system with varying mass, Motion in a central force field, conservation of angular momentum, trajectory of a particle under gravitational force, Kepler's laws, Rutherford's formula.

Rigid body dynamics, equation of motion of a rotating body, Inertial coefficient, Moments of Inertia theorems, idea of principal axes and kinetic energy of rotation. Precessional motion of spinning top, spin precession in constant magnetic field, Larmor's frequency.

Unit III- (Properties of Matter)

Elasticity, stress andstrain, Hooke's Law, Elastic constants and their relations, theory of bending of beams and torsion of a cylinder, Cantilever, cantilever supported at both ends. Experimental determination of elastic constants by bending of beam and Searle's method, modulus of rigidity by static and dynamic method, Poisson's ratio for rubber.

Unit IV- (Oscillations)

Qualitative idea of Oscillations in an arbitrary potential well, simple harmonic motion, coupled oscillator, Eqvation of mation of two simple harmonic coupled oscillators and energy transfer normal modes, normal coordinates of two linear coupled oscillators, damped harmonic oscillation- example of Ballistic galvanometer, forced harmonic oscillators, phase relations, power absorption, resonance, band width and quality factor, LCR series and parallel circuits.

Unit-V - (Waves)

General equation of one-dimensional wave equation and its solution, longitudinal and transverse waves, Plane progressive harmonic wave, its energy density, energy flux and intensity, pressurewaves in gas.

Equation of motion for one dimensional monatomic& diatomic lattices, acoustic and optical modes, dispersion relations, Concept of group & phase velocities.

Suggested Books and References –

1. Mechanics, Berkeley Physics, Vol.l, Kittel, Knight, et.al. 2007, Tata McGraw-Hill
2. An introduction to Mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill
3. Feynman Lectures, Vol. I, R.P. Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education.
4. Course of Theoretical Physics, Vol-I Mechanics, L.D. Landau, E.M. Lifshitz, Butterworth-Heinemann.
5. Mechanics, D.S. Mathur, S. Chand and Company Limited,
6. Theoretical Mechanics, M.R. Spiegel, 2006, Tata McGraw Hill.
7. Introduction to Classical Mechanics: With Problems and Solutions, David Morin
8. Classical Mechanics, Herbert Goldstein, Charles P. Poole, and John L. Safko
9. Classical Mechanics, John R. Taylor
10. Mechanics, Keith R. Symon
11. Mechanics by M P Saxena, P R Singh, S S Rawat and N S Saxena (4^{th} ed., College Book House, 1999)
12. Mechanics by P. K. Srivasatava, New Age International Publisher, Delhi

Suggested E-resources:

1. Online Lecture Notes and Course Materials:

• MIT OpenCourseWare: Classical Mechanics - This resource provides lecture notes, problem sets, and solutions for a complete course on classical mechanics: https://ocw.mit.edu/courses/phvsics/8-01sc-classical-mechanics-fall-2016/

• HyperPhysics - This online resource provides concise explanations and interactive simulations for various topics in mechanics: http://hyperphysics.phy astr.gsu.edu/hbase/hframe.html

PHY101 – यान्त्रिकी

समय 3 घण्टे पूर्णांक :70

नोट: इस प्रश्न पत्र में 03 खण्ड निम्न प्रकार होंगें :

खण्ड अ : इस खण्ड में एक अनिवार्य प्रश्न जिसमें प्रत्येक इकाई से 02 लघु प्रश्न लेते हुए कुल 10 लघु प्रश्न होंगे। कुल अंक:20

खण्ड ब : इस खण्ड में प्रत्येक इकाई से 02 प्रश्न लेते हुए कुल 10 प्रश्न होंगे।प्रत्येक इकाई से एक प्रश्न का चयन करते हुए कुल 05 प्रश्नों के उत्तर देने होंगे। कुल अंक:50

इकाई – 1

भौतिक नियम व निर्देश तन्त्र:जड़त्वीय एवं अ जड़त्वीय तंत्र, गैलेलियन रूपान्तरण व भौतिक नियमों की अनिश्चरता, अजड़त्वीय तन्त्र, आभासी बल, निश्चित कोणिक वेग से घूमता निर्देश तन्त्र एवं विस्थापन, वेग एवं त्वरण के रूपान्तरण, कोरियोलिस बल, पृथ्वी के सापेक्ष गति पृथ्वी के परिभ्रमण का गुरुत्वाकर्षणीय ;हद्ध त्वरण पर प्रभाव एवं इसका 1–डी एवं 2–डी में आवर्तकाल (फोको का लोलक) ।

इकाई – 2

द्रव्यमान केन्द्र की अवधारणा :कण तंत्र का द्रव्यमान केन्द्र, गति का समीकरण, रेखीय संवेग का संरक्षण, प्रयोगशाला तंत्र व द्रव्यमान तंत्र में प्रत्यास्थ व अप्रत्यास्थ टक्कर, परिवर्तनशील द्रव्यमान के किसी निकाय की गति। केन्द्रीय बल क्षेत्र में गति, कोणीय संवेग का संरक्षण, व्युत्क्रम गुरूत्वीय बल के प्रभाव में कण की गति का पथ। केप्लर के नियम।

द्रव्य पिण्ड गतिकी, दृढ़ वस्तु के लिए घूर्णन गति का समीकरण, जड़त्वीय गुणांक, श्र एवं ू समानान्तर नहीं होने की स्थिति, मुख्य अक्ष का ज्ञान एवं घूर्णन की गतिज उर्जा, चक्रण करते लट्टू की पुरूस्सरण गति, नियत चुम्बकीय क्षेत्र में प्रचक्रण पुरूस्सरण, लारमोर आवृत्ति।

इकाई – 3

पदार्थ के गुण : प्रत्यास्थता, हुक का नियम, प्रत्यास्थता स्थिरांक, प्रतिबल एवं विकृति पर प्रमेय, प्रत्यास्थता नियतांकों में सम्बंध, दण्डों के बंकन का सिद्धान्त तथा बेलन में ऐंठन, एक सिरे पर भारित केण्टीलीवर;पद्धजब दण्ड का भार नगण्य हो और;पपद्धजब प्रति एकांक लम्बाई का द्रव्यमान हो। मघ्य में भारित केण्टीलीवर। बंकन विधि से व सर्ल विधि से प्रत्यास्थ स्थिरांकों का प्रायोगिक निर्धारण, दृढ़ता प्रत्यास्थता गुणांक का स्थेतिक व गतिक विधि से प्रायोगिक निर्धारण, रबर के लिए पाइसां निष्पत्ति का प्रयोगिक निर्धारण।

इकाई – 4

दोलन : किसी स्वैच्छिक विभव कूप में दोलनों की गुणात्मक विवेचना, सरल आवर्त गति, समानीत द्रव्यमान, युग्मित दोलन, दो सरल आवर्त युग्मित दोलकों के गति का समीकरण एवं उर्जा स्थानान्तरण, सामान्य विधाएँ, दो रेखिकत युग्मित दोलकों के सामान्य निर्देशांक, अवमन्दित आवर्तीय दोलन, प्रक्षेप गैलवेनोमीटर का उदाहरण, प्रणोदित आवर्तीय दोलन, कला सम्बंध, शक्ति अवशोषण, अनुनाद, बैण्ड चौड़ाई व विशेषता गुणांक, स्ब्परिपथ का उदाहरण।

इकाई – 5

तरंग :एक विमीय तरंग गति का सामान्य समीकरण एवं उसके हल, अनुदैर्ध्य व अनुप्रस्थ तरंगें, समतल प्रगामी तरंग व इसकी उर्जा फ्लक्स व तीव्रता, गैसों में दाब तरंगे।

एक विमीय एकल परमाणु एवं द्वि परमाणु जालक के लिए गति का समीकरण, ध्वनिक व प्रकाशिक विधाएं ।विक्षेपण सम्बंध, तरंग वेग व समूह वेग की अभिधारणा।

PHY102- Physics Practical-I

Duration 6 hrs. Min. Pass Marks 25 Max. Marks 50

Note-Total number of experiments to be performed by the students during the session. Two experiments must be performed in the semester examination. Marks distribution will be as: Experiment I- 30, Practical record – 10, Viva Voce – 10.

1.Study of bending of a beam and determination of Young's modulus.
2.Modulus of rigidity by statical method and dynamical method.
3.Elastic constant by Searle's method.
4. Study of frequency of energy transfer as a function of coupling strength using coupled oscillator.
5.Determination of dispersive power of material of a prism using spectrometer.
6.Measurement of wavelength of monochromatic source of light by Newton's rings.
7.Measurement of wavelength of monochromatic source of light by plane transmission grating.
8.Measurement of wavelength of monochromatic source of light by biprism.
9.Study of specific rotation by polarimeter.
10. Determination of resolving power of a plane transmission grating.
11. Determination of resolving power of telescope.
12. Determination of the Poisson's ratio of rubber tube.
13. Any experiment, equivalent to the UG level.

Paper PHY201- Electromagnetism

Duration 3 hrs. Max. Marks:70

Note:The question paper will contain three sections as under –

Section-A : One compulsory question with 10 parts, having 2 parts from each unit. Total marks:20

Section-B : 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit. Total marks: 50

Lecture- Sixty Lectures including diagnostic and formative assessments during lecture hours.

Unit-I - Scalar and Vector Fields

Scalar and Vector Fields, Gradient of a scalar field, relation between **conservative** field and Potential, line, surface and volume integral of vector fields, concept of flux, Divergence and Curl of a vector field and their physical significance, Gauss' divergence and Stokes curl theorem with proof, Del and Laplacian operator in Cartesian, Cylindrical and Spherical coordinates.

Unit II - Electrostatics

Electric potential and field due to arbitrary charge distribution, Multipole Expansion, potential and field due to dipole & its interaction with electric field electrostatic energy of a uniformly charged sphere, classical radius of an electron.

Atomic and molecular dipoles, induced dipole and polarizability, dielectrics and their electrical polarization,susceptibility and displacement vector, Capacity of a capacitor with partially and completely filled dielectrics, Gauss' law in integral and differential form, Lorentz local field and Clausius-Mossoti equation.

Unit-III - Electrostatic Field

Conductors is an electric field, boundary conditions for electrostatic field and potential at dielectric surface, uniqueness theorem, method of electrical images and its application for system of point charge near a grounded conducting plane, Poisson's and Laplace equation in Cartesian, cylindrical and spherical coordinates (without proof) solution of Laplace's equation in cartesian coordinates, boundary conditions.

Unit IV

Rise and decay of current in LR and CR circuits, decay constants, transients in LCR circuits, self and mutual induction, Measurement of self-induction by Rayleigh's method, AC circuits and complex numbers and their application in solving AC circuit problems, complex impedance and reactance, series and parallel resonance. Quality factor, power consumed by an AC circuit, Power factor.

Biot Savart law, Amperes circuital law in differential and integral form, Magnetization vector, Magnetizing field H, relation between B, H and M. uniform magnetization and surface current, Non – uniform magnetization, orbital and spin angular momentum & magnetic moment, orbital gyro magnetic ratio and Bohr Magneton, Magnetic susceptibility.

Unit-V

Time Varying Fields, Faraday's law of electromagnetic induction, its integral and differential form, Maxwell's equation in differential and integral form, Maxwell's displacement current, Wave equation for electric and magnetic field, Plane electromagnetic waves and their properties, transverse nature of EMW, energy density, Poynting Theorem, Poynting vector, propagation of EM Wave in conducting and isotropic dielectric medium.

SuggestedBooksandReferences-

1. BerkeleyPhysicsCourse,Vol2Electricityand Magnetism.
2. FeynmaninPhysics Vol.2
3. AnIntroductiontoElectrodynamicsbyGriffiths
4. FundamentalUniversity Physics, Mo2Fields-Alonso&Finn.
5. Electricity and Magnetism by D C Tayal, Himalaya Publishing House, 2005.
6. Electricity and Magnetism by M P Saxena, College Book House, 1997.
7. Elements of Electromagnetics by Mathew N.O. Sadiku, New Delhi, Oxford Univ. Press.

Suggested E-resources:

Online Lecture Notes and Course Materials:

1.MITOpenCourseWare:ElectricityandMagnetism-Thisresourceofferslecture notes, assignments, and exams for acomplete course on electricity and magnetism: https://ocw.mit.edu/courses/physics/8-02sc-physics-ii-electricity-and-magnetismspring-20l1/

PHY201– विद्युत चुम्बकिकी

समय3 घण्टे 70 अंक

नोट *:* इस प्रश्न पत्र में 03 खण्ड निम्न प्रकार होंगें :

खण्ड अ : इस खण्ड में एक अनिवार्य प्रश्न जिसमें प्रत्येक इकाई से 02 लघु प्रश्न लेते हुए कुल 10 लघु प्रश्न होंगे । कुल अंक : 20

खण्ड ब : इस खण्ड में प्रत्येक इकाई से 02 प्रश्न लेते हुए कुल 10 प्रश्न होंगे । प्रत्येक इकाई से एक प्रश्न का चयन करते हुए कुल 05 प्रश्नों के उत्तर देने होंगे ।

कुल अंक : 50

इकाई – 1

अदिश एवं सदिश क्षेत्रः अदिश एवं सदिश क्षेत्र की प्रवणता, संरक्षी क्षेत्र व विभव के मध्य सम्बंध, सदिश क्षेत्र के रेखा, पृष्ठ व आयतन समाकलन, अभिवाह की अभिधारणा, सदिश क्षेत्र का डायवर्जेंस व कर्ल तथा इनका भौतिक महत्व, गाउस डायवर्जेंस एवं स्टॉक कर्ल प्रमेयों के कथन एवं सिद्ध करना। कार्तिकीय, बेलनीय, एवं गोलीय निर्देशांकों में डेल;कमसद्धव लाप्लासियन संकारक;कमस^{2}द्ध(व्युत्पत्ति नही)।

इकाई – 2

स्थिर वैद्युतिकी :किसी स्वैच्छिक आवेश वितरण के लिए विभव एवं क्षेत्र, बहु ध्रुव अवधारणा, द्वि ध्रुव के कारण विभव एवं क्षेत्र तथा इनकी विघुतक्षेत्र के साथ अन्योय क्रिया समरूप विद्युत क्षेत्र में द्वि ध्रुव पर बल आघूर्ण व स्थितिज उर्जा, समरूप आवेशित गोले की स्थिर वैद्युत उर्जा, इलेक्ट्रॉन की चिरसम्मत त्रिज्या।

आणविक एवं परमाणविक द्विध्रुव, प्रेरित द्विध्रुव एवं ध्रुवणता, परावैद्युत ;कपमसमबजतपबेद्ध एवं इनकी वैद्युत ध्रुवणता, प्रवृत्ति एवं विस्थापन सदिश, आंशिक और पूर्ण रूप से परावैद्युत पदार्थ से भरे समानान्तर प्लेट संधारित्र की धारिता, समाकलन व अवकलन रूप में गाउस नियम, लारेन्ज का स्थानीय क्षेत्र, क्लासियस–मौसोटी सम्बंध।

इकाई – 3

स्थिर विद्युत क्षेत्र :विद्युत क्षेत्र में चालक, विभव के परिसीमा प्रतिबन्ध, परावैद्युत पृष्ठ पर स्थिर वैद्युत क्षेत्र के परिसीमा प्रतिबन्ध, अद्वितीयता प्रमेय, वैद्युत प्रतिबिम्ब विधि एवं भूसम्पर्कित चालक पृष्ठ के निकट रखे बिन्दुवत आवेश के लिए हनका अनुप्रयोग, कार्तीकीय, बेलनीय एवं गोलीय निर्देशांकों में पाइसॉ व लाप्लास समीकरण(व्युत्पत्ति नहीं)कार्तीकीय निर्देशांकों में लाप्लास समीकरण का हल, आयताकार बाक्स में स्थित किसी बिन्दु पर विभव।

इकाई – 4

स्त्वं त्ब परिपथों में धारा वृद्धि एवं क्षय, क्षयांक स्थिरांक, स्ब्त्परिपथ में क्षणिक धारा,।ब परिपथ एवं सम्मिश्र संख्याये,।ब परिपथ समस्याओं को हल करने में इनका उपयोग, सम्मिश्र प्रतिबाधा एवं प्रतिघात, श्रेणी क्रम एवं समानन्तर क्रम अनुनाद, विशेषता गुणांक,।ब्परिपथ द्वारा शक्ति उपयोग एवं शक्ति गुणांक।

बायो सार्क्ट नियम, अवकलन व समाकलन रूप में एम्पीयर का नियम, चुम्बकन सदिराड, चुम्बकीय क्षेत्र भ् ठ, भ् व ड के मध्य संबंध, समरूप चुम्बकन एवं पृष्ठीय धारा, असमरूप चुम्बकन, परमाणु में विद्युत धारा, कक्षीय जाइरो चुम्बकीय अनुपात, बोर–मेग्नेटॉन, चुम्बकीय प्रवृति।

इकाई – 5

फैराडे का विद्युत चुम्बकीय प्रेरण नियम, इसका अवकलन व समाकलन रूप, मैक्सवेल की विस्थापन धारा, समाकलन व अवकलन रूप में मैक्सवेल के समीकरण, स्व एवं अन्योन्य प्रेरण, रेले की विधि द्वारा स्व प्रेरकत्व का मापन।

विद्युत क्षेत्र व चुम्बकीय क्षेत्र के लिए तरंग समीकरण, सममतल विद्युत चुम्बकीय तरंगे व उनके गुण, विद्युत चुम्बकीय तरंगो की अनुप्रस्थ प्रकृति, ऊर्जा घनत्व, पाइन्टिग सदिश, विद्युत चुम्बकीय तरंगो का चालक व समदैशिक परावैघुत माध्यम में संचरण।

PHY202 - PHYSICS PRACTICAL II

Duration 6 hrs. Min. Pass Marks 25 Max.Marks 50

Note-Total number of experiments to be performed by the students during the session. Two experiments must be performed in the semester examination. Marks distribution will be as: Experiment I- 30, Practical record – 10, Viva Voce – 10.

1. Study of temperature variation of surface tension by Jaeger's method.
   To determine the polarizing angle for the glass prism surface and todetermine the refractive index of the material of prism using Brewster's law $\mu = \tan (i_p)$.
2. Low resistance by Carey-Foster' bridge.
3. Variation of magnetic field along the axis of circular coil and hence determine the radius of coil.
4. To study the variation of charge and current in RC circuit for different time constants (using DC source).
5. To study the behavior of RC circuit with varying resistance and capacitance using AC Mains as a power source and also determine the impedance and phase relations.
6. To study the rise and decay of current in LR circuit with a source of constant emf.
7. To study the voltage and current behavior of LR circuit with a AC power sourcealso determinepower factor,impedance and phase relation.
8. To study resonance in a series LCR circuit and determine Q of the circuit.
9. Conversion of Galvanometer into Ammeter/Voltmeter.
10. Any experiment, equivalent to the UG level.