PROGRAMME PROJECT REPORT (PPR)

Name of the Programme: **MASTER OF SCIENCE IN PHYSICS (M.Sc. in Physics)**

Duration: Minimum 2 years
Maximum 4 years

Registration: ThisProgrammeis recognized by the DEC-IGNOU and now by the UGC-DEB

A. PROGRAMME'S MISSION AND OBJECTIVES

Vision:

To build foundation for excellence and encouraging the development of institution as premier institution by igniting and promoting enthusiasm, interest and passion, in the study of physics, in professional courses, as part of curriculum.

Mission:

- M.Sc Physics helps to continuous improvement of the quality of scientific research as well as the increasing impact on the development of the economy and society as a whole.
- M.Sc Physics achieves its mission by trying to evenly represent the underlying sub-disciplines of physics in research and teaching, but also to promote new areas of research, with an emphasis on interdisciplinary and applied research.
- M.Sc Physics also encourages the development of educational physics through primary and secondary education by participating in the development of the curriculum, developing methodology of physics education, teaching aids and textbooks, through lifelong learning programs and training of teachers, and particularly through continued work with students that were recognized as extremely talented.
- M.Sc Physics actively promotes the highest ethical principles in scientific research, critical thinking, openness to social, scientific, technological and educational changes, as well as the working autonomy at the University, both scientific and educational.

Objectives:

- Students will demonstrate skills in scientific inquiry, problem solving, and laboratory techniques.
- Students will demonstrate understanding of our place in the physical universe.
- Students demonstrate a broad base of knowledge in Physics.
- Students will demonstrate understanding of the laws of nature.
- Graduates will demonstrates capability for conducting independent work or research work
- Graduates will demonstrates familiarity with the major fields of modern physics
- Graduates will demonstrates proficiency in critical thinking and analysis as the relate to physics problem in core theoretical areas of mechanics, electromagnetism, quantum mechanics and statistical mechanics.

B. RELEVANCE OF THE PROGRAMME WITH HEI'S MISSION ANDGOALS

Kuvempu University is an affiliating State University in Karnataka. Established in 1987, it is the University with a distinctive academic profile, blending in itself commitment to rural ethos and a modern spirit. It has 37 Post-Graduate departments of studies in the faculties of Arts, Science, Commerce, Education and Law. It also has 4 constituent colleges at Shankaraghatta and Shimogaand two outlying regional Post-Graduate Centers at Kadur and Chikamagalur.

The mission of the university is to spread higher education in different parts of the state and to provide access to different skill enhancing educational programmes at affordable cost to the disadvantaged and to provide the facility for lifelong learning to intending learners. Master's Degrees in Physics focus on investigating and understanding the workings of the universe and of the physical matter and processes operating within it - on Earth and beyond.

This involves understanding forces such as gravity, the behaviour of different atomic and sub-atomic particles and the fundamental properties of light and energy.

Programmes may be taught degrees (usually awarding an MSc, Postgraduate Certificate or Postgraduate Diploma) or research-based (usually awarding an M.Sc or MPhil). Entry requirements will usually include an undergraduate degree in an appropriate Physical Science subject.

The Vision and Mission of the University are:

Vision: Kuvempu University shall strive to become an international center of excellence in teaching and research to provide high quality value based education to all through various modes to meet the global challenges.

Mission:

- Foster creativity in teaching, learning and research to build a knowledge base and promote quality initiative.
- Provide access to education to all.
- Develop human resources to meet the societal needs.

The Distance Education Programmes are a part of the University's outreach programmes for the rural masses and also to foster University-Society relationship with the motto of "**Education for All**"., to provide quality education at the doorsteps of desirous individuals who want to take up higher education, for the discontinued who could not take up formal education, housewives and employees who want to improve and enhance their knowledge. The University firmly believes that education and seeking knowledge is a **Lifelong Learning** concept.

Offering higher education through Distance Mode is an important step taken by Kuvempu University so as to help the student community in their zeal to pursue higher education both at UG and PG Level. The University felt the necessity of this when a large number of students, who wanted seats for PG. Studies, could not be accommodated in our regular P.G. Programmes. The University believes that Distance Education Mode is an equally good

avenue to be made available to interested students. With these views, Kuvempu University started offering courses through distance mode since 2002-2003. At present it is offering 31 Programmes in various faculties at the U.G., P.G. and PG Diploma levels. These courses were approved by the erstwhile DEC-IGNOU, and now by the UGC-DEB.

Goals & Objectives of Distance Mode Programmes

- Reach out to larger sections of the societywho are willing to seek non-formal education.
- Capacity Building using the non-formal mode platform.
- Concentrate on planning & constant up gradation of facilities tomeet new challenges in education through Distance Mode.
- Provide counseling & consultancy to students.
- Offer area/ region wise educational requirements**.**
- Skill Development and Enhancement.
- To impart quality training through interactive learning module.
- Interactive Pedagogy of teaching-learning and flexible learning environment.
- Provide supportive academic environment and effective teaching.

C. NATURE OF PROSPECTIVE TARGET GROUP OFLEARNERS

Candidates who have passed the bachelor degree with physics as optional (B.sc)orB.Tech or B.E examination accepted as equivalent thereto by the Syndicate subject to the conditions as may be prescribed thereto are the target group of learners for M.Sc., (Physics). The programme has been well received as demonstrated by the increasing enrolments over the years, and it has been welcomed by those who missed the opportunity for higher science education. However, over the years, students, academic counselors, and physics experts have expressed concerns about the quality of the curriculum transaction, including the laboratory, the effectiveness of the student support system, and the performance and satisfaction of the learners. It is intended for

- The students may join this course to increase their employability in the physics teaching, research and many othersectors.
- Those employed in various organizations who desire to pursue higher education as a passion or as a means for movement up the promotional ladder.
- It will give chances to the willing students those who could not enter into the conventionUniversities due to their age, job and limitation of the seat in the respective subject.
- Rural population of any age and those living in remote areas where higher education institutes are not easily accessible
- Drop outs after bachelor degree due to social, financial and economic compulsions as well as demographic factors.

D. APPROPRIATENESS OF PROGRAMME TO BE CONDUCTED IN OPEN AND DISTANCE LEARNING MODE TO ACQUIRE SPECIFIC SKILLS AND COMPETENCE

Education through Distance Mode has become as an important and widely accepted strategy to counteract the inadequacy of the traditional system of education to keep abreast of the new demands. Distance Education is seen as a means of passing on the benefits of recent

advances in communication technology to the masses and thereby actualising the concept of a learned society.

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- We view the greatest strength of Physics, as a discipline, in KUDDE is its ability to integrate and apply knowledge across the interface of social and scientific systems.
- Counsellors with expertise in various fields of Physics like astrophysics, Nuclear Physics Sensing, Material science, Nano science, Bio Physics, Optical physics, etc.
- The intensive practical papers contain exercises on optics experiments, Solid state experiments, Nuclear experiments, etc.
- The practical learning helps to students in fundamental aspects of Nature, Optical instruments, Nuclear instruments, etc.

Further, the Programme develops ability to apply acquired knowledge and solve problems in new or unfamiliar surroundings within broader (or multi-disciplinary) contexts related to the area of study. The Programme will expose students to the diversity and variety of educational practices, policies, settings, and contexts in India. The Programme aims to build among our graduates capabilities for on-goingself-motivated professional development. The Programme will strive to develop capabilities to plan independent educational interventions in various roles such as those of curriculum developers, textbook/ material developers, teacher educators, scientists and researchers. The programme would provide learners a wider and more comprehensive understanding of applied chemistry concepts as field of knowledge and would accommodate a wide variety of learning needs of learners

E. INSTRUCTIONAL DESIGN:

(i) Programme Formulation:

Proposal from the concerned PG department to commence theprogrammewas placed before Monitoring Committee of the DDE/Syndicate. Then it will be referred to the BOS concerned for the formulation and approval of the syllabus scheme pattern, time allotment for each paper, marks allotment, scheme of examination etc., then it was placed in the Faculty meeting and then Academic Council (the highest body) of the University for its approval. After approval by both the bodies, the programmewas introduced. The academic advisory body of DDE refers the matter to the concerned subject/parent department council for preparation of study material. The concerned subject faculty will coordinate with the DDE and the department council, as he/she is on the member in it. Workshops for preparing study material in SLM mode are regularly conducted (with the help of IGNOU experts).

(ii) Curriculum Design:

The Programme is of 2 year duration with annual examinations. The maximum period allowed is 4 years (double the duration). The Programme structure is as below.

Year	Course Code	Courses	Marks		
			Term End Exams	Continuous Evaluation/ IA	Total
Previous Year	56921	Course 1: Mathematical Methods& Classical Mechanics	85	15	100
	56922	Course 2: Quantum &Statistical Mechanics	85	15	100
	56923	Course 3: Solid State Physics	85	15	100
	56924	Course 4: Electronics	85	15	100
		Practical I : Experiments in General physics	55	*20	75
		Practical II: Experiments in Electronics	55	*20	75
		Total marks	**450**	**100**	**550**
Final Year	56931	Course 5: Electrodynamics, Optics & Molecular Spectroscopy.	85	15	100
	56932	Course 6:Nuclear Physics, Cosmic rays and Elementary particles.	85	15	100
	56933	Course 7:Solid State Physics- I	85	15	100
	56934	Course 8:Solid State Physics- I I	85	15	100
		Practical III : Experiments in nuclear Physics	55	*20	75
		Practical IV: Experiments in Solid State Physics	55	*20	75
		Total marks	**450**	**100**	**550**
		Total Marks Previous and Final Year	**900**	**200**	**1100**

(iii) Medium of Instruction:

The medium of instruction isEnglish.

(iv) Detailed Syllabi:Given as Annexure -01

(v) Faculty and support staff:

Full time faculty in regular department will be involved in orientation counselling, and face to face programmes. Such programmes are scheduled during the vacation time of the regular department, which will meet the faculty availability and infrastructure need of ODL Programme. Coordinator of the programme, who is a regular faculty member and the Research and Teaching Assistant (RTA) will be in-charge of the Programme, who will address the day to day academic and learner/student support aspects of the Programme.

Regarding supporting staff, DDE has a separate and well equipped wing/office to take care of all the administration and delivery aspects of ODL Programmes.

There is a separate DDE wing in the Office of the Registrar (Evaluation) for all the evaluation and certification aspects headed by a Deputy/Assistant Registrar.

The DDE and Evaluation wings are fully computerized and technical staff assist in all the activities.

(vi) Instructional Delivery Mechanism:

Instructional delivery mechanism is through study materials prepared by the experts in the subjects concerned. Study materials (SLM) are prepared in-house by the faculty of the department and the faculty from sister universities.

The study material provided is the general guide and covers the course content in order to make the learner to understand core content of the course concerned. Learners are advised to make use of the reference books in the list of books provided along with the syllabus.

Contact Programme: There will be a contact programme for a minimum duration of 25 days normally. A minimum of 15 days for instruction by experienced and scholarly faculty will be arranged for each paper and 10 days for practical orientation. There shall be interaction built around lectures, discussions, individual and group activities. A test will be conducted for the candidates in each paper at the end of the contact programme.

Student support service: Students can interact with the Office/Faculty through e-mails and personal visits. SMS alert facility for the students regarding dissemination of information relating to conduct of PCPs/Orientation Programme and Production file submission deadlines etc. Student Support Service is provided through online mode and grievance handling mechanism is adopted with the help of supporting technical staff. All necessary and relavent information are uploaded in the dedicated website: www.kuvempuuniversitydde.org. Internal Assignments with Guidelines, previous years question papers, notifications timetables and results are available from the website.

Identification of media (audio, video, online computer aided):

Modern techniques use many ways to convey a message, study aids to the students. Print media, however is one of the oldest forms of advertising and supply of the study materials. It also remains to be one of the most popular forms because it can reach a wider target audience. Newspapers are the most popular form of print media. They are generally delivered at home, or are available at newsstands, and it is the most inexpensive way to reach a huge mass of people quickly. Different types of newspapers cater to various audiences, and one can select the particular category accordingly.

F. PROCEDURE FOR ADMISSIONS, CURRICULAM TRANSACTION AND EVALUATION

As outlined in Section-B, Kuvempu University has a policy to provide opportunity to maximum number of eligible and desirous candidate from all sections of the Society including a class having of low-level of disposable income, rural dwellers, women unskilled men minorities etc.

i) Eligibility for the Programme:

A candidate who have passed the 3 year B.Scdegree examination or B.E or B.Tech, B.Sc honors with physics as optional of this University or any University are considered as equivalent there to and passed the examination concerned is eligible for admission to the M.Sc in Physics.
All the candidates who fulfill eligibility criteria are admitted to the programme. If university decides for maximum number of candidates for the Programme, admissions are made first come first basis.

ii) Admission Process

- Notification issued by the Directorate of Distance Education (DDE) in Regional and National Newspapers and in the official website.
- Uploading of the Application by the candidate through Online only.
- Payment of fee through online (various options like net banking etc.) or through banks/post offices using printout of the challan.
- Submission of the printout of the application by the candidate to DDE along with original documents for eligibility, date of birth etc., and along with fee paid receipt.
- Verification of applications- for fulfillment of eligibility criteria (marks cards) documents, fee paid details.
- Approval of the admission and issue of self-learning material (Study Materials) to the students.

iii) Fee Structure:

Figure in rupees as fixed for the academic year 2017-18

SN.	Fee Component	Pervious Year	Final Year
Admission Orientation and other Components			
1	Registration	2520	-
2	Admission	980	980
3	Orientation/Tution fee	3080	3080
4	Study materials	4480	4480
5	Liaison	140	140
6	Practical	3080	3080
7	IA Books	490	490
8	Postage	420	420
9	UDF (DDE)	250	-
Examination, Certification and Other components			
10	Examination	1450	1450
11	PR exam	485	485
12	PPC	-	365
13	Convocation	-	900
14	UDF (Exams)	140	140
	TOTAL	**17,515**	**16,010**

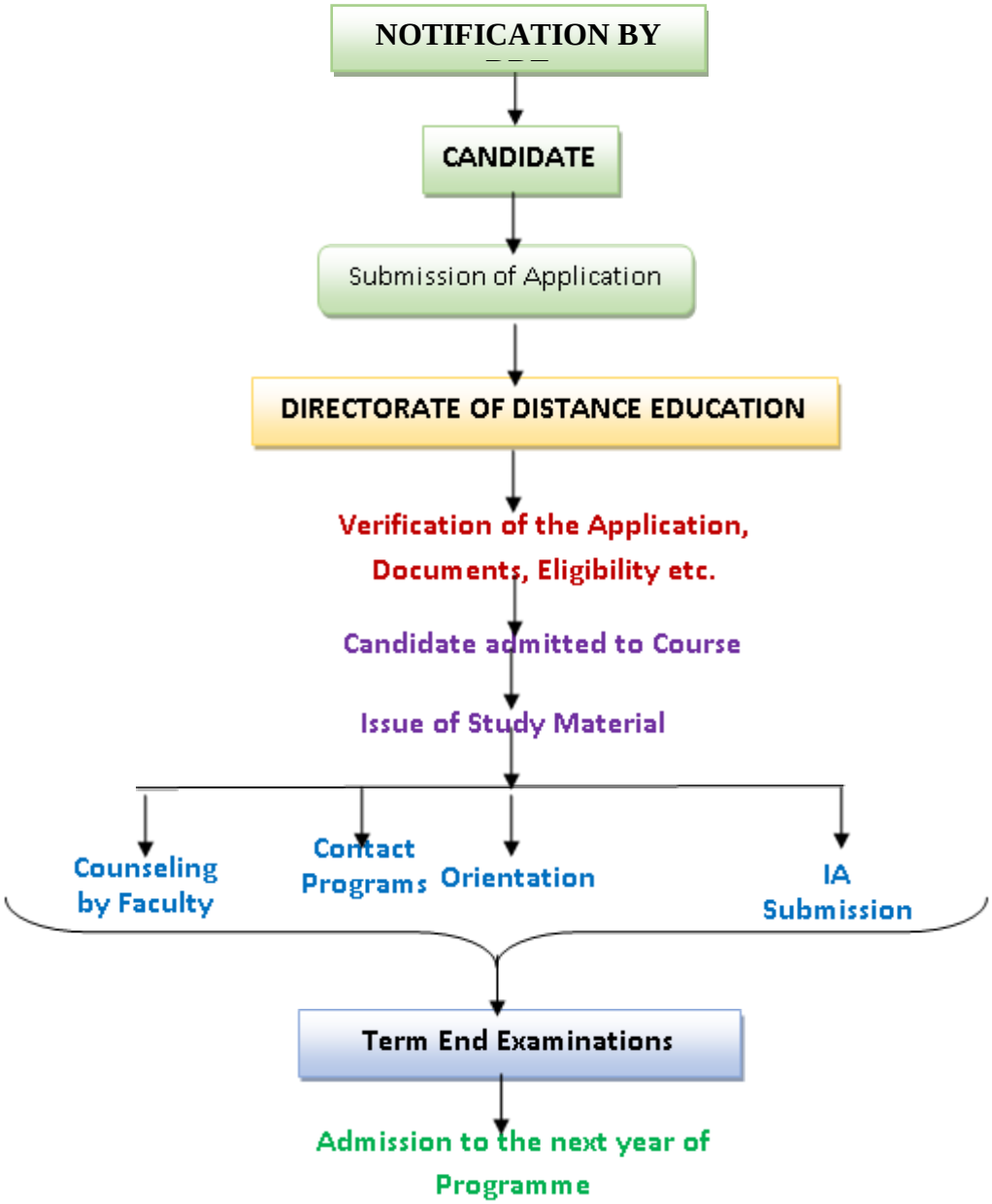
Financial Assistance:

- SC/ST and OBC Students can avail scholarship/fee reimbursement from the concerned State Departments/Agencies
- Fee Concession to Physically Handicap Candidates.
- Fee concession to Employees of the University and their dependents.
- Fee concession to Ex- servicemen.
- Scholarships and education supports extended by various Governmental and Non-Governmental agencies.

iv) Academic and Activity Planner:

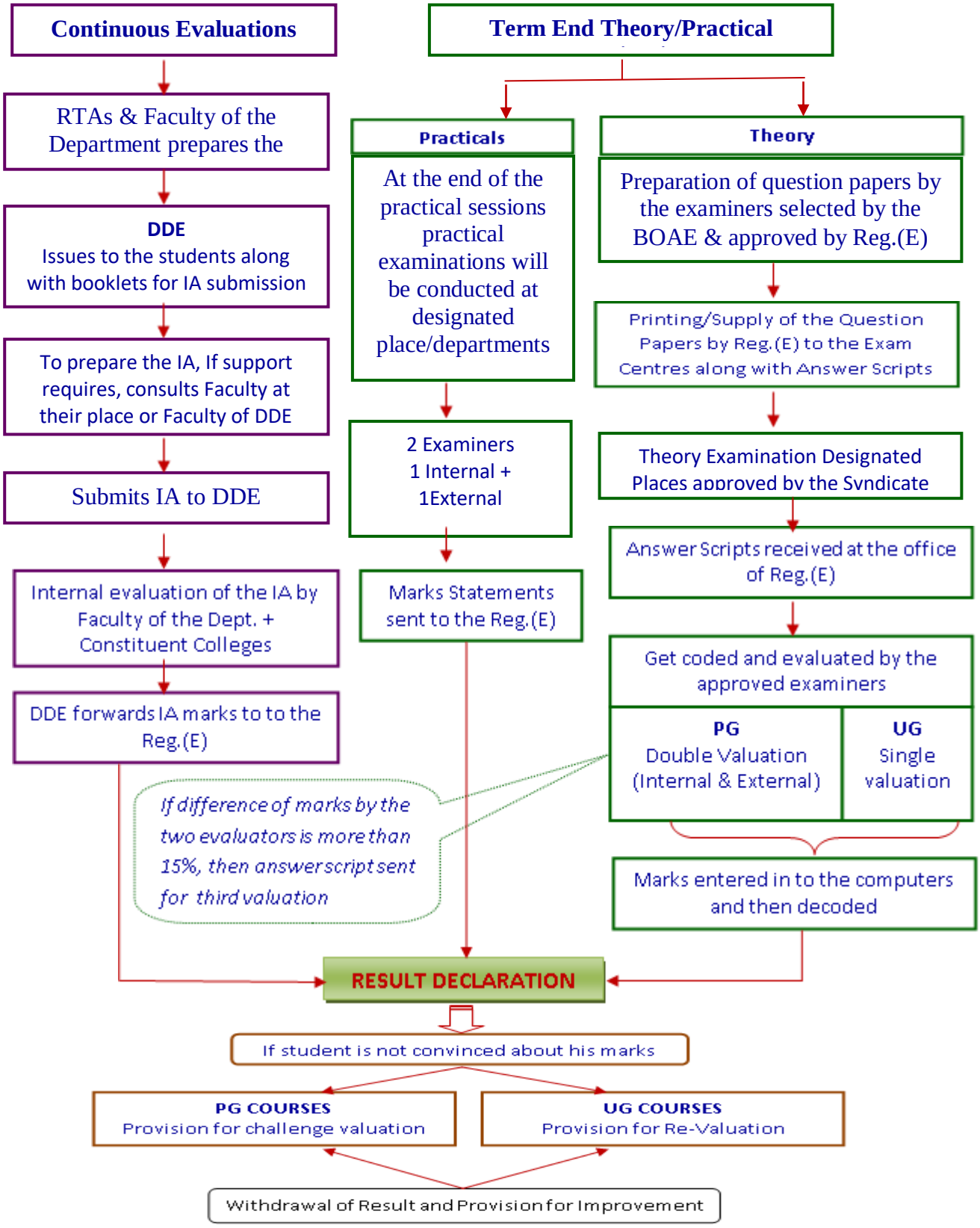
Calendar Year-I		
1	Issue of Notification	July / August
2	Commencement of Online Admissions	July / August
3	Last Date for submission of online applications by the students without Late Fee	October 31
4	Last Date for submission of online applications by the students with late fee	December 31
5	Issue of Study Material and Assignment Books (immediately after verification of the applications)	July to December
Calendar Year-II		
6	Issue of assignment topics Commencement of Counseling sessions	December - January
7	Commencement of Face-to-Face (Orientation) Sessions	February –March
8	Completion of all Orientation Sessions	April 30
9	Last date for Submission of Internal Assignments/ Project Reports	April 30
10	Tentative date for commencement of Examination.	May / June
11	Declaration of Examination Results	August / September

Generalised Academic Flow Chart for the Distance Mode Learners



(v) Evaluation of Learner Progress

Evaluation Process is given here in the form of Flowchart. This Flowchart is common to all Programme at UG, PG and PG Diploma level offered by the University.



(vi) Internal Assessments:

Type of questions	Marks	Total
Two long answer type	5x 2	10
Attendance	5	5
Total		**15**

- As a part of continuous assessment the candidates will have to complete assignments in the booklets provided by DDE and submit them to the Directorate of Distance Education within the specified date. The Topics & Instructions for I.A. will be notified in the Students Corner section of the website and also issued to the students directly or through Student Counselling Centres.
- It is mandatory to submit the I.A. in the same year of registration. However, if the candidate failed to take up the theory examination, for any reason, such candidate can submit the I.A. in the next year with prior permission from the DDE.
- All students are expected to complete the above assessments before taking the Term end Examination.
- There is no provision for resubmission of I.A.
- Attendance marks are allotted according to % of presence in the orientation class.

Provision for class tests and workout exercises: Duringcounselling and Face-to- Face (Orientation/Contact) programmes.

(vii) (a) Term End (written) Examination:

Duration: Duration: 3 hours, **Maximum marks:** 85

Questions pattern

Section	Type of Questions	Marks
A	Three long answer type with internal choice	15x 3
B	Three long answer type with internal choice	15x 3
C	Three long answer type with internal choice	15x 3
D	Three short answer type with internal choice	5x 3
Total		85

Answer any five from part A, B and C (15x5=75)without vomiting any part and part D(5x2=10) is compulsory

b) Practical Examination:

Normally we conduct the practical exam after completion of the practical orientation classes. There are 14 experiments are arranged for examination and among those 1 or 2 experiments have to choose by the student. Total marks for practical exam in particular paper 75. Out of which 55 for practical execution, 10 for record and 10 for viva voice

Declaration of class: At the completion of course evaluation (the Programme) the class will be awarded on the basis of the aggregate of marks at both previous and final examinations taken together.

Pass Class	:	40% of marks or above but below 50% of marks.
Second class	:	50% of marks or above but below 60% of marks.
First Class	:	60% of marks or above

Separate Ranks and Medals are awarded to ODL Learners. Policy for awarding ranks and medals are same as the one followed for the Regular Programme.

Reappearing for Exams: The unsuccessful candidates at the M.Sc physics examinations of particular year are required to reappear for those papers/examinations only as per the syllabus of that year. The repeaters are therefore advised to preserve the syllabus and study material until they pass the final year of the course. Learner can upload their repeater application directly through online after the notification issued for the same.

Further, for M.Sc physics students, practical courses and practical exams are mandatory. If a candidate fails to attend regular practical course and exam, he/she may take up the theory exam. However, his/her completion of the course will be declared only after he/she completes the practical course and exam of the years concerned.

Candidates will have to complete all the exams within double the durations of the course (and not the number of attempts). The double the duration is reckoned from the year of registration.

(viii) Other Policy/Provisions

Renewal of Registration: Students of II year who have failed to pay the II year programme fee in the respective year are permitted to renew their registration by paying the specified course fee along with registration renewal fee and continue their programme. However they should complete the programme with in the maximum permissible period ie., 4 years.

Bonafide student certificate: Those candidates who require Bonafide Certificate/ Study Certificate can obtain by submitting a written requestor a filled in prescribed application form (available from the KUDDE website) along with a fee of Rs. 100/- paid either through Bank challan or Demand Draft.

Change of Address: Any change in the address of the students should be intimated to the Directorate with a fee of Rs. 100/- paid through a challan of Electronic Transfer. No change of address will be entertained once the students receive their examination hall ticket. The Directorate of Distance Education is not responsible for missing correspondence due to change of address without getting address changed at DDE.

Name Correction: Change of Name, if any required, candidate has to make a written request along with relevant documents as proof of change of name, and by paying specified fee.

Duplicate Registration Card: For issue of duplicate Admission/Registration/ Enrolment card- Rs. 200/- will be charged.

Transfer Certificate: A Transfer Certificate is not required for admission to any of the KUDDE courses. The Directorate will also not issue Transfer Certificate at the time of completion of the course. However, for Lateral Entry admissions a migration and transfer certificate will be required from such students.

Change of Examination Centre: DDE will not entertain any change of exam centre unless there is a proof of change of address and it permissible.

Discrepancies in Marks cards and certificates: In case of any discrepancies observed in the marks card/ certificates etc., candidates have to bring it to the notice of the Director, DDE through a written request within a period of 3 months from the date of issue of the document.

Miscellaneous: All the original certificates submitted by the candidates in connection with their admission, registration will be returned to them from the Office of the DDE along with the registration certificate. In case any of their certificates are not received back, they must bring the same to the notice of The Director, DDE, Kuvempu University, immediately. The original records will be maintained for a minimum period of three months. If the candidates ask for the originals before three months, their requests will not be entertained.

Preservation of Answer Scripts / IA Scripts: The answer scripts of Theory Exams will be preserved for a maximum duration of 6 months from the date of announcement of results/ revaluation / challenge valuation results. Any query or request for verifications may be submitted, through a written request, within the notified period only.

Similarly, written IA Scripts of the students will be preserved for a period of six months from the date of announcement of the results (First announcement of results). Any discrepancy observed regarding IA marks may be informed to DDE through a written request within three months from the date of issue of results. Later request may not be accepted.

Students are advised to refer the website for notifications regarding preservation of various documents, issued from time to time.

Notwithstanding any conditions mentioned above the University reserves the right to change, alter, and amend any of the above clauses/conditions. In matters of fees for unforeseen issues / certificates/ endorsements the University may fix the amount subject to the existing fee structure or change it from time to time.

Post-Examination Related Issues: - Submission of application for-Convocation (Degree) Certificates, Duplicate Marks Cards, Provisional Pass Certificate (PPC), Name Correction,

Consolidated Marks Cards, removal of NCL, Academic Transcript, verification of genuineness of Marks Cards and Certificates and Processing Certificates. For all matters regarding post-examination Certifications - are made through the online.Lerner can directly apply for the same. For all enquiries and clarifications regarding said issues learners can contact the DDE section of the office of the Registrar (Evaluation). Contact details, telephone and e-mail ID of the helpdesk at the O/o Registrar (Evaluation) are given in the website

G. Requirement of library resources& laboratory support:

Library resources: A well-established library facility shall be made available with the support of the university library. In the campus we have modern and well equipped library in Kuvempu University with excellent infrastructure facilities for reading, browsing and reference to the students, teachers and research scholars. The library has kept pace with modernization by introducing CD ROM data base, internet and e-mail facilities. It is also a nodal center for INFLIBNET, access is available to 10,000 + e-journals online under the UGC- infonet Consortia. There is a well-developed digital library and campus network interconnecting all the Post-Graduate departments and offices in the campus.

Further, the DDE will made special effort to upgrade the existing DDE Library exclusively for distance learners with an emphasis on distribution of information and course material online by making use of the state-of-art information and communication technologies. Also

The students may avail the library facilities, laboratory and workshop at their study centers.

Library Card: Candidates who are desirous to avail themselves the facilities of Kuvempu University Main Library on the campus will be permitted. They have to obtain a separate Library / ID card on payment of Rs. 100/- (through challan of Electronic Transfer). However, no books will be issued to them.

Laboratory support: we will conduct practical in batch wise; each batch consists of maximum of 6 students. So all the Students have to performs maximum of 14 experiments in respective paper.

Laboratories available in the Department				
Name of Lab	**No. of Labs**	**Area** (Sq. Ft.)	**Capacity** (No. of Students)	**List of experiments and Instruments / Equipment's**
General Physics Lab	01	800	30	Enclosed the list in annexure 2
Electronics Lab	01	800	30	Enclosed the list in annexure 3
Nuclear Physics Lab	01	800	30	Enclosed the list in annexure 4
Soli state Physics Lab	01	800	30	Enclosed the list in annexure 5
Number of Rooms/Halls available for conduction of Seminars/ conferences/General Programmes			Total Number : 1	
			Total Capacity :120	

H. COST ESTIMATE OF THE PROGRAMME AND THE PROVISIONS

Cost Estimated of the Programme is based on following components– calculated for an admission of 100 Students:

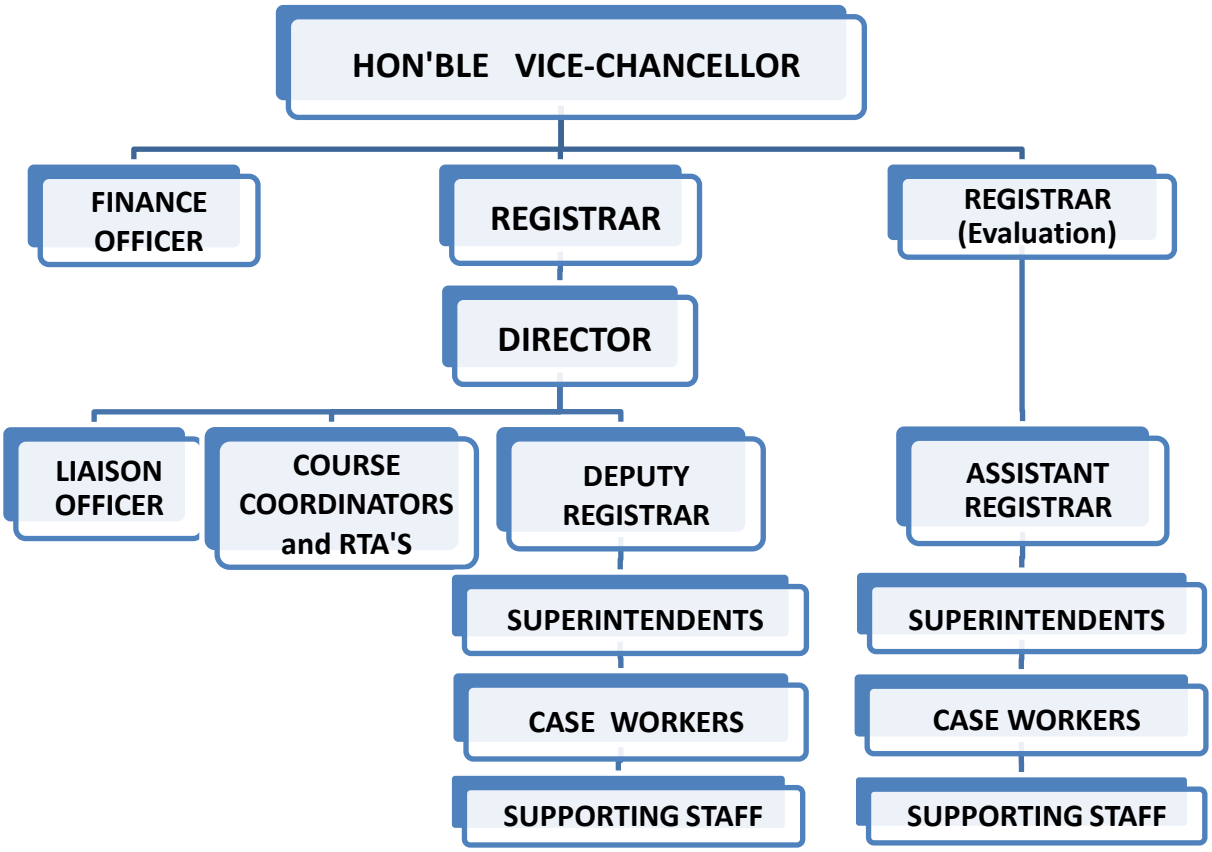
SN	Component	Estimate (lack in Rupees)
1	Study Material Development – Course Writer honorarium, Review setting, editing, SLM conversionetc	6.00
2	Printing and Distribution of SLM	5.54
3	Publicity, Awareness Information Decimation Programmes*	0.20
4	Conduction of Counseling, Orientation/Face to Face/ Practical Sessions etc.	10.30
5	Student Support Services*	0.50
6	TA/DA Meeting Expenses*	0.25
7	Continuous Evaluation / IA	0.30
8	Examination and Certification	3.75
9	Office Automation/ICT/ Communication Related Infrastructure*	0.50
10	Library*	0.46
11	Staff Salaries/ Remunerations/ Other Honorariums – Teaching, Nan-Teaching/Technical/Supporting*	1.59
12	Office Infrastructure*	0.40
13	Laboratory Development and Expenditures	0.76
13	Learner Centre Expenses*	0.36
14	Others – Office Contingence, Post/Courier, Vehicle Maintenance, Fee reimbursement and such others. *	0.67

Note: * costs that will be incurred collectively for all the programmes, but given here are the fractions of the total, considering 100 students admission to the programme.

I. QUALITY ASSURANCE MECHANISM AND EXPECTED PROGRAMME OUTCOMES

(a) Organizational Structure, Management and Monitoring Mechanism

The Organizational Structure of the Kuvempu University Directorate of Distance Education (KUDDE) is given below in the form of flowchart.



For the administrative and policy decisions, and reviewing and monitoring of the ODL activities, Kuvempu University has a Monitoring Committee (MC) Chaired by the Honorable Vice-Chancellor. The Registrar, Registrar (Evaluation), Finance Officer, Deans of all the Faculties, Chief Librarian, One Syndicate Member, One Academic Council Member and the Regional Director of the IGNOU, are its members. The Director, DDE is the Organizing Member. The operational plans, goals and policies are decided by the MC, and all the decisions and policy matters are placed before the Monitoring Committee before implementation. The Committee normally meets twice a year to review the ODL Programmes and activities.

Academic Advisory Committee (AAC) of the DDE will review the academic programme performance, content delivery mechanism. Issues regarding course content and syllabi revision of the entire Programme offered in ODL mode are discussed and decided in AAC. The Registrar will be the Chairman of the AAC, and Registrar (Evaluation), Chairpersons of all BOSs of the concerned Departments will be the members. The Director/ Deputy Director of the DDE is the Organizing Member.

All the major decisions including financial, planning and implementation which are discussed in the MC meeting are placed before the Syndicate of the University and after its approval they will come into force.

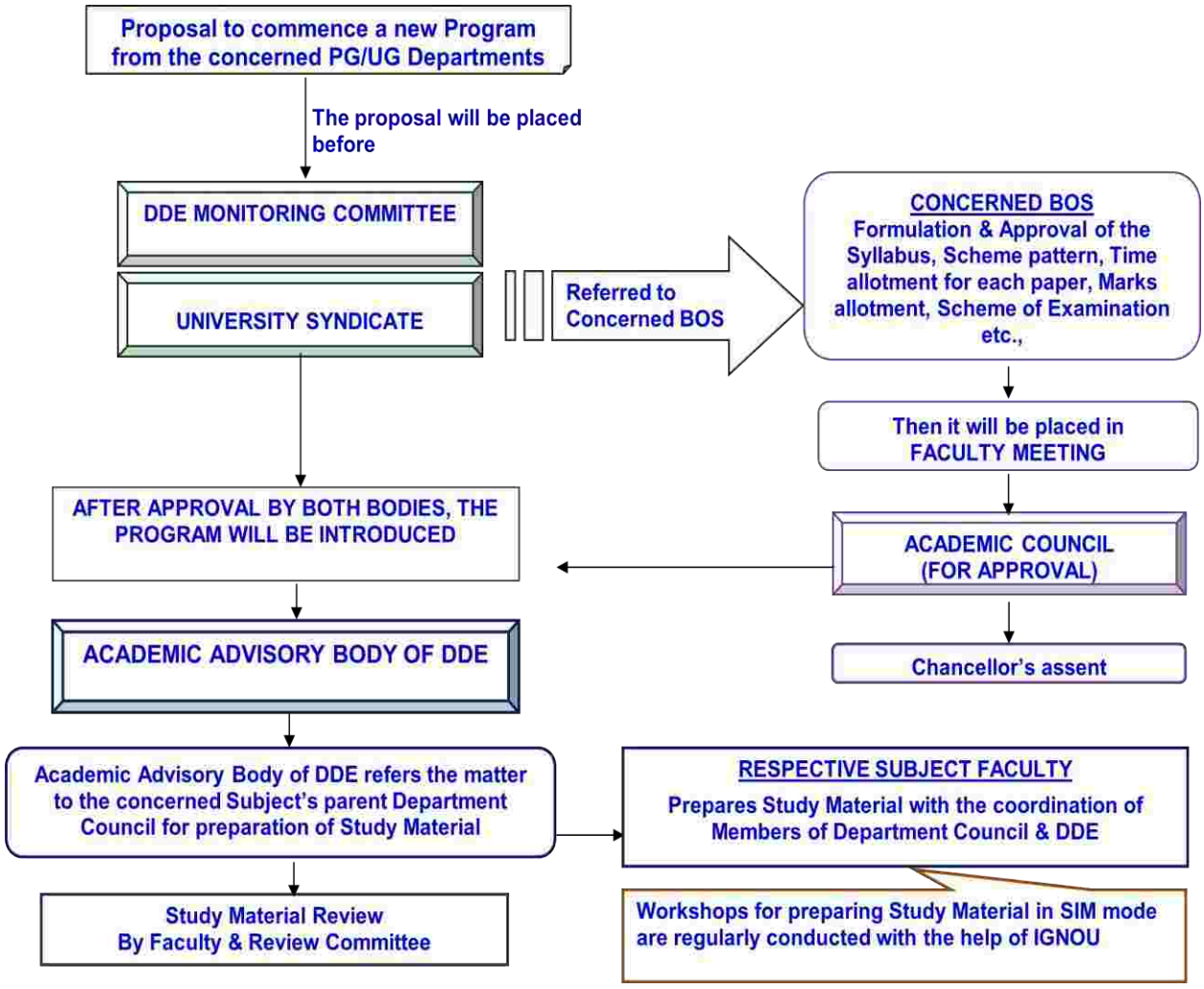
The decisions taken by the AAC are placed through the concerned bodies like, BOS/ Examination wing (for evaluation and certification issues) and finally placed before the Academic Council of the University for its approval.

For the internal quality assurance mechanism there is a Internal Quality Assurance Cell of the University.

(b) Programme Development and Approval Processes:

Proposal from the concerned PG/ UG department to commence a new Programme will be placed before Monitoring Committee of the DDE/ Syndicate. Then it will be referred to the BOS concerned for formulation and approval of the syllabus, programme structure, time allotment for each paper, marks allotment, scheme of examination etc., then it will be placed in the Faculty meeting and then Academic Council for its approval. After approval by both the bodies, the programme will be introduced. The Academic Advisory Body of DDE refers the matter to the concerned Subject's/ parent Department Council for preparation of Study Material. The concern subject Faculty will coordinate with the DDE and the Department Council, as he/ she is one of the member in it. Workshops for preparing Study Material in SLM mode are regularly conducted (with the help of IGNOU experts) and preparation of course material in SLM mode is in progress.

The various steps involved in programme development, approval and implementation are depicted in the flowchart given below.



(c) Programme Monitoring and Review

As a part of the regular monitoring mechanism, feedback from the Learners is obtained at the end of each of the face-to-face programmes - both through discussion and through written feedback form. Feedback form includes mainly three aspects – about appropriateness/ usefulness of learning (study) materials, effectiveness of orientation/ face-to-face programmes and internal assessments/continuous assessment process. Learner can give their opinion, suggestions and complaints, if any, through the feedback form. Issues raised in feedback are addressed at appropriate level.

There is also Student Support Service and Grievance Cell in DDE in order to address the day-to-day issues faced by the Learners. The Research and Teaching Assistants at DDE and the Coordinator in the concerned subjects are available for the learner support services. These apart, regular meetings of concerned faculty are conducted in order to plan the orientation and practical session's activity.

It is the policy of the KUDDE to make available the expert faculty of the PG Departments/ Colleges (for UG) and experts from the sister universities in the state who are regular faculty in the respective subjects for the ODL programmes. The same is followed for the Learner Support Centres (LSC). Programme delivery/academic activities at the LSC are also monitored from the Headquarter.

DDE is organise Coordinators Meet every year wherein all the issues related to ODL programmes – academic, examination, learners related and administration are discussed and remedial measures are considered under the ODL framework of the university. During the Meet academic activities/learners' issues at the LSC are also reviewed.

Annexure -01

M.Sc. PREVIOUS.

CORE SUBJECT: Course 1:MATHEMATICAL METHODS AND CLASSICAL MECHANICS:

UNIT-1COMPLEX VARIABLE: Functions of a complex variable, analyticity and Cauchy-Riemann relations. Conjugate and harmonic nature of the real and imaginary parts of an analytic function. Cauchy's- theorem and integral formulae, Tayler and Laurent's series, zero isolated singular points, simple pole, m th order pole, evaluation of residues- Cauchy residue theorem. The Cauchy principle value, Evaluation of different forms of definite integrals.

UNIT-2 SPECIAL FUNCTIONS: Beta &Gamma functions, Separation of the Helmoholtz and Poisson equations in spherical and cylindrical polar coordinates. Series solutions of the equations of Bessel, Legendre, Hermite and Laguerre. Some recurrence relations andorthogonality properties of these functions. A brief discussion of associated Legendre polynomials and Laguarre's polynomials, spherical harmonics.

UNIT-3 VECTOR ANALYSIS: Concept of Gradient, divergence and curl, Integration of Vectors- Line, Surface and volume integrals- Gauss's divergence theorem. Green's theorem and Stock's theorem- their application to hydrodynamics(Equation of continuity and Euler's equation). Orthogonal curvilinear Co-ordinates- Laplacian operator in Cylindrical polar and spherical polar co-ordinate.
25 hours(03 questions)

UNIT-4 MATRICES: Addition and multiplication of rectangular matrices. Equality and zero.Definition of the inverse of a non-singular matrix.Inversion of simple 2x2 and 3x3 non-singular matrices.Definitions of normal, Hermitian, Skew-Hermitian, Unitary, Symmetric, Skew-symmetric and Orthogonal matrices. The notion of eigen values and eigen vectors. Construction of the eigen values and eigen vectors of simple 2x2 and 3x3 matrices such as the Pauli matrices. Statement of the Cayley Hamilton theorem(no proof expected) Statement of the Schur theorem on triangularisation of arbitrary square matrices and diagonalisation of normal matrices. Explicit diagonalisation of some simple 2x2 and 3x3 real asymmetric matrices.

UNIT-5 TENSOR ANALYSIS: Cartesian tensors- Law of transformation of first and second order tensors. Additions, substraction and multiplication (inner and outer) of tensor. Symmetric and antisymmetric tensors- Quotient law of tensors. Tensor form of gradient, divergence and Curl.Kronecker tensor.

UNIT-6 Application of Tensor: Occurrence of tensors in Physics- Tensors in elasticity, Hook's law; strain and elastic constant tensor. Piezoelectric, polarisability and moment of inertia tensors. Symmetry and reduction in number of independent components of elastic constant tensor.

UNIT-7 INTEGRAL TRANSFORMS : A review of Fourier series, Fourier integral, Fourier transforms- definition, special form of Fourier integral and properties, convolution theorem involving Fourier transform- application of Fourier transforms, Laplace transform , convolution theorem involving Laplace transform- application of Laplace transforms.

25 hours (3 questions).

UNIT-8 CLASSICAL MECHANICS: Mechanics of a Particle & system of particles, D'Alembert's principle, Inertial frames, Galilean principle of relativity, Generalized co-ordinates. The principle of least action.Lagrange's equations of motion of the second kind.TheLagrangian for a system of interacting particles.The example of the simple pendulum. Conservation laws for energy and momentum. Centre of mass. Angular momentum and its conservation. Motion in a central field treated by the Lagrangian method. Application to Kepler problem and Rutherford scattering.

UNIT-9 Hamilton's equations.Poissonbrackets.Canonicaltransformations.A brief introduction to the Hamilton-Jacobi equations.Kepler's problems in angle variables.

25 hours(3 questions).

BOOKS FOR REFERENCE:

1. Mathematical Methods for Physicists- G. Arfken(Academic press 1968).
2. Vector Analysis- M. Speigel (Tata-McGraw Hill 1973).
3. Tensor Calculus- J.L. Synge and A. Schild(University of Toronto Press 1969),
4. The Rotation and Lorentz Groups and their representations for Physicists- K.N. SrinivasaRao (Wiley-Eastern, 1988).
5. Matrices- F.ayres Jr.(Tata-McGraw Hill, 1973).
6. Group Theory- M. Hamermesh (Addison-Wesley, 1964).
7. Applied Mathematics for Engineers and Physicists, L.A. Pipes, Harvil, McGraw Hill Publication
8. Introduction to Mathematical Physics- C. Harper. PrinticeHall .
9. The Mathematics of Physics and Chemistry- Murphy and Margenau.
10. Mathematical Physics, Satyaprakash, Sultan Chand & Sons, New Delhi, 1985.
11. Mechanics- L.D. Landau and E.M. Lifshitz.
12. Theoretical Physics- G. Joos.
13. Classical Mechanics – H. Goldstein, Addison wesley, 1980.
14. Introduction to classical mechanics-R.G. Takwale& P.S. Puranik, TMH ,New Delhi, 1983.
15. Classical Mechanics, N.C.Rana and P.S. Joag, TMH, 1991.

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CORE SUBJECT: Course 2: QUANTUM & STATISTICAL MECHANICS:

UNIT-1 Mathematical preliminaries : A brief review of finite and infinite dimensional vector spaces, linear operators over an n- dimensional vector space V_n, Matrix representation of a linear operator in a given basis of V_n, The algebra of linear operators, effect of change of basis, invariant subspace and the eigen value problem of the linear operator, inner product, examples- function spaces,

UNIT-2 Definition of Hilbert space, Hermitian and Unitary operator and matrices, Properties of the eigen value and eigen vectors of these operators, Theorem of commuting and common set of eigen vectors. Properties of the Dirac delta function.

UNIT-3 Fundamental Concept of Quantum Mechanics: Schrodinger equation, Born's interpretation of the wave function, normalization, superposition principle, qualitative discussion of a wave packet, Heisenberg position and momentum uncertainty relation. Postulates of quantum mechanics kets, bras and operators, matrix representations.

UNIT-4 Mathematical definition of an observable, commuting and non-commuting observable and uncertainty relations. Eigen values and expectation values of observable and their relations with measurements, reduction of state, Ehrenfest theorem, wave functions in position and momentum space.

One dimensional potential barriers: Finite potential barrier, tunneling resonance.

25 hours.(03 questions)

UNIT-5 Harmonic oscillator: Schrodinger equation and its solution in terms of Hermite polynomials. Energy basis and solution using creation and annihilation operators.Passage from one basis to another.Concept of zero-point energy.

Hydrogen atom: Reduction of the two-body problem, reduced mass of the electron, separation of variables. Solution of the Schrodinger equation,
Orbital angular momentum, communication relations, spherical harmonics as eigen states, parity, Energyeigen states, degeneracy.

UNIT-6 Spin:- Stern-Gerlach experiment spin of the electron. Eigen states of angular momentum operators. Addition of two angular momenta. Product coupled bases, singlet and triplet states of two electrons, identical particles, exchange degeneracy symmetric and antisymmetric states, Slater determinant, Pauli exclusion principle. A brief discussion of the Pauli wave mechanics.

UNIT-7 Approximation methods:- Time independent perturbation theory, First order perturbation for non-degenerate case, example of Zeeman effect. Variation method, ground state of Helium atom.

Time dependent perturbation theory: First order perturbation: mention of higher orders. periodic perturbation, Transition probability, Fermi Golden rule.
25 hours.(03 questions)

UNIT-8 STATISTICAL MECHANICS: Macroscopic and Microscopic states of a system. Systems of Identical particles.Criterion for distinguishability and indistinguishability.The postulate of equal a priory probability. phase space, Liouville theorem, ensemble, statistical equilibrium, Gibb's paradox , Sackur-Tetrode equation. Equilibrium energy distribution of fermions and bosons obtained by the elementary method of statistics. The distribution formula in differential notation.The Maxwell-Boltzmann tail of the quantum distribution formulae. The Maxwell distribution.

UNIT-9 Boltzmann equipartition theorem. Application to lattice specific heats- DulongandPetit's law Maxwell velocity distribution. Statistical interpretation of entropy.

Degenerate Bose gas.Bose condensation-application to Superfluidity.Plank's law of black body radiation.Degenerate Fermi gas.The specific heat of a Fermi gas at absolute zero.

25 hours(3 questions).

BOOKS FOR REFERENCE:

1. Quantum Mechanics- PAM Dirac.
2. Advanced Quantum Theory- T. Roman.
3. A text book of Quantum Mechanics- P.M. Mathews and K. Venkatesan. TMH, 1976.
4. Quantum Mechanics- V.K. Thankappan, Wiley Eastern, 1985.

5. Quantum Mechanics- E. Merzbacher.
6. Quantum Mechanics- A. Messiah.
7. Quantum Mechanics- A.S. Davydov.
8. Quantum Mechanics- L.D. London and E.M. Lifshitz.
9. Quantum Mechanics- L.I. Schiff, McGraw Hill publishers, 1955.
10. Quantum Mechanics- J.L. Powell & B. Crasemann, Addison wesley, 1961.
11. Introduction to Quantum Mechanics- L. Pauling & E.B. Wilson, McGraw Hill, 1935.
12. Introduction to Quantum Mechanics- Pitt. Dicke& J.P. Wittke.
13. Principles of Quantum Mechanics- R. Shankar, II Ed. 1984, Plenum ,NY.
14. Modern Quantum Mechanics J.J.Sakurai , Addison-wesley , 1999.
15. Quantum Mechanics- F. Schwabl, Narosa Publishing House, New Delhi.
16. Quantum Mechanics- B.K. Agarwal&Hariprakash ,PHI, New Delhi, 1997.
17. Statistical Mechanics- K. Huang, Wley Eastern Ltd., 1986.
18. Statistical Mechanics- L.D. Landau & E.M. Lifshitz.
19. Statistical Mechanics- B.K.Agarwal& M. Eisner, Wiley Eastern, 1989.
20. Statistical Mechanics and properties of matter – E.S.R. Gopal ,Macmillian, 1976.

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CORE SUBJECT: Course 3: SOLID STATE PHYSICS

UNIT-1 CRYSTAL STRUCTURE: Lattice points and space lattice, lattice transnational vector, basis and crystal structure, primitive and non-primitive cells, fundamental types of lattices, Miller indices, symmetry elements, concepts of point groups and space groups, examples of simple crystal structures.

UNIT-2 X-RAY DIFFRACTION: Scattering of x-rays by an electron, atom., atomic scattering factor. Geometrical structure factor. Laue conditions and Bragg's law, Brillouin Zones, Reciprocal lattice and its properties. Ewald's sphere and its construction.Systematic absences of lines in the case of cubic crystals.Structure factor calculations of NaCl, KCl and diamond.

UNIT-3 EXPERIMENTAL METHODS: Laue, Rotation and powder photographs.

CRYSTAL BINDING: Metallic, ionic, valence and Van der waal's types of binding.

MAGNETIC PROPERTIES OF SOLIDS: Classification, Diamagnetism and its origin, Langevin theory of diamagnetism, Paramagnetism, quantum theory of paramagnetism, Brillouin function. Ferro-magnetism.Weiss molecular field theory.

25 hour(03 questions)

UNIT-4 SUPERCONDUCTIVITY: Experimental facts. Phenomenological theory.Londonequations.Thermodynamics of superconductors.specific heat in superconducting stage.Qualitative ideas of theories of superconductivity.

DIELECTRIC PROPERTIES: Introduction, Review of basic formula, microscopic concepts of polarization Local electric field in solids, Clausius- Mosotti relation and Lorentz-Lorenz relation.

UNIT-5 FREE ELECTRON THEORY OF METALS: failures of classical theory. (Sommerfeld's simple model. Free electron gas. Density of energy states.Fermienergy.Average energy of electrons.Variation of Fermi energy and average energy with temperature.Electronic specific heat.Paramagnetism of free

electrons.Thermionic emission from metals. Electrical conductivity- simple model. Drift velocity and relaxation time. Thermal conductivity.Wiedemann Franz law. Hall effect.)

25 hour (03 questions)

UNIT-6 BAND THEORY OF SOLIDS: Elementary ideas of formation of energy bands. Bloch function. Kronig-penney model, number of states in a band ,Energy gap. Distinction between metals, insulators and intrinsic semiconductors.concept of holes, equation of motion for electrons and holes, effective mass of electrons and holes.

UNIT-7 SEMICONDUCTORS: Introduction to semi conductors, band structure of semi conductors, Intrinsic semiconductors, conductivity and temperature, statistics of electrons and holes in Intrinsic semiconductors, electrical conductivity.

UNIT-8 IMPERFECTIONS IN CRYSTALS: - Discovery and classification of imperfections, point defects – Frenkal&Schottky defects, concentration of point defects. Line defects; dislocation types , dislocation theory.

UNIT-9 CRYSTAL GROWTH: Solution methods, Czekrolski ,Bridgeman, melt and Zone refining techniques.

ELECTRON AND NEUTRON DIFFRACTION: Techniques and applications to the study of thin films and the crystal structure respectively.

25 hours(03 questions)

TEXT BOOKS:

1. Solid State Physics- A. J. Dekker, Macmillan India Ltd., Bangalore, 1981.
2. Solid State Physics- C. Kittel, V Ed., Wiley Eastern Ltd., 1976.
3. Elementary Solid state physics,- M.A. Omar, Addissonwesley, New Delhi,2000.
4. Solid state Physics- S.O. Pillai. New age international publication. – 2002.
5. Solid state Physics- M.A. Wahab, Narosa publishing house, New Delhi.- 1999.

BOOKS FOR REFERENCE:

1. Modern theory of Solids- Seitz.
2. Semiconductors Devices-Physics and Technology- S.M. Sze.
3. Introduction to Solids – L. Azoroff.
4. Solid State Physics- H.C. Gupta- Vikas publishing house, New Delhi.-2002.

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CORE SUBJECT: Course 4:ELECTRONICS:

UNIT-1 NETWORK ANALYSIS: Method of solving networks. Mesh current and node voltage equations. Transfer and driving point impedance and admittance.Thevenin's and Norton's theorem and its applications. Maximum power transfer theorem. Network topology.Tie-set and Cut-set matrices.Transformation of matrices. Two port networks, Π and T equivalents. Laplace transformation techniques for network analysis.

UNIT-2 FILTERS: Types of filters, Conditions for pass band and stop band. Low, high and band pass filters ((Π and T sections), Characteristic impedance. constant K type and M-derived filters, applications, Active filters, advantages of active filters over passive filters.

UNIT-3 TRANSMISSION LINES: Propagation of voltage and current on the lines, line attenuation, characteristic impedance. Reflection coefficient, standing wave ratio, Infinite, short-circuited and open- circuited lines. Transmission line as a circuit element.impedance matching.

25 hours (03 questions).

UNIT-4 DEVICES AND CHARACTERISTICS: Junction diodes. Zenerdiodes.Tunneldiodes.Transistors., FET, MOSFET, UJT, SCR, photo- diodes, Opto-isolators, Regulated power supplies: series and shunt regulators, current regulators.

UNIT-5 Transistor amplifiers: Frequency response, CE, CB and CC amplifiers- biasing methods-comparison of the three basic configurations- multistage amplifiers, methods of coupling (qualitative)

UNIT-6 Transistor Oscillators: Feedback requirements, criteria for oscillations, basic feedback equation, phase shifts oscillator, Wien bridge oscillator, Hartley and colpitts oscillator. Multivibrators: Astable, monostable and bistablemultivibrators.

25 hours (03 questions).

UNIT-7 Operational amplifiers: Ideal op-amp characteristics, inverting and non inverving amplifiers, input and output impedance, CMRR, PSRR closed loop gain, adder and substractor circuits, voltage followers, differential amplifier ,differentiator and integrator, First order low pass and high pass filters- Op amp oscillators- Wien bridge and phase shift oscillators.

UNIT-8 Digital electronics: Number systems and codes: Binary, hexadecimal and octal, BCD, Grey codes and Excess-3 codes, Logic gates : AND , OR , NOR, NOT, NAND, XOR gates, truth tables,

UNIT-9 De-Morgan's theorems, Boolean algebra, Boolean functions, Simplification of Boolean functions using Karnaugh maps, arithmetic circuits, HALF ADDER, FULL ADDER, Flip-flops, counters. 25 hours (03 questions)

BOOKS FOR REFERENCE:

1. Linear Circuits - part-II – P.E. Scott.
2. Modern network analysis- E.M. Reza and S. Seely.
3. Networks, Lines and Fields- J.D. Ryder.
4. Theory of A.C. Circuits- S. Fich and J.L. Patter.
5. Operational amplifiers- S.V. Subramanyam.
6. Transistor circuit- Analysis and Design – F.C. fitchen Van Wostrand (Reinhold Co., 1966).
7. Electronics fundamentals and applications ,- J.D. Ryder, PHI, 1981.
8. Network analysis (III Ed.)- Van valkenberg, PHI 1990.
9. Electronic Circuits- Millman and Halkias.
10. Electronic principles- A.P. Malvino, TMH, 1983.

11. Digital principles and applications- A.P. Malvino and Leach., TMH, 1979.
12. Operational amplifier and linear integrated circuits- R.A. Gaekwad, PHI, 1991.
13. Introduction to semi conductors devices: M.S. Tyagi.

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M.SC. FINAL

CORE SUBJECT:
Course5: ELECTRODYNAMICS, OPTICS AND MOLECULAR SPECTROSCOPY:

UNIT-1 ELECTRODYNAMICS:-ELECTROSTATICS;Coulomb'slaw.Electrostatic field intensity, Electrostatic potential.Equations of Poisson and Laplace. Electrostatic potential due to an arbitrary charge distribution (dipole and quadruple moments). Multipole moments.

UNIT-2 MAGNETOSTATICS: Magnetic forces. Biot –Savart law. Lorentz force. Amperes circuital law.Magnetic scalar potential.Magnetic dipole moment of a current loop.

Maxwell's field equations and material equations(setting up) E-H symmetry. Lorentz lemma.Wave equation. Propagation of plane electromagnetic wave in free space.nature of the plane wave.Poynting vector. Propagation of plane waves in a conducting medium. propagation of plane wave in Ionised gases. Conductivity of ionisedgases.Plasma angular frequency.

UNIT-3 Electromagnetic potentials Scalar and vector potentials.Lorentz condition. Gauge transformations of the potentials. Lorentz and solenoidal gauge conditions.Wave equation for scalar and vector potentials and their retarded solutions.Radiation from an electric and magnetic dipole.Fields of moving charges.Lienardwiechertpotentials.Radiation from an accelerated charge at high velocities.

25 hours(03 questions)

UNIT-4 OPTICS:-REFLECTION AND REFRACTIONS: Boundary conditions at a surface of discontinuity (no derivation). Laws of reflection and refraction.Fresnel's formulae for reflection and refraction.Graphicaldiscussion.Polarization by reflection.Brewster'slaw.Total internal reflection.Fresnel's Rhomb.

ELECTROMAGNETIC THEORY OF DISPERSION.Lorentz-Lorentz relation.Normal and anomalous dispersion.Sellmeir-Drudefromula.Complex refractive index.

INTERFERENCE: General theory of interference of two monochromatic waves. Multiple beam interference with plane parallel plate.Fabry-perotinterferometer.Resolving power.

DIFRACTION: General formulation of Kirchhoff's theory of diffraction. Fraunhofer and Fresnel diffraction at a circular aperture.

UNIT-5 PROPAGATION OF ELECTROMAGNETIC WAVES IN AN ISOTROPIC MEDIUM:

Structure of the plane waves in an anisotropic medium. Wave surface, wave velocity surface and ray velocity surface. Dielectric and index tensors. Solution of wave propagation (Geometrical method) using index ellipsoid Fresnel's equation for normal. Optical

classification of crystals, Light propagation in uniaxial and biaxial crystals.Interference with crystal plates. Interference figures in uniaxial crystals. Pattern in biaxial crystals.

UNIT-6 LASERS:- General considerations and properties of laser radiation Rate equations and principles of laser. Ruby He-Ne &Nd-YAG lasers.Elements of non-linear optics.Opticalrectification.Second harmonic generation.frequencymixing.Applications of laser in spectroscopy & Holography (Principle and applications).

25 hours (03 questions).

UNIT- 7 MOLECULAR SPECTROSCOPY:

ELECTRONIC SPECTROSCOPY: Electronic spectra of diatomic molecules. P.O & R branches.Rotational fine structure.Band head and shading.Fortrat diagram evaluation of I, r and Band origin. Dissociated energy.Isotope shift, Franck- Condon principle and parabola.Electronic spectra of polyatomic molecules.

UNIT-8 PHOTOELECTRON SPECTRA: Basic principles. Outline of experimental method. Application to the determination of Ionization potential. Mossbauer spectroscopy-Principles, instrumentation. Isomer shift and biological applications.

SPIN RESONANCE SPECTROSCOPY: Spin and applied field resonance condition. Relaxation processes. NMR spectroscopy. Outline of chemical shift and spin-spin interaction. Block diagram of NMR spectrometer .Structural determination. NMR imaging.

UNIT-9 ESR SPECTROSCOPY: Systems of unpaired electrons. G-factor.Fine structure and hyperfine structure. Block diagram of ESR spectrometer. spin labeling of molecules.

RAMAN SPECTROSCOPY: Rotational and vibrational Raman spectra. Correlation with IR spectra. Polarization of Raman lines. Molecular structure. Laser Raman spectroscopy and its applications (qualitative).

25 hours (03 questions)

BOOKS FOR REFERENCE:

1. Electromagnetic fields and waves- D. Corson and P. Lorrain, CBS publishers, 1986.
2. Classical Electrodynamics- J.D. jackson, Wiley Eastern Ltd., 1983.
3. Electrodynamics- Sommerfeld.
4. Electromagnetic theory- Panofsky and Phillips.
5. Optics-Max Born.
6. Geometrical and Physicsl Optics- Longhurst.
7. Optics- A. Ghatak, TMH, 1977.
8. Light- Ditchburn.
9. Laser Physics- L.V. Tarasov.
10. Lasers and their applications- M. Beesley.
11. Optics and Lasers- Young.
12. Fundamentals of Molecular spectroscopy- C.N. Banwell, TMH, 1984.
13. Basic principles of spectroscopy- Chang.
14. Spectroscopy – S.Walker&B.P.Straugan, vol.,1,2,3, Chapman & Hall, 1976.
15. Introduction to electrodynamics- D.J. Griffiths, PHI, 1991.
16. Electromagnetics- B.B. Laud.
17. Optics- Matveev.

18. Lasers and Nonlinear optics(II ed) - B.B. Laud, Wiley Eastern.
19. Elements of Spectroscopy- by Gupta and Kumar.,PragathiPrakashan, 1984.

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CORE SUBJECT:
Course 6:NUCLEAR PHYSICS, COSMIC RAYS AND ELEMENTARY PARTICLES.

UNIT-1 PROPERTIES OF THE NUCLEUS:

Nuclear radius. Determination by – alpha decay, mirror nuclei, mesic x-rays, electron scattering and nuclear scattering methods. Nuclear moments: Spin, electric and magnetic moments. Relation between J and on the basis of single particle model. Determination of nuclear spin by molecular beam experiment. Anomalous magnetic moment of the neutron, experimental determination. Parity, Isospin and statistics.

UNIT-2 PASSAGE OF CHARGED PARTICLES AND GAMMA RAYS THROUGH MATTER:

Energy loss due to ionization for proton and the charged particles and electrons. Range energy relations. Radiation loss of the fast electrons. External and Internal bremsstrahlung, (Interaction of gamma rays with matter, Photo effect, Compton effect, pair production.).

DETECTORS: Gas filled counters, scintillation counters, cerenkov counter, nuclear emulsions.

UNIT-3 PARTICLE ACCELERATORS: Microtron, Betatron, Betatron oscillation in cyclic accelerators. Electron and proton synchrotron. AG accelerators storage rings.

NUCLEAR REACTIONS: Relativistic and non-relativistic kinematics Lab and C.M. systems. Transformation of energy, momentum, angles solid angle, etc., from one system to another. Q-values, experimental determination. Threshold for the creation of new particles, types of reactions. Nuclear cross section. Total and differential. Relation between cross section and mean free path.

25 hours(03 questions).

UNIT-4 (**NUCLEAR DECAY:** ↦ -ray spectra, Fine structure and long range ↦ - particles. Geiger-Nuttallaw.Theory of ↦ - decay.↕- decay spectrum.Neutrino hypothesis. Fermi theory of↕- decay , neutrino mass from ↕ - ray spectral shape, Curie plot, ft-values and forbidden transitions. Theory of K-electron capture Neutrinos. Double ↕- decay) anti-neutrino, helicity, interaction cross section. Methods of excitation of nuclei, multipole transitions and internal conversion(Qualitative treatment only) Nuclear Isomerism, Islands of isomerism. Resonance scattering of gamma rays. Mossbauer effect. Mass of the photon.Atomic phenomena following electron capture and internal conversion.characteristic x- rays.Auger effect. Fluorescence yields.

UNIT-5 NUCLEAR FORCES: General features of nuclear forces. Spin dependence. Charge independence. Exchange character, etc., Meson theory of nuclear forces(Yukawa's theory only). Qualitative explanation of anomalous magnetic moments of neutron.

NUCLEAR MODELS: Liquid drop model, semi empirical mass formula Its applications to: (1) stability of isobars (2) fission process. Shell model. Single particle potentials.Spin orbit coupling

& level scheme. The Fermi gas model, Estimation of well depth. Level density.Nuclearevaporation.Effect of Fermi momentum in particle production.

25hours (03 questions).

UNIT-6 REACTOR PHYSICS: Slowing down of neutrons. Moderators, condition for controlled chain reactions in a homogeneous reactor, critical size, effect of reflector, Breeder reactor

UNIT-7 COSMIC RAYS: Primary cosmic rays. Origin, composition and energy spectrum.Fermi mechanism of acceleration.cosmicray showers: types of showers and their experimental study. Elements of cascade theory.geomagneticeffects.Motion of a charged particle in earth's magnetic field.Latitude, altitude and azimuthal effects.Stormer's cone. Van Allen belts.

UNIT-8 ELEMENTARY PARTICLES: Discovery and properties. Antiparticles production and decay kinematics. Outline of methods of determining mass, spin and life time.Fast production and slow decay, T-$\hbar$ puzzle, Strange particles.Gell-Mann and Nishijimascheme.Non-conservation of parity in decay interactions.Experiments with Co-60.

UNIT-9 classification of elementary particles and their interactions.Hyper nuclei, neutral kaons and their mixed strangeness.Mesic atoms, Muon catalysis, electron and muon neutrinos, neutrino astronomy.Resonance particles, symmetry in particles interactions.Eight-fold way, Quarks. 25 hours (3 questions).

BOOKS FOR REFERENCES

1. Introductory Nuclear Physics- Halliday.
2. Nuclear Physics-Green.
3. Nuclear Physics-Kaplan.
4. Introduction to Nuclear Physics-Enge., H. Addison-Wesley Ltd., NY 1971.
5. Nuclei and Particles- Segre.
6. The atomic nucleus-Evans. R.
7. Cosmic ray and Nuclear Physics- Janossy.
8. High Energy particles- Rosei.
9. Modern Physics- Leighton.
10. Cosmic rays- Wilson.
11. The fundamental particles- C.E. Swartz.
12. The study of elementary particles by the photographic method. C.F. Powell, P.H. Fowler and d.H. Perkins.
13. Elementary particles- C.N. Yanga.
14. Elementary particles- Thorndike and Frisch.
15. Fundamental particles- K. Nishijima.
16. Nuclear Radiation detectors- S.S. Kapoor&V.S.Ramamurthy, Wiley Eastern, New Delhi, 1986.
17. The Atomic Nucleus - Evans R.D. TMH, 1955.
18. Nuclear Physics - I. Kaplan
19. Nuclear Physics -Halliday.
20. Introduction to elementary particles- D. Griffiths- John Wiley. 1987.
21. Nuclear Physics- R.R. Roy & B.P. Nigam, Wiley Eastern Ltd., 1983.

22. Introductory Nuclear Physics- Kenneth S. Krane- John Wiley & Sons, 1987.

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Course 7:- SPECIAL SUBJECT: SOLID STATE PHYSICS-I:

UNIT-1 Lattice dynamics:- Introduction, dynamics of the chain of identical atoms, Dynamics of diatomic linear chain, dynamics of identical atoms in three dimensions, experimental measurement of dispersion relation, Anhormonicity and thermal expansion.

Transport properties:-

UNIT-2 Electrical conductivity of metals: Simple model, ideas of drift velocity and relaxation time. Boltzmann transport equation, Sommerfeld theory of electrical conductivity. Temperature dependence of resistivity of metals at high, low and at very low temperatures.electron- phonon collision, Matthiesson's rule, residual resistivity, Hall effect, electronic specific heat.

UNIT-3 Thermal conductivity of Insulators and Metals:-Phonon-Phonon interactions- Normal and umklapp process, Thermal conductivity of insulators at high and low temperatures. Effect of impurities and imperfections on the thermal conductivity. Effect of finite size of the specimen Derivation of the expression for thermal conductivity of metals. comparison of (i) thermal conductivity of metals due to electrons and phonons and (ii) Thermal conductivity of metals and dielectrics.

25 hours (03 questions).

UNIT-4 Dielectric Prperties: Macroscopic snd microscopic views of dielectric response, complexdielectrics constant & dielectric losses, dielectric relaxation in solids, Debye equations, electronic , ionic and orientation polarisabilities. PolarisationCatastrophe,.The classical theory of electronic polarization and optical absorption. Experimental determination of dielectricconstant and relaxation time

UNIT-5 Ferroelectrics: - General properties, classifications and properties, dipole theory of ferroelectricity, objections against the dipole theory, ionic displacements and the behaviour of Barium Titanate above the curie temperature, theory of spontaneous polarisation of Barium Titanate, Thermodynamics of ferroelectrics, ferroelectric domains, Antiferroelectricity and Ferrielectricity.

UNIT-6 Luminescence: General remarks, excitation & emission, Franck- Condon principle, Decay mechanisms, temperature dependent & independent decays. Thermoluminescence and glow curve Electro luminescence, Gudden- Pohl effect, theDestrian effect. carrier injection luminescence.

25 hours(3 questions)

Ionic conductivity :- Lattice defects in ionic crystals, the hydration energy of ions, The activation energy for the formation of defects in ionic crystals, Ionic conductivity in pure and with divalent impurity alkali halides.

UNIT-7 Atomic Diffusion in solids ;- First and second Fick's law. Solution to the Fick's second law. Some applications of diffusions, diffusion measurements, Random walk treatment of

diffusion, The Kirkendall effect, diffusion in alkali halides, diffusion and ionic conductivity, Nernst –Einstein .

UNIT-8 Optical Properties of materials:- Absorption processes, photo conductivity, photo conductivity in crystals containing excess metal, photo electric effect, photo electric effect in alkali halides.

UNIT-9 photovoltaic effect, colour centers: types of colour centers, other electronic centers, transformation of F centers into F^1 centers and vice-versa. Colour centers resulting from excess halogen, colour centers produced by irradiation with x-rays.

25 hours(03 questions)

TEXT BOOKS:

1. Charles Kittel, Introduction to solids state Physics, Wiley, 5thedition(1976).
2. A.J. Dekker, solid state Physics, Macmillan India . Ltd., Bangalore ,1981.
3. M.A. Omar, Elementary solid state Physics- Addison- Wesley, 2000.
4. H.C. Gupta,' Solid state Physics' Vikars publishing house, New Delhi, 2001.
5. S.O. Pillai, solid state Physics, V edition, New age international publishers, 2002

BOOKS FOR REFERENCE:

1. S. Mrowec, Defects and diffusion in solids- an introduction ,Elseviewr Scientific (1980).
2. J.P. Poirier, Physics of defects, North Holland(1980).
3. A.M. Stoneham, Theory of defects in solids , Oxford University Press(1985).
4. J.S. Blakemore, Solid state Physics, II edition, Cambridge University Press, (1974).
5. M.A. Wahab , Solids state Physics, Narosa Publishing house, New Delhi 1999.

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Course 8: SPECIAL PAPER:SOLID STATE PHYSICS- II

UNIT-1 Magnetic properties of solids:

Ferromagnetism:- Weiss theory, spontaneous magnetisation and its variation with temperature, Heisenberg exchange interaction, ferromagnetic domains, domain theory,Spin waves in one dimension, quantisation of spin waves, thermal excitation of magnons, Bloch's T3/2 law **.**

UNIT-2 Antiferromagnetism ; two sublattice model, Neel temperature, susceptibility, Neutron diffraction. **Ferrimagnetism:** structure of ferrite, saturation magnetisation, elements of Neel's theory.

UNIT-3 Paramagnetic relaxation: Phenomenological description, complex susceptibility, casimir and Dupre'sthermodynamical theory of spin lattice relaxation, spin-spin relaxation, magnetic resonance (ESR & NMR). Bloch equations and their steady solutions, line width, ESR and NMR experiments.

UNIT-4 Superfluidity: Permanent liquids, the melting curve, liquid ^{3}He and liquid ^{4}He., liquid ^{3}He; specific heat susceptibility, transport co-efficient, perfect Fermi gas , liquid ^{3}He as a Fermi gas, properties of , liquid ^{3}He zero sound, solutions of ^{3}He in liquid ^{4}He, the melting curve.

25 hours (03 questions)

UNIT-5 Impurity Semiconductors: Carrier concentration, effect of temperature and impurity concentrations on the carrier concentrations, electrical neutrality condition, Fermi energy, variation of Fermi energy with temperature and impurity density. Effect of impurity density and temperature on Fermi energy at very low temperature, mobility of current carries,

Effect of temperature and doping on mobility, electrical conductivity, variation of electrical conductivity with respect to band gap. Impurity band conductivity.

UNIT-6 Hall effect in Intrinsic and extrinsic semiconductors:

Expression for Hall coefficient in terms of mobility and carrier densities, Hall mobility and Hall factor: Effect of temperature, impurity concentration and magnetic field on Hall mobility. Magneto- resistance phenomenon(qualitative).

Excess carriers in semiconductors: Generation and recombination rates, transport behaviour of excess carriers, continuity equation for excess carriers, Einstein's equations, expression for the diffusion length.

25 hours (03 Questions)

UNIT-7 High field transport :- Expression for drift velocity and electron temperature, Gunn effect space charge domains, expression for the space charge density, super lattice and Bloch oscillators.

Metal- Semiconductor contacts.Schottky barrier, P-N junctions: theory of carrier transport in P-n junctions, characteristics of potential junctions and deviations from ideality. Capacitance effects: Space charge and diffusion capacitance. Impurity profiling through capacitance measurements.TunnelandZener diode and applications.

UNIT-8 Photo conductivity: Role of traps and recombination. Photo voltaic devices for solar cells and radiation detection. Luminescence; light emitting diodes and laser action in P-n junction diodes.

UNIT-9 Superconductivity: Type –I & Type-II super conductors, superconductor in AC fields, BCS theory, flux quantisation. Quantum tunneling, Josephson's junction, theory of DC and AC Josephson effect, High T_C superconductors, applications of super conductors.

25 hours (03 questions)

TEXT BOOKS:

1. Charles Kittel, Introduction to solids state Physics, Wiley, 5thedition(1976).
2. A.J. Dekker, solid state Physics, Macmillan India Ltd, Bangalore, 1981.
3. M.A. Omar, Elementary solid state Physics- Addison- Wesley, New Delhi, 2000.
4. H.C. Gupta,' Solid state Physics' Vikars publishing house, New Delhi, 2001.
5. S.O. Pillai, solid state Physics, V edition, New age international publishers, 2002

BOOKS FOR REFERENCE:

1. S. Mrowec, Defects and diffusion in solids- an introduction ,Elseviewr Scientific (1980).
2. J.P. Poinier, Physics of defects, North Holland(1980).
3. A.M. Stonecham, Theory of defects in solids , Oxford University Press(1985).
4. J.S. Blakemore, Solid state Physics, II edition, Cambridge University Press, (1974).
5. Solid State and semiconductor Physics, II edition, J.P. Mckelvey, 1966, Harper & Row, NY.
6. Physics of semiconductor devices, Dilip K. Roy, University Press, 1992, Hyderabad.

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Annexure 2

General Physics Lab

Experiments list	Apparatus in the lab
1.Michelson Interferometer:	Michelson Interferometer, Sodium vapour lamp, Transformer (55W).
2.Fabry-Perot Etalon	Fabry-Perot interferometer, Sodium vapour lamp, transformer (55W), Lens
3.Verification of Brewster's law	Sodium vapour lamp, Transformer (55W), Spectrometer, Prism
4.Determination of size of particle of lycopodium powder:	Sodium vapour lamp, transformer (55W), eriometer, glass plate dusted with lycopodium powder, lens, meter scale.
5.Birefringence of mica:	a sheet of known thickness, two polaroids, quarter wave plate, laser light
6.Fresnel's law	Sodium vapour lamp, transformer (55W), prism, spectrometer, polaroids
7.Franck-Hertz Experiment:	Franck –Hertz set up.
8.Measurement of grating constant by using He-Ne laser	He-Ne laser, transmission grating, meter scale
9.Law of intermediate metals by thermo EMF analyser	Thermo EMF analyser, thermometer, standard thermo emf chart, thermocouple
10.Law of Malus	pair of polaroids, photo voltaic cell, digital nano ammeter, laser source
11.Determination of Planck's constant using spectrometer	Spectrometer, digital nano ammeter, prism, photovoltaic cell, power supply
12.Diffraction at a single slit	Spetrometer, a single slit with adjustable slit width, travelling microscope, sodium source, transformer (55W).
13.Birefringence of mica using Babinet compensator	Pair of polaroids, mica sheet of known thickness, babinet compensator, sodium and mercury source, transformer.
14.Determination of wavelength of He-Ne Laser	He-Ne Laser, reflection grating, meter scale
15.Determination of Stefan's constant	Stefan's constant kit, black body (copper plate), thermometers
16.Study of elliptically polarized light	Laser source, Polaroids, quarter wave plate, photovoltaic cell, digital nano ammeter.

Annexure 3

Electronics Lab

Experiments list	Apparatus in the lab
1. Op-amp characteristics : **Aim:** To study the op-amp in its differential mode and common mode and to determine CMRR and Slew Rate.	CRO, AFO, dual power supply (5V and 9V), IC-741, Resistor: 1kΩ, 10kΩ, bread board, connecting wires.
2. **Op-amp as Integrator :** **Aim:** To design and construct the practical integrator and to study its performance using IC-74	CRO, AFO, dual power supply (5V and 9V), IC-741, Resistor: 1.5kΩ, 180Ω, capacitor: 0.1μF, 0.01μF, bread board, connecting wires.
3.Op-amp as Differentiator : **Aim:** To design and construct the practical differentiator and to study its performance using IC-741.	CRO, AFO, dual power supply (5V and 9V), IC-741, Resistor: 1.5kΩ, 180Ω, capacitor: 0.1μF, 0.01μF, bread board, connecting wires.
4.Op-amp as Voltage comparator : **Aim:** To design and verify op-amp as voltage comparator using IC-741	Dual power supply (5V and 9V),2 variable power supply(0-15V) IC-741, Resistor: 1kΩ, 2 LED's, bread board, connecting wires.
5.Schmitt trigger using IC-741: **Aim:** To design and construct Schmitt trigger using IC-741 and to find its duty cycle.	CRO, dual power supply (5V and 9V), IC-741, Resistor: 1kΩ, 10kΩ, bread board, connecting wires.
6.Second order low pass filter using IC 741: **Aim:** To design and construct second order low pass filter using IC-741 and study its performance.	CRO, AFO, dual power supply (5V and 9V), IC-741, Resistor: 10kΩ, 1kΩ , bread board, connecting wires.
7.Second order high pass filter using IC 741: **Aim:** To design and construct second order low pass filter using IC-741 and study its performance.	CRO, AFO, dual power supply (5V and 9V), IC-741, Resistor: 10kΩ, 1kΩ , bread board, connecting wires.
8.Logic gates: **Aim:** To study the performance of basic gates.	Digital logic kit
9.Universal gates: **Aim:** To study the performance of universal gates and realization of basic gates using universal gates.	Digital logic kit
10.Boolean expression: **Aim:** To simplify the given Boolean expressions and to construct logic circuit.	Digital logic kit
11.Adder and subtractor : **Aim:** To construct adder and subtractor circuit and verification of truth table.	Digital logic kit

Annexure 4

Nuclear Physics, optics & molecular spectroscopy Experiments list:

Experiments list	Apparatus in the lab
1. Characteristics of GM counter: To study the characteristics of GM counter and to determine the operating voltage.	G M counter, Radioactive source (Beta or Gamma source).
2. **Verification of Inverse Square Law**: To verify inverse square law.	G M counter, Radioactive source (Beta or Gamma source).
3. Linear absorption coefficient of Beta particle: To study the intensity of beta rays as they pass through different thickness of aluminium foils and to determine the linear absorption coefficient.	G M counter, radioactive source holder, aluminium foil, radioactive source (Beta source).
4. Linear absorption coefficient of Gamma particles: To study the intensity of gamma rays as they pass through different thickness of lead foils and to determine the linear absorption coefficient	G M counter, radioactive source holder, lead foils, radioactive source (gamma source).
5. Randomcity of nuclear decay: To determine the random nature of radioactive decay using G M counter.	G M counter, Radioactive source (Beta or Gamma source).
6. Z-dependence of Beta absorption coefficient: To determine the linear absorption coefficient and to study their dependence on the Z-value of adsorbing material.	G M counter, beta source, Aluminium, copper, silver absorber of different thickness.
7. Dead time of GM tube using double source method: To study the dead time of the G M tube using double source method.	G M counter, gamma source (cobalt).
8. Calibration of Constant Deviation spectrometer (CDS):	CDS, Sodium vapour lamp, transformer (55W), mercury source, constant deviation prism.
9. Absorption coefficient of a solution using photovoltaic cell	Sodium vapour lamp, transformer (55W), convex lens, graduated glass tube, photovoltaic cell, $K_2Cr_2O_7$ solution, $CuSO_4$ solution, $KMnO_4$solution
10. Absorption spectra of iodine vapour using CDS	CDS, sodiumvapour lamp, transformer (55W), constant deviation prism, incandescent lamp, heater, iodine granules, conical flask, stand.
11. Electron spin resonance	ESR spectrometer, RF Oscillator, CRO

Annexure 5

Solid state Physics Experiments list:

Experiments list	Apparatus in the lab
1. **Energy gap of a semiconductor:** To determine the Energy gap of a given semiconductor using four probe method	Semiconductor sample, power supply, Heating oven with four probe set up Ammeter voltmeter.
2. **XRD Analysis:** To determine thelattice constant of the given XRD photographic film sample by using nomogram and matrix method	XRD Photographic film, Standard vernier callipers, table lamp.
3. Dielectric constant: To determine the Dielectric constant and curie temperature of the given ferroelectric material.	Ferroelectric Sample, LCR meter, Heating bath, Dimmerstat, Digital temperature detector, screw guage.
4. Fermi energy of copper: To determine the Fermi energy of the given metal sample and to determine Fermi velocity, Fermi temperature, mobility of the sample.	Standard Metal sample wire, screw guage, heating bath, power supply, Digital multimetre.
5. Determination of IR LED wavelength: To determine the unknown wavelength of the given IRLED By using known LED wavelength	LED s of known wavelength, IRLED of unknown wavelength, powersupply, ammeter voltmeter.
6. Hall Effect: To determine the hall voltage, hall current, mobility of the Charge carriers in the given semiconducting sample using hall effect set up.	Semiconductor sample, hall effect set up, power supply, electromagnets, constant current source.
7. Reverse saturation current: To determine the Reverse saturation current and energy gap of the given diode	Diode, milliammeter, millivoltmeter, power supply, heating bath, digital temperature detector.
8. Activation energy: To determine the Energy gap and activation energy of a given semiconductor.	Standard Semiconductor sample, Thermometer, power supply, milliammeter, heating bath.
9. Solar cell: To study the Areal characteristics, powerload, voltage current, and intensity current characteristics of the given solar panel.	Standard solar panel, milliammeter, voltmeter, table lamp, power supply, digital multimeter, dimmerstat.
10. **Photoelectric Effect:** To Determination of Work function of the given metal by using filters and using the principle of photoelectric effect.	Standard metal sample, light source, colour filters, milliammeter, voltmeter, rheostat, powersupply,
11. Childs 3/2 power law: To Verify the Childs 3/2 power law using given diode valve	Diode valve, DC regulated power supply, battery, Milliammeter, voltmeter.
12. Temperature dependence of hall	Semiconductor sample, Four probe set up, milli

coefficient: To determine the temperature dependence of Hall coefficient of given semiconductor.	ammeter, millivoltmeter, temperature detector, current source, Electromagnets
13. Quinke's method: To determine the Succeptibility of the given ferromagnetic substance using Quinke's method	Ferromagnetic substance, Quinke's tube, Electromagnets, Power supply, Gauss meter, travelling microscope,
14. Dependence of concentration of succeptibility: To determine the concentration dependence of ferromagnetic substance using Quinke's method	Ferromagnetic substance, Quinke's tube, Electromagnets, Power supply, Gauss meter, travelling microscope, weighing balance
15. Forward bias: To determine the energy gap, forward bias current of the given pn junction diode under forward bias	Pn junction diode, DC regulated power supply, heating bath, rheostat, digital multimeter, milliammeter, voltmeter.