UNIVERSITY OF KOTA

SCHEME OF EXAMINATION

AND

COURSES OF STUDY

Department of Pure & Applied Physics
Faculty of Science

B.Sc. (Hons.) III & IV Semester

Third Semester (July-December, 2024)
Fourth Semester (January-June, 2025)

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

Edition: 2024

Bachelor of Science (B.Sc. Hons.) Physics

Semester Scheme of Examination

Year / Semester	Serial Number, Code and Nomenclature of Paper			Duration of Exam	Teaching (Hrs./Week) and Credits			Distribution of Maximum Marks			Minimum Pass Marks	
	Number	Code	Nomenclature		L	P	C	Internal Assess.	Sem. Assess.	Total Marks	Internal Assess.	Sem. Assess.
IInd Year III Semester	3.1	DCC-PHY	Physics-III Thermal and Statistical Physics	3 Hrs.	4	--	4	30	70	100	12	28
	3.2	DCC-PHY	Physics Practical-III	6 Hrs.	--	4	2	--	50	50	--	25
	3.3	DCC-MAT	Mathematics-III	3 Hrs.	4	--	4	30	70	100	12	28
	3.4	DCC-MAT	Mathematics Practical-III	6 Hrs.	--	4	2	--	50	50	--	25
	3.5	DSE-PHYH	Physics (Hons)-III Optics	3 Hrs.	4	--	4	30	70	100	12	28
	3.6	DSE-PHYH	Physics Hons Practical-III	6 Hrs.	--	4	2	--	50	50	--	25
	3.7/3.8	GEC	Environmental Science/Computer Application	1.5 Hrs.	2	--	2	--	50	50	--	20
	Total (I Semester)			**--**	**14**	**12**	**20**	**90**	**410**	**500**	**--**	**--**
IInd Year IV Semester	4.1	DCC-PHY	Physics-IV Electronics	3 Hrs.	4	--	4	30	70	100	12	28
	4.2	DCC-PHY	Physics Practical-IV	6 Hrs.	--	4	2	--	50	50	--	25
	4.3	DCC-MAT	Mathematics-IV	3 Hrs.	4	--	4	30	70	100	12	28
	4.4	DCC-MAT	Mathematics Practical-IV	6 Hrs.	--	4	2	--	50	50	--	25
	4.5	DSE-PHYH	Physics (Hons) -IV Elementary Quantum Mechanics and Spectroscopy	3 Hrs.	4	--	4	30	70	100	12	28
	4.6	DSE-PHYH	Physics Hons Practical-IV	6 Hrs.	--	4	2	--	50	50	--	25
	4.7/4.8	GEC	Environmental Science/Computer Application	1.5 Hrs.	2	--	2	--	50	50	--	20
	Total (II Semester)			--	**14**	**12**	**20**	**90**	**410**	**500**	**--**	**--**
Total (I and II Semesters)				**--**	**28**	**24**	**40**	**--**	**--**	**1000**	**--**	**--**

Note: The syllabi of the DCC-PHY, DCC-MAT and AEC papers are same as prescribed for the B.Sc. Pass Course by the concerned BOS.

Rules & Regulations

Objectives of the Course:

Innovation and Employability-Physics 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. Although physics is a fundamental science it is a very practical subject. Physicists 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.

The Department of Pure and Applied Physics has been started the Hons. course from July, 2013. Our current programme involves the students in a holistic experience of Physics education and instills the spirit of research in the formative years of their careers. This flagship 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 Pure and Applied branches of Physics with extensive theoretical and experimental knowledge in 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 shall be placed in premier research institutes and companies in India and abroad, qualify NET/GATE/JEST examinations and eligible for M.Tech., PhD and teaching.

Programme and Course outcomes-At the end of the program, the students will develop a strong analytical skill and will be able to study critically a physics problem, solve the problem using different tools and present the result/conclusion. They will develop a good communication skill such that they can explain complicated physics technical terminologies in simple manner. They will be aware of the information available nowadays and will be able to retrieve information from e-libraries and other e-sources available using internet. They will be aware of their ethical and moral values and not practice fabrication and plagiarism. They will know of their responsibility of preserving our environment and the world. Finally, they will be ready to work individually as well as in a team.

The students of B. Sc. Physics Hons will be covering Mechanics, Math Physics, Electricity and Magnetism, Waves and Optics, Thermal Physics, Digital Systems, Quantum Mechanics, Solid State Physics, Electromagnetism and Statistical Mechanics. Over and above these they will study 06 discipline specific elective and 02 generic elective courses. In most of these courses they will have hands-on experiences on different experiments based on the theories they have learnt.

Duration of the Course:

The course B.Sc. (Hons.- Phsyics) shall consist of three academic years divided in to six semesters.

Eligibility for Admission:

The basic eligibility for admission to the course is XII with Physics, Chemistry and Mathematics with minimum marks for GEN category candidates of Rajasthan-55%; 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. (Hons.-Physics) consists of:

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

(ii) Dissertation / Project Work / Practical training / Field work, which can be done in an organization (Government, Industry, Firm, Public Enterprise, *etc.*) approved by the Department.

Attendance:

Every teaching faculty handling a course shall be responsible for the maintenance of attendance Register for candidates who have registered for the course. The teacher of the course must intimate the Head of the Department at least seven calendar days before the last instruction day in the semester about the attendance particulars of all students. Each student should earn 75% attendance in the courses of a particular semester failing which he or she will not be permitted to appear in the End-Semester Examinations. However, it shall be open to the authorities to grant exemption to a candidate who has failed to obtain the prescribed 75% attendance for valid reasons and such exemptions should not under any circumstance be granted for attendance below 65%.

Teaching Methodologies:

The classroom teaching would be through conventional lectures or power point presentations (PPT). The lecture would be such that the student should participate actively in the discussion. Student seminars would be conducted and scientific discussions would be arranged to improve their communicative skills. In the laboratory, instructions would be given for the experiments followed by demonstration and finally the students have to do the experiments individually.

Maximum Marks:

Maximum marks of a theory and practical paper shall be decided on the basis of their contact hours / per week. One teaching hour per week shall equal to one credit and carry 25 maximum marks. Therefore, 4 teaching hours/week having 4 credit points shall carry 100 maximum marks for each theory paper/course. While two contact hours per week for a laboratory or practical work shall be equal to one credit point. Therefore, 4 contact hours / week shall equal to 2 credit points and shall carry 50 maximum marks.

Assessment Pattern:

The assessment of the students shall be divided into two parts in which first part is continuous or mid-term or internal assessment (30% weightage of the maximum marks) and second part is semester or end-term or external assessment (70% weightage of the maximum marks).

(i) Continuous / Mid-Term / Internal Assessment:

(a) The continuous or mid-term or internal assessment for each theory paper shall be taken by the faculty members in the Department during each semester. Internal assessment part is further divided in two parts of equal weightage of marks as per the details given below:

Continuous Assessment	Modes of Assessments		Max. Marks
	Collegiate (Regular) Students	Non-collegiate (Private) Students	

Cont. Assess-I	Written Examination	Report Writing	20
Cont. Assess-II	Seminar / Presentation / Project Report / Quiz / GD / Viva-voce	Viva-voce	10

Note: *In the Continuous/Mid-Term/Internal Assessment-I, written examination shall be of one hour duration for each theory paper and shall be taken according to the academic calendar which will be notified by the Department. Time duration for Continuous/Mid-Term/Internal Assessment-II is not allotted. It will be decided by the faculty member which will be taking second internal assessment.*

(b) For practical papers, there will not be continuous or mid-term or internal assessment. There will be only one external or end-term or semester assessment having 100% weightage of maximum marks.

(c) A student, who remains absent (defaulter) or fails or wants to improve the marks in the continuous or mid-term or internal assessment, may be permitted to appear in the desired paper(s) in same semester and one time only with the permission of the concern Head of the Department. Defaulter/improvement fee of Rupees 250/- per paper shall be taken from such candidates. Duly forwarded application of such student by the Head of the Department, who may permit the such candidates to appear in the continuous or mid-term or internal assessment after production of satisfactory evidence about the reason of his/her absence in the test(s) and deposition of the defaulter/improvement fee, shall be sent to the concerned teacher to take the continuous or mid-term or internal assessment of such candidates. A record of such candidates shall be kept in the Department.

(d) Regular attendance of the student shall be considered in the internal assessment. Marks (equal to 10% of internal assessment) may be given to the student(s) for regularity who is/are taken classes regularly. If the attendance/regularity factor is similar for all the students, then weightage marks for regularity may be merged in the weightage of second internal assessment (seminar / presentation / assignment / dissertation / quiz / group discussion / viva-voce, *etc.*).

(e) Paper wise consolidated marks for each theory paper and dissertation / seminar (*i.e.* total marks obtained during various modes of internal assessment) obtained by the students (out of the 30% weightage of the maximum marks of the each paper) shall be forwarded by the Head of the Department (in two copies) to the Controller of Examinations of the University within a week from the date of last internal assessment test for incorporation in the tabulation register.

(f) The consolidated marks obtained by the students be also made known to them before being communicated by the concerned Head of the Department to the University for final incorporation in the tabulation register. If any discrepancies are discovered or pointed out by the students, the same shall be looked into by the concerned faculty member and corrections made, wherever necessary. The decision of the Head of the Department before the communication of marks to the University shall be final. No corrections shall be made in the internal assessment marks after the declaration of the result by the University.

(g) Consolidated marks of internal assessment obtained out of the 30% weightage of maximum marks of each theory paper which will be communicated to the University shall be in whole number and not in fraction. Marks awarded for the various internal assessments in each paper shall be added up and then round off to the next whole number to avoid any fraction.

(h) All test copies and other material related to the internal assessment shall also be sent to the Controller of Examinations of the University to keep in record as per the University guidelines.

(i) The concerned Head of the Department shall be responsible for proper conduct of internal assessment tests and for communication of the consolidated marks to the University within the prescribed time.

(j) The Head of the Department shall keep a record of the marks and also notify the same to the candidates immediately so that if any candidate is not satisfied with the award in any test or seasonal work, he / she should represent the matter to the higher authority.

(ii) Semester / End-Term / External Assessment:

(a) The semester or end-term or external assessment (70% weightage of the maximum marks) shall be 03 hours duration to each theory paper and 06 hours duration for each practical paper and shall be taken by the University at the end of each semester.

(b) The syllabus for each theory paper is divided into five independent units.

Question Paper Pattern:

(A) Continuous / Mid-Term / Internal Assessment:

30% weightage of Maximum Marks (30 Marks out of 100 Maximum Marks).

(i) Continuous / Mid-Term / Internal Assessment-I (Max. Marks: 20):

Department of .....
University / College : .....
Address .....

First Internal Assessment Test 20… - 20….
(Written Examination)

Name of Class/Course :	Max. Marks : 20 Marks
Name of Semester :	Duration of Exam. : 1.00 Hr
No. & Name of Paper :	Date of Exam. :

Q. No. 1. …… 05 Marks

or

……

Q. No. 2. …… 05 Marks

or

…….
Q. No. 3. …… 05 Marks
or
…….

Q. No. 4. …… 05 Marks
or
…….

(ii) Continuous / Mid-Term / Internal Assessment-II (Max. Marks: 10):

Department of .....
University / College: .....
Address .....

Second Internal Assessment Test 20… - 20….
(Seminar / Presentation / Project Report / Quiz / GD / Viva-voce)

Name of Class/Course:	Max. Marks : 10 Marks
Name of Semester :	Mode of Assessment:
No. & Name of Paper:	Date of Assessment:

Format for Compilation of Marks/Awards of Continuous/Mid-Term/Internal Assessment-I & II

Department of .....
University / College: .....
Address .....

Name of Class/Course: .....
Name of Semester : .....
No. & Name of Paper: .....
Max. Marks : .....

S. No.	Name of Student	Father's Name	Marks Obtained			
			Internal Assess. - I	Internal Assess. - II	Total Marks (In Figure)	Total Marks (In Words)
1.						

Name & Signature of the Faculty Member

(B) Semester / End-Term / External / Assessment:

70% weightage of Maximum Marks (70 Marks out of 100 Maximum Marks).

Question Paper Pattern for Semester Examination

[Common for Collegiate (Regular) and Non-collegiate (Private) Students]

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

Note: *The syllabus is divided into five independent units and question paper will be divided into following two sections:*

- ***Section-A*** *will carry one compulsory question comprising 10 short answer type questions (answer about in 10-20 words) by taking two questions from each unit with no internal choice. Each short answer type question will have 2 marks and hence Section-A will carry total 20 marks.*
- ***Section-B*** *will carry 50 marks equally divided into five long answer type questions (answer about in 400-500 words) with one question from each unit with internal choice (another question will be given in option or question may be divided in to sub-divisions). Paper setter shall be advised to set one question from each unit along with one option of each question and students are instructed to attempt total five questions by selecting one question from each unit. Each long answer type question will have 10 marks and hence Section-B will carry total 50 marks.*

Section-A

Q. No. 1: Comprising 10 Short Answer Type Questions

Unit-I

(i) …… 02 Marks
(ii) …… 02 Marks

Unit-II

(iii) …… 02 Marks
(iv) …… 02 Marks

Unit-III

(v) …… 02 Marks
(vi) …… 02 Marks

Unit-IV

(vii) …… 02 Marks
(viii) …… 02 Marks

Unit-V

(ix) …… 02 Marks
(x) …… 02 Marks

Section-B

Unit-I

Q. No. 2: …….. 10 Marks

Or

……

Unit-II

Q. No. 3: …….. 10 Marks

Or

……

Unit-III

Q. No. 4: …….. 10 Marks

Or

……

Unit-IV

Q. No. 5: …….. 10 Marks

Or

……

Unit-V

Q. No. 6: …….. 10 Marks

Or

……

Practical Examinations:

Continuous / Mid-Term / Internal Assessment:

Not applicable in Practical Examinations.

Semester / End-Term / External Assessment:

Common for Collegiate (Regular) and Non-collegiate (Private) Students

Duration of Exam: 6 Hours **Maximum Marks: 50**

Distribution of Maximum Marks:

S. No.	Name of Exercise	Marks
1.	Exercise-1	15
2.	Exercise-2	15
3.	Practical Record	10
4.	Viva-voce	10
	Total Marks	**50**

Minimum Pass Marks and 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 continuous/internal and semester / external examinations 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 re-appear in the due papers' examinations along with next odd/even semester examinations.

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, wants to improve his/her performance in the theory papers of just previous semester, he/she may re-appear only one time in these theory 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 undergraduate programme up to five years and so on.

i) The marks secured in the General Hindi, General English, Computer Applications and Environment Science shall be counted in awarding the division to a candidate as per the University act and ordinances.

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

Classification of Successful Candidates:

(a) Each student shall be awarded a final letter grade at the end of the semester of the particular course. The letter grades and their corresponding grade points are given as:

Percentage of Marks Obtained	Performance	Grade Letter	Grade Point
90.00 – 100.00	Outstanding	O	10
80.00 – 89.99	Excellent	A^+	9
70.00 – 79.99	Very Good	A	8
60.00 – 69.99	Good	B^+	7
50.00 – 59.99	Above Average	B	6
45.00 – 49.99	Average	C	5
40.00 – 45.99	Below Average / Pass	P	4
00.00 – 39.99	Fail	F	0
--	Absent	AB	0
--	Unfair Means	UM	0
--	Withdrawn	W	0

(b) A candidate who remains absent for any semester examination shall be assigned a letter grade AB along with corresponding grade point zero. He/she will have to re-appear for the said examination in due paper/course.

(c) Semester Grade Point Average (SGPA): Performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five papers (theory/practical) in a semester with credits C_1, C_2, C_3, C_4 and C_5 and the student's grade points in these courses are P_1, P_2, P_3, P_4 and P_5 respectively, then students' SGPA is calculated as:

$$SGPA = \frac{C_1P_1 + C_2P_2 + C_3P_3 + C_4P_4 + C_5P_5}{C_1 + C_2 + C_3 + C_4 + C_5} = \frac{\sum_{i=1}^{n} C_iP_i}{\sum_{i=1}^{n} C_i}$$

Where:

C_i: Number of credits earned in the i^{th} paper/course of semester for which SGPA is to be calculated.

P_i: Grade point earned in i^{th} paper/course.

i = 1, 2, 3, 4,……..n : Represents the number of papers/courses in which a student has appeared in End of Semester Evaluation (EoSE).

The SGPA is calculated, as per example given below, up to two decimal points:

Paper/Course	**Credit (C)**	**Grade Letter**	**Grade Point (P)**	**Credit Point (CP)**	**SGPA**
Physics	4	A	8	4 x 8 = 32	
Physics Practical	2	B^+	7	2 x 7 = 14	ΣCP
Mathematics-I	4	A	8	4 x 8 = 32	$= \frac{}{\Sigma C}$
Mathematics Practical-I	2	B^+	7	2 x 7 = 14	146
Physics Hons	4	A	8	4 x 8 = 32	$= \frac{}{20}$
Physics Hons Practical	2	B	6	2 x 6 = 12	= **7.30**
General Hindi/English	2	C	5	2 x 5 = 10	
Total	**20**	**--**	**--**	**146**	

It should be noted that, the SGPA for any semester shall take into consideration the F and AB grade awarded in that semester. For example, if a student has a F or AB grade in paper/course 4, the SGPA shall then be computed as:

$$SGPA = \frac{C_1P_1 + C_2P_2 + C_3P_3 + C_4 \text{ x ZERO} + C_5P_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

(d) Cumulative Grade Point Average (CGPA): The CGPA is calculated with the SGPA of all the semesters up to two decimal points and is indicated in final grade report card / final transcript showing the grades of all the semesters and their papers/courses. The CGPA shall reflect the failed status in case of F grade(s), till the paper(s)/course(s) is/are passed. When the paper(s)/course(s) is/are passed by obtaining a pass grade on subsequent examination(s), the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$CGPA = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4 + C_5S_5 + C_6S_6}{C_1 + C_2 + C_3 + C_4 + C_5 + C_6} = \frac{\sum_{i=1}^{n} C_iS_i}{\sum_{i=1}^{n} C_i}$$

Where:
C_1, C_2, C_3, … is the total number of credits for I, II, III, …. Semesters and S_1, S_2, S_3, … is the SGPA of I, II, III, …. Semesters.

The CGPA is calculated, as per example given below, up to two decimal points:

Semester	**Credit (C)**	**SGPA**	**C x SGPA (CS)**	**CGPA**
Semester-I	20	7.30	20 x 7.30 = 146.0	ΣCS
Semester-II	20	7.69	20 x 7.69 = 153.8	= --------
Semester-III	20	7.23	20 x 7.23 = 144.6	ΣC
Semester-IV	20	7.86	20 x 7.86 = 157.2	
Semester-V	20	8.12	20 x 8.12 = 162.4	925.80
Semester-VI	20	8.09	20 x 8.09 = 161.8	= -------
Total	**120**	**--**	**925.80**	120
				= **7.71**

(e) 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

III SEMESTER

3.5-Optics

Unit 1
Formation of images, sign convention, position of object and its image formed by refraction on spherical surfaces, lateral, axial and angular magnification, Abbe's sine condition, aplantic points, deviation produced by thin lenses, equivalent focal length, combination of two thin lenses, Abberations: chromatic, Achromatic Combination of lenses, spherical, method of reducing spherical aberrations, Eye-piece: Huygen's, Ramsden's.

Unit 2
Superposition of waves from two point sources, the necessity of coherence, spatial & temporal coherence, Effective size of a point source, Shape of interference fringes, Intensity distribution in space, Fresnel's biprism experiment, Interference by division of amplitude, Interference in thin films, colur of thin films in transmission and reflection, Newton's rings, Michelson's interferometer, fringes of different shapes Determination of λ and $\Delta\lambda$ with Michelson's interferometer.

Unit 3
Fraunhofer diffraction by a single slit, circular aperture, two parallel slits, Plane diffraction grating, transmission and reflection gratings, dispersion by grating, resolving power, Rayleigh's criterion of resolution, Resolving power of a grating, Resolving power of a telescope, Fresnel's diffraction, half-period zones, Fresnel's diffraction by a circular aperture, Straight edge and thin slit, Cornu's (geometrical) spiral to study Fresnel's diffraction, Zone plate.

Unit 4
Polarised light, Production and analysis of plane, circularly and elliptically polarised light, Huygen's theory of double refraction using Fresnel ellipsoidal surfaces (No mathematical derivation), Theory of polarized light, Quarter and half wave plates, Optical activity, Specific rotation, Fresnel's explanation for optical rotation, Biquartz and half shade Polarimeters.

Unit 5
Spontaneous and stimulated emission, Einstein's A and B coefficients, Laser Criterion, Condition for amplification, population inversion, methods of optical pumping, He-Ne Laser, Ruby lasers, Holography, Construction of hologram and reconstruction of the image, Basic characteristics of the optical fiber, total internal reflection, acceptance angle, acceptance cone, numerical aperture.

Text/Reference Books:
1. Optics by Brij Lal and Subrahmanium, S. Chand Publication, 2006.
2. Introduction to Fiber optics - A. Ghatak and K. Thyagarajan, Cambride University Press, Cambridge, 1988.
3. Introduction to Modern Optics- A. K. Ghatak, Tata McGraw Hill.

3.6-PHYSICS HONS PRACTICAL

1. To study the variation of charge and current in RC circuit for different time constants (using DC source).
2. To study the behavior of RC circuit with varying resistance and capacitance using AC as a power source and also determine the impedance and phase relations.
3. To study the rise and decay of current in LR circuit with a source of constant emf.
4. To study the voltage and current behavior of LR circuit with a AC power source also determine power factor, impedance and phase relation.
5. Study of RC / LC transmission line.
6. Determine ballistic constant using constant deflection method.
7. Determine ballistic constant using condenser method.
8. Determine high resistance by leakage method.
9. Determine the magnetic field using ballistic galvanometer and search coil.
10. Determine the mechanical equivalent of heat (J) by using calendar and barn's constant flow calorimeter
11. Determine the thermal conductivity of a bad conductor using lee's disc method.
12. Determine the melting point of given material using platinum resistance thermometer.
13. Plot thermo emf vs temperature graph and find the inversion and neutral temperature.
14. Determine the thermodynamic constant (Cp/Cv) using Clement and Desorme's method.
15. Study of variation of total thermal radiation with temperature and verify the Stefan's law.
16. Determine the value of Stefan's constant.
17. To determine the polarizing angle for the glass prism surface and to determine the refractive index of the material of prism using Brewster's law =tan (i_p).
18. Measurement of wavelength of monochromatic source of light by Newton's rings.
19. Measurement of wavelength of monochromatic source of light by plane transmission grating. Measurement of wavelength of monochromatic source of light by biprism.
20. Study of specific rotation by polarimeter.
21. Determination of resolving power of a plane transmission grating.
22. Determination of resolving power of telescope.
23. Determination of dispersive power of material of a prism using spectrometer.
24. Any other experiments of the equivalent standard can be set.

IV SEMESTER

4.5-Elementary Quantum Mechanics and Spectroscopy

Unit 1

Failures of the classical mechanics, black body radiation and spectral distribution of energy, Planck's quantum hypothesis and average energy of Plank oscillator, Plank's radiation law and discussion to obtain Wein's, Rayleigh-Jeans and Stefan-Boltzmann laws using it, photo electric effect, Einstein's explanation, Compton effect, Wave-particle duality, de Broglie waves, Davisson-Germer experiment, group and phase velocities.

Unit 2

Uncertainty principle, formulation and its applications, finite size of atom, non existence of electrons in nucleus, Concept of wave packet, Phase velocity and group velocity, Construction of one dimensional wave packet, Momentum space representation of wave packet (Fourier transform), Bohr's principle of complementarity, wave function, boundary and continuity conditions of wave function, physical significance of wave function (Schrodinger's and Born's interpretation).

Unit 3

Schrodinger's equation, Its need and justification, time dependent and time independent forms, probability current density, Postulates of Quantum mechanics, operators in quantum mechanics, Definition of an operator, linear and Hermition Operator, Properties of Hermitian operators, Expectation values of dynamical variables -position, momentum, energy, Eigen functions & eigen values, degeneracy, orthogonality of eigen function, ehrenfest theorem, Commutation relations, parity-symmetric and antisymmetric wave functions.

Unit 4

Particle in a one-dimensional box, eigen functions and eigen values, Discrete energy levels, generalization to three dimensions and degeneracy of levels, Potential step and rectangular potential barrier, alpha decay, Square well potential problem, calculation of transmission and reflection coefficients, Particle in one dimensional infinite potential well, Particle in a one-dimensional finite depth potential well, Energy eigen values and eigen functions, simple harmonic oscillator (One dimensional case), Zero point energy.

Unit 5

Applications of Quantum Theory to Atomic Spectroscopy: Quantum features of spectra of one electron atoms, Frank–Hertz experiment and discrete energy states, Stern and Gerlach experiment, spin and magnetic moment, Spin orbit coupling and qualitative explanation of fine structure, Atoms in magnetic field Zeeman spliting, Stark Effect. Molecular Spectroscopy: Qualitative features of molecular spectra, Rigid rotator discussion of energy, eigenvalues and eigenfunction, rotational energy levels of diatomic molecules, Rotational spectra, vibrational energy levels of diatomic molecules, vibrational spectra, vibrational rotational spectra.

Text/Reference Books:

1. Elementary Quantum Mechanics and Spectroscopy - S. L. Kakani, C. Hemrajni and T.C. Bansal, College Book Centre, Jaipur, 1995.

2. Quantum Mechanics-Theory & Applications by A. K. Ghatak & S. Loknathan, McMillan, 1977
3. Perspectives of Modern Physics- Arthur Beiser, McGraw Hill, Auckland,1995.
4. Introduction to Atomic Spectra - H E. White, Tata McGgraw Hill International Edition

4.6-PHYSICS HONS PRACTICAL

1. Determine the resistance per unit length of Carey fosters bridge and find the resistance of a given wire.
2. Determine the self-inductance of a coil using Anderson's bridge.
3. Determine the capacity of a gang condenser by Desauty's bridge and find the dielectric constant of liquid.
4. Determine the self-inductance of a coil using Rayleigh's method.
5. Study Maximum power transfer theorem.
6. Study of power supply using two diodes/ bridge rectifier using various filter circuits.
7. Study of half wave rectifier using L and pi section filters.
8. Characteristics of given transistor PNP/ NPN (common emitter, common base and common collector configurations).
9. Determination of band gap using a junction diode.
10. Determination of power factor of a given coil using CRO.
11. Study of single stage transistor audio amplifier (variation of gain with frequency)
12. Study of diode as integrator with different voltage wave forms.
13. Design a Zener regulated power supply and studies the regulation with various loads.
14. Study the characteristic of field effect transistor (FET) and design and study amplifier of finite gain.
15. Applications of operational amplifier as (minimum two of the following exercises) : (i) Inverter (ii) Non-Inverter (iii) Differentiator (iv) Integrator.
16. Any other experiments of the equivalent standard can be set.