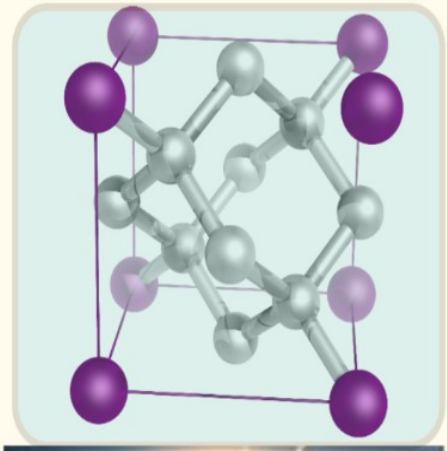
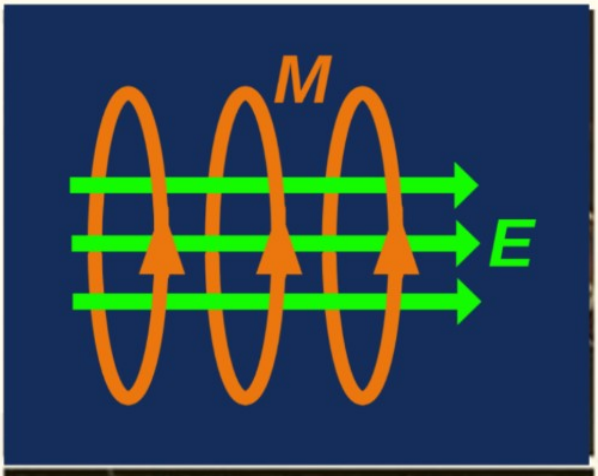
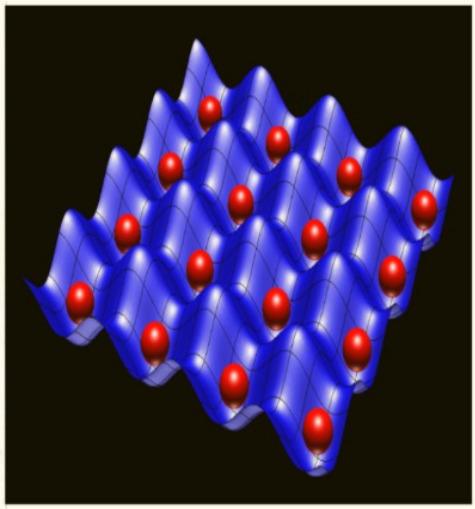
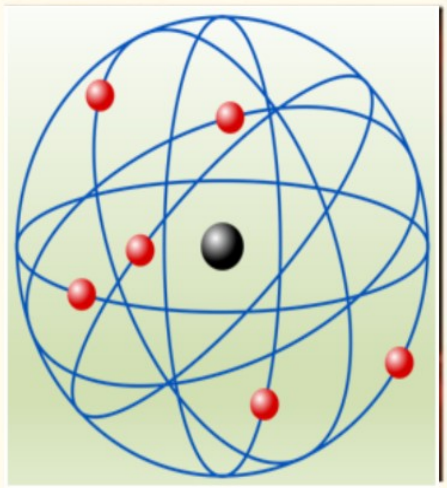
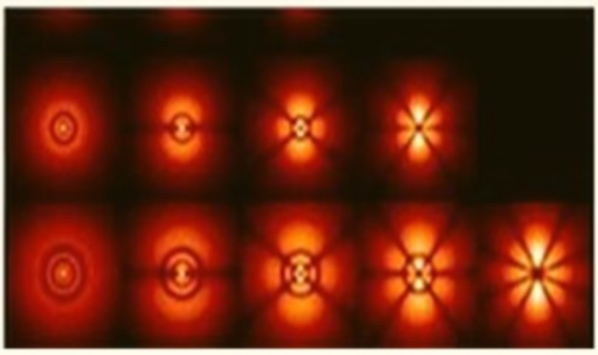
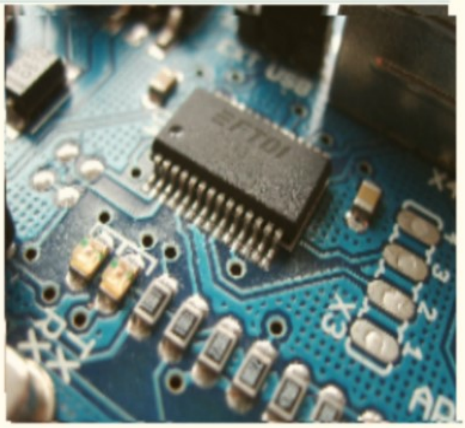
PROGRAMME GUIDE
M. Sc. (PHYSICS)
(MSCPH)





SCHOOL OF SCIENCES

INDIRA GANDHI NATIONAL OPEN UNIVERSITY

NEW DELHI 110068

RECOGNITION

The UGC Notification No. F. 1-1/2020(DEB-I) dated 4th Sept., 2020 regarding recognition of Degrees and Certificates acquired through ODL mode states as under:

— 22. Equivalence of qualification acquired through Conventional or Open and Distance Learning and Online modes.— Degrees at undergraduate and postgraduate level in conformity with UGC notification on Specification of Degrees, 2014 and post graduate diplomas awarded through Open and Distance Learning mode and/or Online mode by Higher Educational Institutions, recognised by the Commission under these regulations, shall be treated as equivalent to the corresponding awards of the Degrees at undergraduate and postgraduate level and post graduate diplomas offered through conventional mode.

July, 2023

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Further information on Indira Gandhi National Open University courses may be obtained from the University's office at Maidan Garhi, New Delhi-110 068.

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CONTENTS

ABOUT THE UNIVERSITY

The Indira Gandhi National Open University came into being on September 20, 1985, by an Act of Parliament to achieve the following objectives:

- democratising higher education by taking education to your doorsteps;
- providing access to high quality education to all those who seek it irrespective of age, region or formal qualifications;
- offering need-based academic programmes by giving professional and vocational orientation to the courses;
- Promoting and developing distance education in India.

The Indira Gandhi National Open University has an international jurisdiction, a nationwide student support service network, socially and academically relevant programmes based on students need analysis which are also cost effective, with provision for you to study at your own pace.

The University operates through its 21 Schools of Studies. The methodology of instruction in this university is different from that of the conventional universities. The Open University System is more learner-oriented, and the learner is an active participant in the teaching-learning process. Most of the instruction is imparted through distance mode rather than face-to-face communication. The University follows a multi-media approach for instruction. It consists of: self-instructional printed course material, audio and video programmes, the online repository of course related material – eGyankosh, face-to-face counselling at Learner Support Centres by academic counselors, assignments, laboratory work, teleconference/web conference, interactive radio counseling, WEAS (web enabled academic support) portal and the Gyan Dhara channel.

MESSAGE FROM THE PROGRAMME TEAM

Dear Learner,

Congratulations on taking admission in M.Sc. (Physics) programme at IGNOU! We extend you a warm welcome to this newly launched programme in the open and distance learning (ODL) mode. This programme is designed to provide you with a comprehensive and in-depth understanding of the fascinating field of physics.

The M.Sc. (Physics) programme has advanced courses in all the important areas in physics. As you know, mathematical methods form an important tool in the study of advanced physics courses. Therefore, as a preparation for studying your M.Sc. Courses, it is advised that you should revise the mathematical methods such as vector algebra and vector calculus, ordinary and partial differential equations, matrices, and complex analysis that you have studied in your undergraduate programme. A strong foundation in these topics will greatly benefit you in grasping the concepts and applications covered in the courses of the programme.

The study materials for the courses are uploaded on the eGyankosh site (https://egyankosh.ac.in/) of IGNOU. The student support services such as counselling sessions for the theory courses and the practical sessions for the laboratory courses will be conducted at the designated Study Centres. The information regarding these activities will be made available on the website of your Regional Centre from time to time. IGNOU faculty will also provide you support through Web Enabled Academic support (WEAS) Portal of IGNOU. For your admission cycle (July/2023), the first term-end examination will be held in June 2024 for the courses of the first and second semesters, and every six months thereafter.

This **Programme Guide** contains key information about the programme including the details of courses on offer, the syllabi of courses, how to study the courses, evaluation methods, rules and regulations and links to important forms. It will help you to navigate through the different stages of the programme and progress in it.

At all stages of your journey in IGNOU, please use the **IGNOU website** as your source of all the latest information on different aspects like cut-off dates for submission of different forms and fees for different services. Please check the IGNOU website regularly for announcements on these.

We are excited to have you join our M.Sc. (Physics) programme and embark on this journey of intellectual growth and exploration. We are committed to providing you with a high-quality learning experience. You may reach out to us at our **dedicated email address** mscph@ignou.ac.in for academic queries on the programme.

Once again, we extend our warmest welcome and wish you all the best in your pursuit of knowledge and excellence in the field of physics.

Sincerely,

Programme Team (M.Sc. Physics)

IGNOU WEBSITE

The IGNOU website is **http://www.ignou.ac.in**. It offers relevant information to the general public and student support facilities to the learners through the Single Window Information and Student Support (SWISS). These include:

- Online registration for fresh admission to various programmes
- Online Re-Registration
- Online submission of Term-End Examination Form
- Results of the Term End Examinations
- Checking status of study material
- Downloads of Assignments/Question papers/Forms
- Catalogue of audio/video programmes
- Schedule of Gyan Darshan/Gyan Vani/ programmes
- Admission announcements
- Addresses of regional and Study Centres
- Updates on the latest happenings at the University
- Checking registration details
- Web Enabled Academic Support (WEAS)
- TEE date-sheet
- Examination Hall Ticket
- Course Completion Status
- Accessing eGyanKosh: using this web site you can download your course material and view videos related to your courses.
- Student Portal (after admission): https://ignou.samarth.edu.in/: **All students are advised to register on the Student Portal after confirmation of their admission and create their own Student Account.**

1. M.Sc. (PHYSICS) PROGRAMME

Programme Code: MSCPH

The M. Sc. (Physic) programme housed in the School of Sciences has been designed by eminent physicists and teachers from across the country. The courses of this programme strive to cover all the core concepts in different areas of physics. It offers an exciting opportunity to people who are interested in physics and would like to pursue a career in teaching or research and development in physics and allied areas.

Objectives of the Programme

This programme has the following broad objectives:

- to impart high quality higher education in physics;
- to equip the learners with core knowledge in physics and provide adequate analytical and laboratory training for pursuing higher education or a career in physics research and development;
- to prepare students for higher studies in interdisciplinary areas;
- to provide a focused insight into currently relevant branches of physics research through well designed elective courses;
- to foster academic integrity and professional ethics.

Duration

The **minimum** duration of the programme is **two years,** which is divided into **four semesters**. The **maximum** period allowed for completion of the programme is **four years**.

Medium of Instruction

The programme is available only in **English**.

Programme Fee

The programme fee, exclusive of examination fee is Rs. 28,000/-* for the full programme to be paid year wise @ Rs.14,000/- per year plus additional charges as applicable. As and when it is necessary, the University can revise the programme fee and the revised fee shall be payable by you as per schedule of payment notified by the University.

Re-Registration

Learners have to submit the Re-Registration (RR) forms for the IInd year (comprising 3rd and 4th semester courses) 'Online' only on https://ignou.samarth.edu.in/ as per schedule being notified by the University from time to time. Timely payment of fees is the responsibility of the students. Students are expected to remit fee as early as possible without waiting for the last date. In case, you fail to remit the fee as per the schedule, you will have to wait for next cycle of fee payment schedule. Non-payment of fee results in discontinuation of the dispatch of study material. Such students will not be permitted to write the examinations. In case any student willfully appears in the examination without proper registration for a course(s), the result shall not be declared.

Note that you have to re-register in the second year, irrespective of whether you have cleared all the Courses in your first and second semester. While the programme has a semester structure, the fee is to be paid annually. At the time of your admission you have paid the fee for the first year (1st and 2nd semesters). At the time of re-registration, you need to pay the fee for the second year (3rd and 4th semesters).

2. PROGRAMME STRUCTURE

Studies in this 2 year programme are divided into **4 semesters (2 semesters per year)**.To successfully complete this programme, you will have to earn **72 credits** over a period of 2 to 4 years depending on your convenience. These 72 credits comprise

1.	**Core Courses**	60 credits
2.	**Elective Courses**	12 credits
	Total	**72 credits**

The details of these courses are given in Sec.5. After successfully completing the programme you will be awarded the **degree** of **M.Sc. (Physics).**

Core Courses

The core courses are offered in all four semesters of the programme. They deal with the fundamental concepts in different branches in physics and the related analytical techniques, which will help you to apply these concepts to new areas in physics and solve problems. The detailed syllabi of these courses are given in Sec. 5.

Elective Courses

Three elective courses are being offered in three currently relevant branches of physics research. An attempt is made to update you with the developments in these areas and expose you to the interdisciplinary nature of current research in science.

The **semester-wise details of the courses of M.Sc (Physics) programme** is as follows: (The Laboratory courses are marked with a *)

FIRST SEMESTER

Course Code	Course Title	Type of Course	Credits
MPH-001	Mathematical Methods in Physics	Theory (Core)	4 Credits
MPH-002	Classical Mechanics I	Theory (Core)	2 Credits
MPH-003	Electromagnetic Theory	Theory (Core)	2 Credits
MPH-004	Quantum Mechanics I	Theory (Core)	4 Credits

MPH-005	Electronics	Theory (Core)	4 Credits

SECOND SEMESTER

Course Code	Course Title	Type of Course	Credits
MPH-006	Classical Mechanics II	Theory (Core)	4 Credits
MPH-007	Classical Electrodynamics	Theory (Core)	4 Credits
MPH-008	Quantum Mechanics II	Theory (Core)	4 Credits
MPHL-009	General Physics Laboratory*	Laboratory (Core)	4 Credits
MPHL-010	Electronics Laboratory*	Laboratory (Core)	4 Credits

***These Laboratory Courses (MPHL 009 and MPHL 010) will be conducted over the period of Semesters 1 and 2 and the Study Centres will prepare the schedule accordingly.**

THIRD SEMESTER**

Course Code	Course Title	Type of Course	Credits
MPH-011	Statistical Mechanics	Theory (Core)	4 Credits
MPH-012	Condensed Matter Physics	Theory (Core)	4 Credits
MPH-013	Optics	Theory (Core)	2 Credits
MPH-014	Computational Physics	Theory (Core)	2 Credits
MPHL-015	Computational Physics : Laboratory	Laboratory (Core)	4 Credits
MPHE-025 MPHE-026	**Elective Course (Any ONE**)** i) Materials Science ii) Elements of Reactor Physics	Theory (Elective)	4 Credits

****Only one course out of MPHE-025 and MPHE-026 is to be opted in Semester 3. Elective course opted in Semester 3 cannot be opted again in Semester 4.**

FOURTH SEMESTER$$

Course Code	Course Title	Type of Course	Credits
MPH-016	Atomic and Molecular Physics	Theory (Core)	4 Credits
MPH-017	Nuclear and Particle Physics	Theory (Core)	4 Credits

MPHE-025 MPHE-026 MPHE-027	**Elective Courses (Any TWO[$$])** i) Materials Science ii) Elements of Reactor Physics iii) Nanoscience	Theory (Elective)	4 Credits + 4 Credits

[$$] **Only two courses out of MPHE-025, MPHE-026 and MPHE-027 are to be opted in Semester 4, without repetition.**

3. INSTRUCTIONAL SYSTEM

The M.Sc. (Physics) programme instructional system includes Self-Learning Material (SLM, Open Educational Resources (OERs), assignments, counseling sessions and practical sessions at the Learner Support Centres (LSCs).

3.1 Print Material

For courses other than those offered through OERs, the study material will be provided in digital form (on eGyankosh, the repository for SLMs of the University) and/or in printed form. The study material is properly planned and are self-instructional in nature.

The **printed study material is sent to you by registered post to the address provided by you in the application form at the time of admission**.. The material will be despatched to you **semester wise**. You can check status of dispatch of study materials on the IGNOU website using the web link: www.ignou.ac.in/ignou/aboutignou/division/mpdd/material, provided by MPDD. For non-receipt of study material, students are required to write to the Registrar, Material Production and Distribution Division, IGNOU, Maidan Garhi, New Delhi –110 067 or e-mail to mpdd@ignou.ac.in.

The soft copy of the learning material can be downloaded from eGyankosh (at https://egyankosh.ac.in) and also IGNOU E-Content mobile App (which can be downloaded from Google Play Store).You can also access your course materials, assignments, and other learning resources through Web Enabled Academic Support **(WEAS) Portal of MSCPH.** To access the WEAS Portal click the link - https://sites.google.com/ignou.ac.in/weas.

3.2 Open Educational Resources (OERS)

For some courses (or parts of some courses) of this programme, the course material will be in the form of Open Educational Resources which may be in the form of video lectures or ebooks. The links for the same will be provided on **eGyankosh**. You will not receive the printed SLM for these courses.

3.3 How To Study A Course

- **SLM based Courses**

  The learners joining open and distance learning institutions like IGNOU are expected to be self-learners. As there is no regular and face-to-face classroom teaching in such institutions, you are provided **self-learning materials (SLM)** for the courses of the programme which are developed in self-instructional style and completely cover the course contents. An effort is made to make SLMs self-contained so that you do not need any additional help to understand

it. Since SLMs for the courses are the primary learning resource, you should know how these SLMs are structured and how you can make best out of it.

SLM of the courses in IGNOU are offered in the form of booklets called **Blocks**. Each block is divided into several units so that the learning material is presented in smaller portions, which are easier to absorb at a time. The units in a clock have the unity and are structured in a standard way.

Each **unit** contains expected learning outcomes which tell you what you are expected to know after studying the unit. These goals state what conceptual understanding you should have, what kind of ability to reason and problem-solving skills you should develop.

We give the **summary** at the end of the conceptual discussion followed by a section called **terminal questions**. The last section gives the answers/ solutions to (SAQs and TQs) problems.

Physics, as you know, cannot be learnt passively. Learning Physics is not like listening to a story and memorizing it. You have to not only understand concepts but acquire the abilities of reasoning and problem solving. The idea is not to memorise without understanding, but to understand and apply concepts to a variety of problems.

The first thing you must understand while studying the courses in Physics is that Physics is about understanding how the world around us and the universe works. We express our understanding of the physical universe in terms of equations and numbers. Solving problems based on equations is a very important part of Physics. But, always remember, what is even more important in Physics is to understand what the equations and the numbers tell us. We give below some advise regarding how to study SLMs for the courses of the programme:

- Always keep a pen/pencil and paper with you while studying.
- Work through all steps in the derivations given in the text **yourself**. Also, **work each step** in the solved examples given in the text on your own.
- You may use the Blocks of the course as your notebook. **Make notes in the text as well as in the margin.**
- You will have to work out the mathematical steps, SAQs, Terminal Questions on separate papers, as no space has been provided in the text for this purpose.
- You may need to use a **calculator** for calculations in numerical problems. So keep a calculator handy.
- We advise you to make an honest attempt at solving the Self Assessment Questions (SAQs) and the Terminal Questions. Do not immediately turn to the answers given at the end of each unit if you cannot solve a problem in the first instance. You should go through the unit once more and then attempt the questions again.
- You must also express the answers to numerical problems in proper units.

Your actual study time for a unit will, of course, depend on your background. For example, if you have done your graduation in the last one or two years with physics and mathematics, the calculus and vector algebra used in the courses of the programme will be easy to follow. However, if you have done your graduation a few years ago, then you may like to brush up your knowledge of undergraduate level physics and topics in mathematics such as calculus and vector algebra.

- **OER based Courses**

  For the OER based courses wherein the course content will be provided to you in the form of video lectures or e-Text, you will not be provided with any SLM either in digital or printed form. Of course, a detailed write-up as to how these video lectures or e-Texts are to be watched/studied to cover the course content in a systematic manner will be provided. While going through the video lectures, similar to the study with SLM, you should attempt the examples/exercise yourself. You should take notes while watching the lectures. You can pause or rewind and watch the lecture/ part of the lecture, where you find the concept difficult to understand. We will give you the links to the transcripts of the lectures, wherever available. By reading the transcripts, you can understand the subject discussed in the lecture better.

3.4 Practical Work

Three out of the twenty courses of this programme are Laboratory courses. The practical sessions for these courses will be conducted at the LSCs, in the Physics Laboratories and Computer Laboratories. The laboratory session for each laboratory course will run for 14 days. Attending practical sessions is **compulsory** for all the learners. Completing minimum 70% of each laboratory session is mandatory. It qualifies you to appear for the term-end practical examination for the course which is held on the last day of the session. Schedule for practical sessions will be made available to you by your LSC/RC.

3.5 Teleconference

Teleconference/web conference, using one-way video and two-way audio transmission via satellite, is another medium used by the University to impart instruction to and facilitate learning for a distance learner. The schedule for the teleconferencing sessions would be available on the website of the University or the Regional Centres.

3.6 Interactive Radio Counselling

Interactive phone-in radio counselling sessions conducted by the University are available on and Gyan Vani FM station. The radio counselling sessions are broadcast 'live' and are relayed by stations across the country. Now, there is a synchronized weekly transmission "IGNOU HOUR" on Sundays from 4.00 p.m. to 5.00 p.m. with coverage of almost all over the country.IRC sessions can be accessed through radio at the frequency 105.6 MHz, through DTH and also through Internet at the link gd.ignouonline.ac.in/gyandhara. The phone numbers for interaction are: 01129533581, 01129536131, 29533103 and 1800112347.

3.7 Gyan Darshan

Gyan Darshan, the 24 hours educational TV channel is a joint venture of IGNOU with Doordarshan. It is available through the Cable TV network. The telecast schedule of Gyan Darshan is made available on IGNOU web site: http://www.ignou.ac.in .

Please ask your cable operator to provide this channel.

3.8 IGNOU e-Content Mobile App

IGNOU-e-Content Mobile App is an official mobile app of Indira Gandhi National Open University (IGNOU), New Delhi. This app is an ICT initiative of IGNOU to provide Digital Learning Environment to IGNOU learners and extending Technology Enhanced Learner Support Services to

them. The aim of this initiative is to disseminate the digitised course material to IGNOU Learners. IGNOU learners can use this app to access their course material through their hand held devices such as Mobile Phones and Tablets.

3.9 Scheme of Study

In order to enable you to complete your M.Sc. (Physics) programme within the minimum period of two years, you will have to complete 72 credits worth of courses in four semesters. Registration to the programme is annual, so you register for the first and second semester in Year 1 and for the third and fourth semester in Year 2. In the second year irrespective of whether you pass or not in all the courses of the first year, you must re-register for the third and fourth semester by submitting the Re-registration Form with the requisite programme fee.

It is quite possible that you may not find sufficient time to prepare for the Term End Examinations of all the courses you have registered for. You can focus only on those courses in which you intend to take the examination. You can give the examination of the remaining courses later. You may appear for the term-end examinations for the first time after one year of admission to the programme, at that time, you are eligible to appear for the exams of the first and second semesters. Thereafter you can appear for your exams every six months till the completion of the validity of your admission. Examinations are held in the month of June/December of each year. In this way, you can plan your courses within two to four years. By a proper planning every year, you can complete this programme according to your convenience.

3.10 Learner Support Centres (LSCs)

To provide effective students support, we have set up LSCs for this programme. You will be allotted one of these study centres. The particulars of the LSC to which you are assigned will be communicated to you at the time of admission.

Each Learner Support Centre will have:

- A **Coordinator/Assistant Coordinator** who will coordinate all the activities, academic as well as administrative, related to the programme and will be a guide/support to you at the centre.
- **Counsellors** in different courses, core as well as electives, to provide you counselling and guidance in that subject.
- Physics laboratories where you will do the practicals of the laboratory courses of the programme.
- A **computer laboratory** where you will do your computer practicals.

In the LSC you will also have an opportunity to interact with fellow students. This may lead to the formation of self-help groups.

4. EVALUATION

The system of evaluation, both for theory courses and laboratory courses have two components i) continuous evaluation, and ii) term-end examination. For the theory courses the continuous assessment is through the tutor marked assignments (TMAs). The weightage of continuous evaluation and term-end examination of various courses of the programme are shown in the table below:

Type of Course	Weightage of	
	Continuous Assessment	Term End Examination
Theory Courses	30% **(Assignment)**	70%
Laboratory Courses	70% (Guided Experiments)	30%

For every courses, you are required to score at least 40% marks in both the continuous assessment as well as the term-end examination separately. In the overall computation also, you must get at least '40% marks in each course to be eligible for the M.Sc. degree.

If you do not clear the term-end examination of all the courses taken in a particular semester, you can appear for the term-end examination of those courses again after 6 months, as per the University rules. The overall percentage wise division of the results is

Division	Percentage of Marks
Ist Division	**60% and Above**
IInd Division	**50% and Above; but below 60%**
IIIrd Division	**40% and Above; but below 50%**
Fail	**Below 40%**

4.1 Assignments

Tutor Marked Assignments (TMA) are **compulsory** component of the course. You will need to do one tutor marked assignment for each theory course. There are no assignments for the laboratory courses of the programme. **Each assignment is valid for the dates printed on the assignment. If you fail in an assignment or are not able to submit the assignment before the validity date, you have to submit the assignment for the next year.**

The TMA for each semester can be downloaded from the Student Zone of the University website at https://webservices.ignou.ac.in/assignments/.

The main purpose of the assignments is to test your comprehension of the learning material you receive from us and also to identify the gaps in your understanding of the course by providing feedback to you. These assignments will be checked by your counsellors, who will also explain to you where and how you can improve your understanding. The information given in the course material should be sufficient for answering the assignments. However, to take you a little further, you can always refer to other books accessible to you. **You will not be allowed to appear for the term-end examination for a course if you have not submitted the assignments stipulated in time for**

that course. If you appear in term-end examination without submitting the assignments, then the result of term-end examination is liable to be cancelled.

These assignments are to be submitted at the LSC according to the submission schedule provided in the assignments booklets. Before submission, you should ensure that you have answered all the questions in all assignments. Incomplete answer sheets bring you poor grades.

SPECIFIC INSTRUCTIONS FOR TUTOR MARKED ASSIGNMENTS

1. Write your Enrolment Number, Name, Full Address, Signature and Date on the top right had corner of the first page of your response sheet.
2. Write the Programme Title, Course Code, Course Title, Assignment Code and Name of your Study Centre on the left hand corner of the first page of your response sheet.

   Course Code and Assignment Code may be reproduced from the Assignment.
3. Read the assignments carefully and follow the specific instructions, if any, given on the assignment itself.
4. Use only foolscap size for your responses and tie all the pages carefully. Avoid using very thin paper. Allow a 4 cm. margin on the left and at least 4 lines in between each answer. This may facilitate the evaluator to write useful comments on the margins at appropriate places.
5. Write the response in your own hand writing. Do not print or type the answers. Write answers in your own words; do not reproduce your answers from the units sent to you by the University. If you reproduce from units, you will get poor marks for the respective question.
6. Do not copy from the response sheets of other students. If copying is noticed, the assignments of such students will be rejected.
7. Write each assignment separately. Write the question number with each answer.
8. **The completed assignments should be sent to the Coordinator of the LSC allotted to you. Under no circumstances you should sent the tutor marked response sheets to the Headquarters for evaluation. Please retain a copy of the assignment.**
9. After submitting the assignment at the LSC, get the acknowledgment from the Coordinator on the prescribed assignment remittance-cum-acknowledgment card.
10. Provision for online submission of assignments is also available. You will get more details about this on the website of your Regional Centre.

4.2 Term End Examination

As stated earlier, Term End examination is another component of the evaluation system. For non-laboratory courses, Term End Examination carries 70% weightage in the final result. For laboratory courses, assigned unguided experiments similar to term-end examination carry 30% weightage.You are eligible to appear for the Term End examinations for the theory courses one year after admission and every six months thereafter.

If you get a pass score in a course in the Term End Examination, you will not be allowed to reappear in the subsequent examinations in that course for improvement of marks. In case, you fail to get a pass score in the Tem-end Examination, you will be eligible to reappear in the next Term End Examination for that course as and when it is held, within the total span of the programme.

General Guidelines Regarding the Term-End Examination

1. To be eligible to appear the Term-end Examination in any course, the students are required to fulfill the following conditions:
   a) registration for the courses, in which they wish to appear is valid,
   b) they should have opted and pursued the prescribed courses
   c) they have also submitted the required number of assignment(s), if any.
   d) they have submitted the online examination form of IGNOU and have paid the requisite examination fees.
2. The University conducts term-end examination twice a year, in June and December. You are eligible to appear for the Term End examinations for the theory courses one year after admission and every six months thereafter. You can also appear for these exams in later cycles as per the validity of your program
3. .Examination schedule is also notified through the website of IGNOU www.ignou.ac.in. You are advised to see whether there is any clash in the examination dates of the courses you wish to take i.e. examination of any two courses you wish to take are scheduled on the same day at the same time. If there is any clash, you are advised to choose one of them in that examination and appear for the other course in the next examination (i.e. June or December as the case may be).
4. The online examination form is to be filled up from IGNOU website at http://exam.ignou.ac.in/, in general, as per the schedule given on the IGNOU website (**You MUST visit IGNOU website for actual cutoff dates**). The details of fee and late fee are displayed on the website.
5. You can pay examination fee online using Credit Card / Debit Card /Net Banking while filling up the form. It may also be noted that in case, examination fee needs to be returned to student due to technical reasons, the fee will be refunded to the same account (Credit card/ Debit card/ Net Banking) from which the payment was made.
6. **Hall Ticket for Term-End Examination**
   - Hall Ticket will be uploaded on the University Website approximately 10 days before the commencement of the Term-end examinations. Please take print out of Hall Ticket from University website (www.ignou.ac.in) and report at the Examination Centre along with the Identity Card issued by the Regional Centre/University.
   - You will be allowed to appear in Term-end Examination for the course(s) for which registration is valid and not time-barred and assignment(s) is/are submitted. Examination Fee once submitted will not be refunded.
   - You must carry IGNOU Identity-Card in the Examination Hall for writing Examination. A digital copy of the student Identity Card is available in the student account (https://ignou.samarth.edu.in). It can be downloaded and printed whenever required.

   - **Contact Details**

     In case of non-receipt of Control number or any query pertaining to Examination Form please contact **Phone No.(s) : 011-29572209 or send us an email at termendexam@ignou.ac.in**

7. **Early Declaration of Results:** In order to facilitate the students who have got an offer of admission to further courses of study or have been selected for employment etc. and are required to produce marks sheet/grade card by a specified given date provision of early declaration of result is made. Student may apply for early processing of their answer-scripts and declaration of the results for this purpose along with supporting documents and requisite fee. The students must submit their requests for early declaration before the commencement of the Term-end Examination i.e., before 1st June and 1st December respectively. In such cases, the University will make arrangements for processing the answer-scripts and early declaration of the results as a special case.

8. **Obtaining Photocopy of Answer Scripts:** After the declaration of result, if the students are not satisfied with the marks awarded, they can request the University for Photocopy of Answer Scripts. The request for obtaining Photocopy of Answer Scripts by the student must be made within 30 days from the date of declaration of result (i.e.) to the Evaluation Centre concerned in the prescribed format along with the requisite fee. The form is available on the IGNOU website.

9. **Re-evaluation of Answer-script(s):** In case the student is not satisfied with the marks obtained, a request for revaluation can be made then. The answer-scripts will be re-evaluated by another Evaluator. Students can apply for re-evaluation within one month from the date declaration of results i.e. the date on which the results are made available on the University Website using the prescribed application form available on the University Website along with the requisite fee . The better of the two scores among the original marks/grades and re-evaluated marks/grades will be considered and the revised marks/grades shall be incorporated in the students' record and the revised grade card/marks sheet will be sent to the students. Re-evaluation is not permissible for Assignments and Laboratory courses.

4.3 Examination for Laboratory Courses

Evaluation of laboratory courses is carried out at the time of conducting the laboratory courses at the study centre. Each and every experiment, which you perform, is evaluated. Evaluation of experiments, which you perform under the guidance of your counsellor, constitutes continuous evaluation and carries 70% weightage. On the other hand, the evaluation of unguided assigned experiment(s), which you perform during the last session of your lab course, carries 30% weightage and constitutes Term End evaluation.

5. DETAILS OF COURSES

5.1 Core Courses

MPH-001: Mathematical Methods in Physics — 4 Credits

In this course we acquaint you with the areas of mathematics required for higher studies in physics. Specifically, you will learn about partial differential equations and special functions, vector spaces,matrices and tensors, complex analysis, Laplace and Fourier transforms and group theory . These mathematical techniques will be used extensively in most of your theory courses and it will help if you are thorough with these methods before you start studying your other courses. In order to study this course effectively, it would also be better if you revise the standard courses in the mathematical methods in physics typically taught at the undergraduate level.

Syllabus

Partial Differential Equations and Special Functions: Partial differential equations, Method of separation of variables, Solution of Laplace equation in various coordinate systems (Cartesian, spherical and cylindrical), solution of Poisson, Heat diffusion and wave equations; Integral equations; Fredholm and Volterra equations; Legendre polynomials, hypergeometric functions, Bessel and spherical Bessel functions, spherical harmonics, Hermite and Laguerre Polynomials, Sturm- Liouville problem, expansion in orthogonal functions.

Vector Spaces, Matrices and Tensors: Finite dimensional real linear vector spaces. linear dependence and independence, basis and dimensions, Linear mappings or operators and matrices corresponding to them. Vector spaces of matrices. Inner product, orthogonality, and Gramm-Schmidt orthogonalization. Finite dimensional complex vector spaces. Hermitian inner product. Norm. Cauchy inequality. Adjoint of an operator. Hermitian and unitary operators. Matrix diagonalization. Similarity transformations. Eigenvalues and eigenvectors of unitary and hermitian matrices. Dual vector space. Dual basis.

Elements of Tensors, Applications in Physics (Moment of Inertia tensor, Elasticity tensor, stress tensor in fluids and metric tensor in relativity)

Complex Analysis: Functions of a complex variable, analytic functions, Cauchy-Riemann conditions, zeros and singular points, classification of singularities, Multivalued functions, Branch points and cuts, Cauchy's integral theorem and formula, Taylor and Laurent expansions, analytic continuation, contour integrals, residue theorem, Jordan's Lemma; evaluation of definite integrals, Principal value, summation of series, conformal mapping, gamma function.

Fourier and Laplace Transforms: Fourier transform, sine, cosine and complex transforms with examples, definition, properties and representations of Dirac delta function, Properties of Fourier transforms, transforms of derivatives, Parseval's theorem, applications to partial differential equations; Laplace transform, properties and examples of Laplace transform, convolution theorem and its applications, Laplace transform method of solving differential equations.

Group Theory: Definition of groups, Subgroups and cosets. Homomorphisms and isomorphism. Invariant subgroup and quotient group. Matrix representations; Continuous groups. Groups of transformations. Translation and rotation groups in 2 and 3 dimensional Euclidean spaces. Generators of one-parameter subgroups. Lorentz and Poincare groups. SL(2,C) and its relation to Lorentz group. SU(2), and SU(3).

MPH-002: Classical Mechanics-I 2 Credits

In your undergraduate physics courses you have solved problems using Newton's Laws of motion. You will now study a new set of analytic techniques for solving dynamical problems. In this course you will study the Lagrangian formulation of mechanics and its applications. You will derive and solve the Euler-Lagrange equations of motion, which are derived from the Lagrangian of a physical system The Lagrangian is a scalar function which depends on the kinetic energy and potential energy of the system. You will also study the "Priciple of Least Action", one of the most famous princles in physics which can not only be be used to derive Newtonian, Lagrangian and Hamiltonian equations of motion, but also has applications in modern physics like in relativity and quantum mechanics.

Syllabus

Revision of Elementary Mechanics

Variational Principles and Lagrange's Equation: Generalised coordinates, Lagrange's equation; Hamilton's principle; derivation of Lagrange's equations from Hamilton's principle; Cyclic Coordinates, Integrals of Motion, Symmetry Properties.

The Two Body Central Force Problem: Reduction to the equivalent one body problem, classification of orbits, Virial theorem and applications, Bertrand's Theorem, the Kepler problem, the Laplace-Runge-Lenz vector, Scattering in a central force field.

Small Oscillations: Study of small oscillations using generalized Coordinates, forced vibrations and resonance.

MPH-003: Electromagnetic Theory — 2 Credits

The word electromagnetism comes from a combination of electricity and magnetism. Electric and magnetic phenomena have been observed in nature since ancient times and they were considered as two entirely separate phenomena. The discoveries of Oersted and Faraday regarding the magnetic effects of current and electromagnetic induction changed things dramatically. These developments indicating some kind of relation between electric and magnetic phenomena culminated in the work of Maxwell, who clearly established that electricity and magnetism are the two aspects of the same phenomenon. In this course on Electromagnetic Theory, we will investigate the realm of electrostatics and magnetostatics. While electrostatics is the study of electric fields produced by stationary charges, magnetostatics deals with the stationary magnetic fields and their interactions. You will learn the basic concepts related to electrostatics and techniques to solve electrostatic problems. We also discuss the genesis of magnetic fieldin terms of current loop and investigate how various materials behave in a magnetic field. Throughout this course, we will adopt a rigorous mathematical approach to electromagnetic theory, emphasizing the importance of vector calculus and mathematical techniques in solving related problems.

Syllabus

Electrostatics: Electric field, Electric potential; Gauss's law, Poisson and Laplace equations, solutions of Laplace equation (with emphasis on applications), boundary value problems in electrostatics; Special Techniques: method of images with applications, Electrostatics of macroscopic media, polarization of a medium; Microscopic properties of dielectrics (Claussius-Mossotti relation), Simple model of a dielectric; Electrostatic energy of a dielectric.

Magnetostatics: Lorentz force law, Integral and differential forms of Biot-Savart law, Magnetic vector potential and multipole expansion of the vector potential (emphasis on dipole expansion); Magnetic fields of localized current distributions, Torques and forces on magnetic dipoles, Effect of a magnetic field on atomic orbits, Magnetic fields in matter, Magnetization, Bound currents, Ampere's law in Magnetized materials, diamagnetism and paramagnetism; Ferromagnetic media, B and H fields; Magnetic circuits. Maxwell's equations and electromagnetic waves.

MPH-004: Quantum Mechanics-I — 4 Credits

Quantum mechanics, as you know, is a totally new way of interpreting data and predicting the behaviour of microscopic particles based on the idea of an essential discontinuity, the quantum, in the

affairs of the world. In this course you will study the basic concepts of quantum mechanics like the uncertainty principle and the wave particle duality, as well as the mathematical framework of quantum mechanics which tells you how to predict the behavior of quantum mechanical systems. You will study about the wave function and its probabilistic interpretation in quantum mechanics and the Schrodinger equation which is the differential equation for the quantum mechanical wave function. You will learn about operators which describe dynamical variables in quantum mechanical systems. You will solve the Schrodinger equation to describe several simple potential systems like the barrier and step potentials, the simple harmonic oscillator potential as well as the hydrogen atom. Finally, you will study the abstract mathematical formalism for quantum mechanics which treats the states of a quantum system as vectors in Hilbert space. You will learn how to study physical systems using this formalism.

Syllabus

Introduction to Quantum Mechanics: Wave-particle duality, Gaussian wave packets and group velocity, probabilistic interpretation of the wave function and its normalization, Dirac delta function and Fourier transforms, Momentum and energy operators, Heisenberg's uncertainty principle, Ehrenfest's Theorem. Time independent Schrodinger equation and stationary states, free particle solution.

Applications of Quantum Mechanics: One-dimensional problems: particle-in-a-box, square well potential, linear harmonic oscillator, tunnelling through a barrier; Motion in a central potential, orbital angular momentum, the hydrogen atom problem.

Quantum Mechanics in Hilbert Space: Hilbert space,linear operators Dirac's bra-ket algebra, eigen values of self-adjoint operators, unitary operators, time evolution of state vectors, Heisenberg picture, coordinate and momentum representations, observables and measurement in quantum mechanics, collapse of the state vector (project ion postulate), expectation values of observables, generalized uncertainty principle. One-dimensional harmonic oscillator using operator algebra, angular momentum in quantum mechanics, ladder operators and their matrix representation, spin angular momentum and Pauli matrices, Stern Gerlach experiment.

MPH-005: Electronics — 4 Credits

We often come across electronic equipment and systems in our everyday life. We use many electronic techniques in different scientific experiments for data collection and processing. It is useful to know about the working of various electronic systems and their components. In this course you will learn about different advanced devices used in the electronic circuits as well as get familiar with different electronic circuits you come across in various applications. The course is built upon the prior knowledge of electronics you have gained at the undergraduate level.

We will offer this course in the form of recorded lectures from renowned professors in the field of Electronics from different prestigious institutions in India. **These lectures are available as Open Educational Resources (OERs) at NPTEL site**. We will provide you with the links of these lectures and prescribe the sequence in which you should watch these lectures so that you will understand the different topics of the course well. Along with the links for the video lectures, we will also provide the links for the transcripts prepared by these experts wherever available so that you can read them through in case you have some difficulty in understanding the talk. It is advisable to follow the sequence that we will prescribe, as it will help you in a thematically coherent study.

Syllabus

Electronic Devices: Construction, working, biasing, I-V characteristics, frequency response and applications of **Diodes** (Power Diode, LED, Laser Diode, Photodiode, Solar Cell, Varicap, *p-i-n* Diode, Tunnel Diode, Gunn Diode), **Transistors** (BJT, j-FET, MOSFET, CMOS, UJT ,SCR)

Electronic Circuits: Amplifiers : Circuits, applications, limitations of Class A, Class B, Class AB, Class C amplifiers, Darlington pair configuration; feedback and stability concept, bandwidth of amplifiers; **Oscillators**: Positive feedback criterion for sustained oscillations, Audio and RF oscillators, clock generators, relaxation oscillators, microwave generators

Operational Amplifiers: Characteristics of practical op-amps and their effect on applications, applications of negative and positive feedback op-amp circuits- Integrators, Differentiators, Schmitt trigger, active filters, precision rectifiers, logarithmic amplifier, sample-hold circuits.

Special Electronic Circuits: Astable, monostable, bi-stable multivibrators, Phase Lock Loop (PLL) and Voltage Controlled Oscillators

Power Supplies: Linear and Switch-mode power supply, current limiting and fold back operations, DC-AC inverter

Digital Electronics Applications: Sampling theorem, Digital to Analog and Analog to Digital Converters, Signal to noise ratio improvement techniques.

Microprocessor-Microcontrollers: Microprocessor (8085): Architecture, block diagram and introduction to assembly language programming with some simple programmes; **Microcontroller (8051):** Architecture, block diagram and some basic applications.

MPH-006: Classical Mechanics-II 4 Credits

In this course we develop further the analytical techniques of mechanics in the Hamiltonian formalism. The starting point is the Hamiltonian of the physical system which is once again a scalar function, which, for non-relativistic motion is, most often, though not always , the sum of the kinetic and potential energy of the system. Hamilton's equations of motion, derived from the Hamiltonian, are first-order differential equations in contrast to the Euler Lagrange equations of motion which are second order differential equations. Hamiltonian mechanics also gives us a structured framework for transforming between coordinate systems through canonical transformations. You will also learn the concept of phase and Liouville's theorem in which you will learn that areas of phase space elements are conserved for all Hamiltonian systems. Hamiltonian mechanics also serves as a link between classical and quantum mechanics.

Syllabus

The Hamilton Equations of Motion: Legendre transformations, Hamilton equations of motion, Principle of least action. Phase plot, fixed points and their stabilities.

Canonical Transformations: The equations of canonical transformations, Poisson brackets, equations of motion, invariance of Poisson's brackets under canonical transformation, Liouville's theorem.

The Hamilton Jacobi Theory: Solution to the time dependent Hamilton-Jacobi equation, Jacobi's theorem, action angle variables, adiabatic invariants.

Rigid Body Dynamics: Degrees of freedom of a rigid body, Euler's theorem, kinetic energy of rotating rigid body, angular momentum, moment of inertia tensor, Euler's equation of motion for rigid bodies, Euler angles, motion of a heavy symmetrical top.

MPH-007: Classical Electrodynamics — 4 Credits

This is the second course on electromagnetic theory in this programme. While the first course entitled Electromagnetic Theory (MPH 003) dealt with electric and magnetic fields generatedby static charge distribution and current distribution respectively, this course primarily deals with the time varying electric field and magnetic field and their interactions. It forms the foundation of our understanding of electricity, magnetism, and optics, and provides a framework for explaining a wide range of physical phenomena, from the behavior of light to the functioning of electronic devices. You will study the key concepts of classical electrodynamics including Maxwell's equations, which are a set of four fundamental equations that describe the behavior of electric and magnetic fields. We will examine how these equations can be used to understand various electromagnetic phenomena, such as the propagation of electromagnetic waves in free space as well as in different media, the generation of electric and magnetic fields by charges and currents, and the interactions between charged particles. We will also explore important topics such as electromagnetic radiation, the principles of electromagnetism in different reference frames, and the behavior of electromagnetic waves in different media.

Syllabus

Maxwell's equations and electromagnetic waves, Faraday's law, generalized Ampere's law, Displacement current, Maxwell's equations, Gauge symmetry, Coulomb and Lorentz gauges, Electromagnetic energy and momentum (mention only), Poynting's theorem and conservation of energy and momentum, Electromagnetic waves in vacuum.

Dynamics of charged particles, Motion of charged particles in uniform static electric field, uniform static magnetic field, crossed electric and magnetic fields, spatially non-uniform magnetic field, $\nabla\vec{B}$ drift and time varying electric fields.Electromagnetic waves in different media, Derivation of ac conductivity, ac dielectric susceptibility, effective relative permittivity for a plasma, Wave propagation in dielectrics, conductors and plasmas, phase and group velocity; Reflection and refraction (including oblique incidence); Dispersion relation and energy propagation; Guided wave propagation, Waveguides, Applications (radio communication and other applications).

Radiating systems, Inhomogeneous wave equation and Green's function solution, wave equation for vector and scalar potential, electric dipole fields and radiation, magnetic dipole, short antenna.

Special theory of relativity and electrodynamics, Michelson Morley experiment, Lorentz transformations, four vectors, Transformation of electric and magnetic fields, Invariance of Maxwell's equations, Lorentz invariants; Four vector potential, Electromagnetic field tensor, Lorentz force on a charged particle, invariance of electric charge and Lorentz covariant formulation of electrodynamics; Electromagnetic field tensor in four dimensions and Maxwell's equations, Dual field tensor.

Radiation from Moving Charges, Liénard-Wiechert potentials, Electric and magnetic fields due to an accelerated charge and a uniformly moving charge.

MPH-008: Quantum Mechanics-II — 4 Credits

In this second course in quantum mechanics we study the concepts related to symmetries in quantum mechanics and the ensuing conservation laws. These ideas are of fundamental importance because they serve as constraints while formulating physical theories and models. You have already solved the Schrodinger equation for several systems in your first course in quantum mechanics. However exactly solvable physical systems are rare in quantum mechanics, which is why one needs approximation methods. In this course you study perturbation theory and its application to several physical problems. You will also study the scattering theory for quantum systems. In this course we also introduce the basic concepts of relativistic quantum mechanics which will provide an exposure to how relativistic quantum mechanics leads naturally to the notion of spin angular momentum as well as anti-particles.

Syllabus

Symmetries and Conservation Laws in Quantum Mechanics: General concept of symmetry in Q. M. (unitary operators and symmetry), space translation and conservation of linear momentum, time translation and conservation of energy, rotation and conservation of angular momentum, parity. Multi-Particle Systems: Identical particles, Exchange symmetry for Fermions and Bosons, addition of angular momenta, CG coefficients.

Approximation Methods for Stationary States: Time-independent perturbation theory and applications, degenerate case, Stark effect. spin-orbit coupling and fine structure, Zeeman effect without spin, WKB approximation, alpha particle lifetime calculations; the double oscillator, variational methods.**Approximation Methods for Time-dependent Problems**: Time- dependent potential, Interaction picture, time-dependent two-state problems with sinusoidal oscillating potential, application to NMR, time-dependent perturbation theory, Dyson series, transition probability, Fermi Golden Rule, constant and harmonic perturbation, semi-classical theory of radiation.

Scattering Theory: scattering cross sections, integral equation formulation, partial wave analysis, Born approximation.

Relativistic Wave Equation: Klein Gordonequation, Dirac's relativistic wave equation, position probability density; expectation values, Dirac matrices, plane wave solutions of the Dirac equation; the spin of the Dirac particle, significance of negative energy states and antiparticles.

MPHL-009: General Physics Laboratory — 4 Credits

1. As you know, laboratory work is an integral component of physics curricula at all levels so as to bridge the gap between theory and practice by engaging in hands-on experimentation. Through this course, you will acquire crucial skills, deepen your understanding of fundamental physics concepts, and gain valuable experience in laboratory techniques that will be beneficial for future research or professional endeavors in the field of physics. This course aims at developing experimental skills, reinforce theoretical concepts, enhance problem-solving abilities and promote teamwork and communication.
2. The Experiments in this course are from two broad areas: measurement of physical constants and determination of the electrical, thermal, magnetic, dielectric and optical properties of materials. The list of experiments for the course is given below:

Sl. No.	Name of Experiment
1.	Measurement of charge (e) by Millikan oil drop method.
2.	Determination of (e/m) by Thomson's method.
3.	Determination of Planck's constant using photoelectric effect.
4.	Determination of resistivity of a solid and band gap of a semiconductor using Four Probe method.
5.	Measurement of Hall coefficient.
6.	Measurement of thickness of a thin film.
7.	Refractive index using interferometry.
8.	Magnetic susceptibility of a solid.
9.	Velocity of sound in air.
10.	Thermal conductivity of a solid (Teflon /Aluminium /Brass /Copper).
11.	Dielectric constant of ice.
12.	Determination of the wavelength of laser beam using Michelson Interferometer.

MPH-010: Electronics Laboratory — 4 Credits

You have already performed several experiments in electronics in your college laboratory while doing the undergraduate Physics courses. In this laboratory course you will perform some advanced level experiments in electronics. It is imperative to know the electrical behaviour of various electronic devices before you start using them in the application circuits. In the initial few experiments you will study the characteristics of various devices and then perform some advanced experiments by using these devices in application circuits.

You will perform the experiments at the Study centre assigned to you and it is mandatory to attend the laboratory sessions. The laboratory training for this Course will be imparted for 120 hours (two weeks).

List of Experiments:

1. Study of UJT characteristics
2. Study of MOSFET characteristics
3. Study of photodiode characteristics
4. Study of CE amplifier at small and large signals
5. Design, assembly and testing of *R-C* Oscillator
6. Study of differential amplifier
7. Design, assembly and testing of IC 723 based power supply
8. Study of wave shaping circuits
9. Design, assembly and testing of Schmitt trigger and function generator
10. Design, assembly and testing of Multivibrators
11. Design, assembly and testing of DAC
12. Design, assembly and testing of Amplitude Modulator
13. Micro-controller programming

MPH-011: Statistical Mechanics — 4 Credits

Statistical Mechanics provides a framework for understanding the behaviour of large collection of particles or systems. It aims to explain macroscopic properties based on the microscopic behaviour of equilibrium is equally likely to be found in any of its accessible microstates, and the probability of a particular microstate is proportional to its statistical weight.

In this course, you will study basics of statistical mechanics like ergodic theory where a system explores all of its accessible states. You will then study different ways of characterizing a system known as ensembles such as the microcanonical ensemble, the canonical ensemble, and the grand canonical ensemble. You will also study Quantum Mechanical ensemble theory which extends statistical mechanics to quantum systems. Cumulant expansion and cluster expansion techniques will be used to study classical gases with interactions. In the last block of the course, you will study Phase transitions, such as first-order and continuous phase transitions.

Syllabus

Fundamentals of Statistical Mechanics: Macroscopic and microscopic states of a physical system, contact between statistical physics and thermodynamics, basic postulates of statistical mechanics, concept of ergodicity (time and ensemble average).

Classical Ensemble Theory: Phase space, classical Liouville's equation, Ensembles: micro-canonical, canonical and grand canonical; classical ideal gas, the entropy of mixing and Gibbs paradox; partition functions, Equipartition and virial theorems; calculation of statistical quantities (examples of ideal gas and harmonic oscillator); energy and density fluctuations.

Quantum Mechanical Ensemble Theory: Quantum micro and macro states, **t**he density matrix/operator, quantum Liouville's equation, quantum micro-canonical, canonical and grand canonical ensembles, examples of particle in a box; partition functions and distribution functions of ideal quantum gases, Fermi-Dirac statistics, and Bose-Einstein statistics, Maxwell- Boltzmann statistics as a limiting case, Black-body radiation, Bose- Einstein Condensation, electronic specific heat, Fermi energy, Pauli paramagnetism.

Statistical Mechanics of Interacting Systems: Cumulant expansion and Cluster expansionfora classical gas, Virial expansion of equation of state, Pair correlation function, Radial distribution function, structure factor, relation to thermodynamic functions.

Phase Transitions: Basics of phase transitions (first order and continuous phase transitions), Ising model, mean field theory, Landau's theory of phase transitions, critical exponents.

MPH-012: Condensed Matter Physics — 4 Credits

In this course on Condensed Matter Physics you study the fundamental macroscopic properties of matter, and also learn about the interactions between large numbers of atoms and electrons that give rise to these properties. This course draws heavily from both quantum mechanics and statistical physics. In the first part of the course you learn the basic ideas of crystal structure and symmetry and in brief about the newer materials like quasicrystals, liquid crystals, graphene etc. You will study about the characteristic vibrations of the crystal lattice in solids and about the quantized vibrational modes called phonon, which explain the thermal and electrical conductivity of materials. You will also study the thermal and electrical properties of electrons in a solid and learn about energy bands are formed. You will study the properties of semiconductor materials. This course also covers the characteristics of the dielectric and magnetic properties of materials and superconductivity.

Syllabus

Structure and Symmetry: Liquids and Gases; Crystalline solids; Direct lattice, Reciprocal lattice; Brillouin zones. Bragg's law; *X*-ray diffraction and determination of crystal structure: Structure factor; Typical crystal structures; Quasicrystals; Liquid crystals; One- and two-dimensional order in three-dimensional materials; Defects in solids.

Lattice Vibrations Vibrational modes of monatomic linear lattice and diatomic lattice; Acoustic and optical modes of vibration; Three-dimensional lattices; Quantisation of lattice vibrations - phonons; Density of states; Heat Capacity, Thermal Conductivity.

Electrons in Solids Free-electron theory of metals; Nearly Free Electron Model (NFEM); Electron in a periodic potential, Bloch theorem; Tight Binding Approximation (TBA); Reduced and periodic zone schemes; Band structure of insulators, conductors and semiconductors; Crystal momentum, number of orbital in a band; Construction of Fermi surface; Experimental methods for determining Fermi surface: Basic principles of the de Haas-van Alphen effect and cyclotron resonance. Semiconductor; Direct and Indirect band gap; Intrinsic and Extrinsic semiconductors; *p* - *n* unction, formation of depletion layer, drift and diffusion currents; Electrical parameters - resistivity, carrier concentration, mobility, Hall coefficient.

Dielectric and Magnetic Properties: Electronic, ionic, orientational polarisabilities for free atoms and molecules; Clausius-Mossoti relation; Frequency dependence of dielectric constant; Brief ideas of piezoelectric, pyroelectric and ferroelectric crystals. Diamagnetism, Paramagnetism and Ferro-magnetism; Different types of magnetic order: ferro, antiferro and ferri magnetism; Spin-spin interaction, Ferromagnetism, Curie-Weiss law. Magnons, Antiferromagnetic transition (qualitative treatment only).

Superconductivity: Experimental observations: Zero resistance, critical temperature, persistent current, Meissner effect, critical magnetic field, critical current, Type I and Type II superconductors, heat capacity, response to microwave and infrared radiation, energy gap, isotope effect. Thermodynamics of superconducting transition; London equation, penetration depth; Ginzburge – Landau theory; Qualitative ideas of BCS theory, Josephson tunnelling, and High T_c superconductors (general idea).

MPH-013: Optics — 2 Credits

Optics, as a branch of physics, explores the nature of light, its propagation, and its various manifestations in the form of electromagnetic waves. By delving into the electromagnetic theory, we gain a deeper understanding of how light behaves, enabling us to comprehend the intricate phenomena observed in optical systems. We will cover a wide range of topics, including interference, diffraction, lasers, waveguides and optical systems on the basis of Maxwell's equations which form the bedrock of our understanding of the electromagnetic spectrum, encompassing everything from radio waves to X-rays and beyond. This course will give you a basic foundation in applied optics, enabling you to pursue further studies or careers in fields such as optical engineering, photonics, telecommunications, and more.

Syllabus

Electromagnetic Waves in Isotropic Media, Maxwell's equations, Plane wave propagation in isotropic dielectrics, Three-dimensional wave equation in a dielectric; The Poynting vector; Energy density and

intensity of electromagnetic wave. Electromagnetic Waves in Anisotropic Media, Polarisation, Plane wave propagation in uniaxial crystals; Wave and ray velocities; Wave plates; Jones matrices.

Interference, Multiple beam interferometry, Fabry-Perot interferometer; Concept of cavity modes.Scalar Theory of Diffraction, Distinction between Fraunhofer and Fresnel diffractions; Fraunhofer diffraction − rectangular and circular apertures. Diffraction and Fourier Optics, Fresnel diffraction integral; Gaussian beam propagation; Fourier transforms; Fourier transforming property of a thin lens (qualitative discussion) and applications to spatial frequency filtering.

Lasers and Optical Waveguides, Light amplification, the Einstein coefficients; Directionality of laser beams; Optical resonators. Waveguides,Electromagnetic analysis of optical waveguides; Classification of modes for a planar waveguide, TE and TM modes in a symmetric planar waveguide. Optical Fibre Waveguides, Optical fibres; Attenuation and material dispersion; Qualitative discussion of (i) scalar wave equation and the modes in a step index fibre and (ii) pulse dispersion in multimode and single mode step index fibre; Brief idea about fibre amplifiers, fibre lasers and fibre Bragg gratings.

MPH-014: Computational Physics (Theory) 2 Credits

In this course you will study the important numerical methods that are commonly used to find solutions to physical problems. You will learn the methods of numerically determining the roots of polynomials, intrapolation and extrapolation of data, solving differential equations and numerical integration. Numerical methods are of utmost importance when exact solutions are either not available or too intractable. We also introduce Monte Carlo methods which find applications in almost all branches in physics, in the modelling of measurable properties in a variety of complex systems.

Syllabus

Error Analysis, Roots of Polynomials :Bisection method, Newton-Raphson's method, Secant method **,** Numerical interpolation, extrapolation and fitting of data **:** Polynomial interpolation and extrapolation, cubic spline interpolation**,** Numerical integration **:**Trapezoidal Rule, Simpson's Rule, Gaussian Quadrature Method**,** Finite Difference Calculus :Interpolation Formulae (Newton Gregory Interpolation), Difference Quotients , Differencing in 2D, Linear Algebra: Exact Methods (Gauss Elimination, LU decomposition), Introduction to DiagonalisationOrdinary Differential Equations **,**Initial Value Problems of 1st Order (Euler Cauchy method, Runge Kutta method), Initial Value Problems of 2nd order (Runge Kutta Method): Introduction to Stochastic Methods : Uniform random number, Tests of randomness, Biased Distributions, Application to Monte Carlo Integration

MPHL-015: Computational Physics: Laboratory 4 Credits

In this laboratory you will implement the computational techniques learnt in MPH-014 by writing the numerical algorithms and implementing these algorithms through a computer programme. The objective of the course is to teach you to apply these methods to solve problems in physics. You will also learn how to present your results graphically by using plotting softwares. The course material for this course includes an introduction to linux and a programming language.

Syllabus

1. Introduction to Linux and Plotting Software **(8 hrs)**
2. Introduction to Programming Language **(24 hrs)**

Five simple programmes (including problems on matrix manipulations)

3. Roots of Polynomials **(8 hrs)**
   Two problems and one application
4. Finite Differences and Numerical Differentiation **(4 hrs)**
5. Numerical interpolation, extrapolation and fitting of data **(16 hrs)**
   Polynomial interpolation and extrapolation, qubic spline interpolation
6. Numerical integration **(8 hrs)**
   Trapezoidal rule, Simpson rule, Gaussian quadrature
7. Ordinary Differential Equations **(16 hrs)**
   Euler and RK methods
8. Linear Algebra **(30 hrs)**
9. Stochastic Methods **(16 hrs)**

MPH-016: Atomic and Molecular Physics — 4 Credits

This course will provide you an opportunity to explore the fundamental principles and theories that govern the behavior of atoms and molecules and thereby equip you with the necessary knowledge and skills to understand the inner workings of matter at the atomic and molecular level. The course covers basic concepts of atomic structure, including electron configurations, quantum numbers, and energy levels. We will also explore atomic models, such as the Bohr model and quantum mechanical model. These will enable you to grasp the principles of quantum mechanics as applied to atomic and molecular systems. You will also study atomic and molecular spectroscopy and interaction of atoms with electromagnetic radiation.

Syllabus

Atomic Physics: Single electron atoms (Qualitative features with experimental results); Review of H atom, Selection rules and the spectrum of one electron atoms, Spectra of alkali atoms; Transition probabilities, Line intensities, Line shapes and widths of excited states, Fine structure of single electron atoms, Hyperfine structure(introduction).

Many-electron Atoms: He atom, ground state and first excited state, fine structure, quantum virial theorem. Hund's rules, periodic table and atomic properties: ionization potential, electron affinity. Thomas-Fermi method, determinantal wave function; Coupling of angular momenta, multiplet structure, orbital energies, photoelectron spectroscopy.

Molecular Physics: Hydrogen molecule, Hydrogen molecular ion, Description of molecular orbital and electronic configuration of diatomic molecules: H_2, C_2, O_2 and CN; Heitler-London method, molecular orbital and valence bond theories. Molecular binding, LCAO, LCMO.Symmetric and antisymmetric wave functions, Slater determinants, constant field approximation, Born-Oppenheimer approximation and Qualitative description of different types of energies, bonding, directed valence.

Molecular Spectroscopy: Rotational, vibrational and electronic spectra of diatomic molecules; Fluorescence and phosphorescence, Bond dissociation energies, Molecular orbitals and models, NMR, ESR, infrared spectra and Raman spectroscopy.

Interaction of Atoms with Radiation: Atoms in an electromagnetic field, absorption and induced emission, spontaneous emission and line-width, stimulated emission , Einstein A and B coefficients, density matrix formalism, two-level atoms in a radiation field. (Semi-classical treatment). Lasers, optical pumping, population inversion, rate equation; Modes of resonators and coherence length. interaction of laser with atoms.

MPH-017: Nuclear and Particle Physics — 4 Credits

Indian sage Kannada imagined atoms about 2500 years back as the basic constituent of matter. The discovery of radioactivity by Becquerel and Curies and study of radiations and their properties by Rutherford who hypothesized existence of nucleus led to the development of "nucleus physics". Recent studies have led to vast developments in nuclear and elementary particle physics. To begin with, we have discussed basic properties of nucleus and models like shell model, collective model, etc. The discussion of radioactivity, radioactive decay and the nucleon-nucleon problem are discussed. Nuclear reactions and their mechanisms, nuclear fission and fusion, reactors etc. are also discussed in this course. At the end of the course, we have introduced the elementary particles. You will study the relativistic conservation laws and apply them to particle reactions and decays. You will learn about the classification of elementary particles and their quantum numbers, the fundamental interactions and the quark model.

Syllabus

Static Properties of Nuclei: Discovery of atomic nucleus. Nuclear stability, binding energy, mass defect, semi-empirical mass formula. Nuclear size and its determination form electron scattering. Nuclear form factors. Angular momentum, spin and magnetic moments.

Nuclear Interactions: Nuclear forces, two-body bound state, deuteron problem. R.m.s. radius, quadrupole moment. Properties of nuclear potentials. Exchange and tensor forces. Effective range theory. Spin dependence. Charge independence and isospin.

Nuclear Models: Liquid drop model. Bohr-Wheeler theory of fission. Experimental basis for shell model. Spin-orbit coupling. Magic numbers. Angular momenta and parities for nuclear ground states. Qualitative introduction to Collective model of Bohr and Mottelson and the Nilsson model.

Nuclear Decays: Alpha, beta and gamma decays. Gamow theory of alpha decay. Internal conversion. Nuclear isomerism. Fermi theory of beta decay. Shape of beta decay spectrum. Total decay rate. Angular momentum and parity selection rules. Parity violation in beta decay. Multipole transitions in nuclei. Selection rules.

Nuclear Reactions: Direct and compound nuclear reaction mechanisms. Compound nucleus. Reciprocity theorem. Breit-Wigner formula. Resonance scattering. Elementary theory of nuclear reactors.

Elementary Particle Physics: Relativistic kinematics, energy and momentum conservation in particle reactions and decays, kinematics of a scattering process.Classification of elementary particles: hadrons, leptons and quarks.The fundamental interactions; quantum numbers of particles : mass, spin, colour, intrinsic parity, anti-particles; symmetries; parity, time reversal and charge conjugation (CPT).Quark model; discovery of charm, bottom and top quarks.Quark and lepton families; discovery of μ and τ leptons with their associated neutrinos.

5.2 Elective Courses

MPHE-025: Materials Science — 4 Credits

This elective course is designed to give a comprehensive knowledge about the materials observed around us. Apart from their nature, and various properties, we will discuss the synthesis methods adopted in preparation of various materials. It is important to study the properties of materials, since that is the main determining factor governing their applications.

This course will be offered in the form of recorded lectures from renowned professors from different prestigious institutions in India in the field of materials science available as Open Educational Resources (OERs) at NPTEL site. We will provide you with the links of these lectures and prescribe the sequence in which you should listen to these lectures so that you will understand the different topics of the course well. It is advisable to follow the sequence that we will prescribe, as it will help you in a thematically coherent study.

Syllabus

Nature of Material Structure and Morphology: Crystalline and amorphous nature of materials, Composition of materials; Morphology of materials, structure –property correlations.

Materials Processing: Powder technology for metallic, non-metallic, ceramics: Compaction, sintering, calcinations, annealing, vitrification reactions, quenching, Chemical (soft) synthesis techniques, Equilibrium and non-equilibrium process, Synthesis of thin films and surface layers of solids: Ion beam induced phenomena, laser assisted materials synthesis, physical and chemical vapour deposition techniques

Imperfections in Solids: Types of Defects: Point defects, impurities in solids, linear defects, dislocations, interfacial defects, volumetric defects, Causes of defects, Correlation of defects with properties (magnetic, optical and electrical) of materials

Phase Transformation and Rate Processes in Solids: Crystallization : Nucleation, growth rates, single crystal growth, zone refining, Solid solutions: Precipitation and dispersion strengthening, Diffusion Processes: Mechanism of diffusion in solids, steady & non-steady state diffusion, Fick's law ,Phase Transitions: Order parameter, liquid-solid transitions, glass transition, solid solutions and intermetallics, Phase Equilibrium Diagrams (with examples): Phase rules and equilibrium, Cooling curves, solid solution equilibrium diagram, Eutectic systems, Gibbs phase rule, Martensitic transformation

Properties of Materials: Mechanical properties:, Electrical properties: Conductivity of materials (metals, semiconductors [elemental and compound], superconductors), conducting polymers, ionic and fast ionic conductivity, introduction to molecular electronics, Optical properties, Magnetic materials and their properties, Chemical properties

Applications of Materials in Various Fields: Energy**,** Space**,** Environment**,** Biomedical**,** Defence, Industry etc.

MPHE-026: Elements of Reactor Physics — 4 Credits

Human need of nuclear energy is rapidly growing in the world. This is a challenge to be met, preferably through construction of more nuclear reactors. Towards this initiative, the world is looking

for fission as well as fusion reactors. Scientists are trying to create the sun on the Earth. The fission reactors are at advanced stages of construction in India.

In the course "Elements of Reactor Physics", we have covered basics of reactor physics. You will also learn about interactions of neutrons with matter. We have discussed in detail the basic mechanism by which neutrons lose or gain energy in a reactor. Transport equation and its solutions in approximate form-the diffusion equation-are also discussed for some simple physical systems.

Syllabus

Energy options, Q value of nuclear reactions, direct and compound nuclear reaction mechanisms, Compound nucleus, Reciprocity theorem, Breit-Wigner one-level formula, Resonance scattering. Fundamentals of nuclear fission, Fission neutrons: prompt and delayed neutrons, Neutron balance in a nuclear fission chain reaction, Effective multiplication constant and six factors formula, Calculation of fast fission factor ε, neutron reproduction factor η, thermal utilization factor f, and resonance escape probability p,fast neutron leakage probability p_f and thermal neutron leakage probability p_t. Reactor types including fast breeder reactor, breeding ratio, doubling time. Neutron moderation by elastic scattering, Calculation of slowing down density and energy spectrum in hydrogen, slowing down spectrum in heavier ($A > 1$) (i) non-absorbing and (ii) absorbing media (Wigner's approximation and Geolzel-Greuling approximation), neutron moderation by inelastic scattering, effect of anisotropy in scattering.

Derivation of space, energy and time-dependent neutron transport equation with delayed neutrons for multiplying and non-multiplying systems, P_n approximation, diffusion approximation.

One speed steady state diffusion equation, solution of diffusion equation in different geometries using different sources and boundary conditions. Two group theory, modified one group theory, Fermi age theory and its application to simple slowing down problem, Experimental determination of Fermi age, Properties of critical systems, a homogeneous multiplying system with and without reflectors.

MPHE-027: Nanoscience — 4 Credits

Nanoscience is the study of structures and molecules with sizes ranging from 1 to 100 nm with novel properties widely differing from their bulk counterparts. The dependence of these properties on the size, compositions and methods of preparation make it a rich and active area of research with applications that touch almost every aspect of modern day life ranging from medicine to electronics. In this course we try to provide a comprehensive overview of the different types of nanomaterials and their methods of synthesis, their novel electrical, optical, magnetic and dielectric properties and their wide ranging applications. Nanoscience is an area where you will see a convergence of physics, materials science and biology and this should bring home to you that a lot of modern day science is inherently interdisciplinary in nature.

Syllabus

Fundamentals of Nanoscience: Introduction to Nanostructures- Size & shape dependence, quantum confinement effects, societal implications (pros and cons).Typical nanostructures: Quantum dots, shells, core-shells, nanowires, nanotubes, nanorods, nanoplates, thin films, quantum corrals, cantilevers, porous materials, biological nanomaterials, nano-forms of carbon. Growth of nanostructures: Top-down and bottom-up approach of nanostructure formation, nucleation and growth.Physical Methods of Nanosynthesis: Mechanical methods, thermal evaporation, e-beam

deposition, molecular beam epitaxy, sputter deposition, plasma and ion beam assisted deposition, arc deposition, lithography. Chemical and Biological Route of Nanoparticle synthesis: Sol-gel method, Micellar growth, microemulsion routes, hard and soft template routes, microwave assisted synthesis, sonochemical route, Electrochemical route, CVD/MOCVD method, biosynthesis (S-layer and DNA based), Langmuir-Blodget films, self-assembly, hydrothermal methods, immobilization in matrices, separation and purification techniques. Stability of Nanostructures: Grain-growth over time period, phase transition and relaxation of residual stresses in nanostructures, chemical stability, stability against radiation, structural stability against deformation, colloids- flocculation and coagulation, degradation of nanobiosystems

Transport in Low Dimensional Systems: Transmission in nanostructures: Tunneling in planar barrier structures, Landauer formula, Landau levels, Classical Hall Effect Quantum Hall Effect, Fractional Quantum Hall Effect. Ballistic transport in quantum wires: Conductance quantization in quantum point contacts, Transport in Quantum dots: Single-electron tunneling in semiconductor quantum dots, coupled quantum dots as artificial molecules, Thermal effects: Electron-phonon interaction, melting point behaviour, thermal conductivity of nano materials.

Magnetic Properties: Magnetism in Finite Size Particles: Single domain particles, superparamagnetism, types and role of anisotropy, disorder and interactions. Measurement of Magnetic Properties: Hysteresis, ZFC – FC magnetization, ac susceptibility, memory effects.

Optical and Dielectric Properties of Semiconductor & Metal Nanostructures: Size effects on absorption and emission properties. Electronic, excitonic effects: Weak and strong-excitonic confinement, blue shift in semiconductors. Plasmonic behaviour in metals: Red shift effect.

Applications of Nanosystems: Nanotechnology in energy and environment sectors, Nanoelectronics, Nano-manipulation devices, Micro- and nanofluidics, Self-cleaning with lotus effect, Spintronic devices, Photonic devices, Nanosensors and transducers, Biomedical applications of nanomaterials. Manipulation devices, Micro- and nanofluidics, Self-cleaning with lotus effect, Spintronic devices, Photonic devices, Nanosensors and transducers, Biomedical applications of nanomaterials.

6. OTHER USEFUL INFORMATION

6.1 Refund of Fee

Refund of fee is governed by the Fee Refund Policy of the University. The same is available on the University Admission Portal (https://ignouadmission.samarth.edu.in). Fee paid for one programme is not adjustable against any other programme of the University. In case the University denies admission, the programme fee will be refunded after deduction of registration fee, through online mode.

6.2 Reservation

The University provides reservation of seats for Scheduled Castes, Scheduled Tribes, Non-Creamy Layer of OBC, Economically Weaker Sections, War Widows, Kashmiri Migrants and Physically Handicapped learners, as per the Government of India rules, for admission to its various programmes. However, submission of forged certificate under any category shall be liable for not only cancellation of admission but also to be legally implicated as per Government of India rules. Eligible students can

apply for Government of India scholarship on the National Scholarship Portal (**https://scholarships.gov.in/**) after confirmation of their admission.

6.3 Correction of Address and Study /Regional Centre Change

Learners can initiate the request for change of address, Learner Support Centre and Regional Centre online from their user account. The user account is to be created at https://ignou.samarth.edu in by clicking'New Registration. They can also make a request to the Regional Centre.

6.4 Correction/Change of Name/Surname of Learner

Spelling mistakes, if any, committed at the time of data entry stage will be rectified at the Regional Centre. In case there is a change in the name (other than the one mentioned in his/her High School Certificate), then it is mandatory to furnish legal evidence of having changed his/her name/ surname while submitting the admission form.

For 'Change of Name/Surname', after confirmation of admission, the learners are required to submit thefollowing documents at the Regional Centre:

a) Original copy of Notification in a daily newspaper notifying the change of name;

b) Affidavit, in original, on non-judicial Stamp Paper of the appropriate value sworn in before 1st Class Magistrate specifying the change in the name;

c) Marriage Card/ Marriage Certificate in case of women candidates for change in surname;

d) Gazette Notification, in original, reflecting the change of name/surname; and

e) The requisite fee.

Request for correction and/or change of Name / Surname will be entertained only before completion of the programme.

6.5 Disputes on Admission & other University Matters

The place of jurisdiction of filing of suit, if necessary, will be New Delhi/Delhi ONLY.

6.6 Prevention of Malpractice/Notice for General Public

Learners seeking admission to various academic programmes of Indira Gandhi National Open University are advised to directly contact IGNOU headquarters at New Delhi or Regional Centres of IGNOU only. Learners interacting with intermediaries shall do so at their own risk and cost. However, in case of any specific complaint regarding fraudulent institutions, fleecing learners etc., please contact the University through:

Email: ignouregistrar@ignou.ac.in

As per directions of Hon'ble Supreme Court of India ragging is prohibited. If any incident of ragging comes to the notice of the authority the concerned learner shall be given liberty to explain and if his explanation is not found satisfactory, authority would expel him from the University. IGNOU admissions are made strictly on the basis of merit. Only those learners who satisfy the eligibility criteria fixed by the university will be admitted. Learners will not be admitted if they are not eligible as per the eligibility criteria. Therefore, the candidates should not be misled by the false promises of admission made by any private individuals or institution.

6.7 Placement Services

In order to further extend learner support services to its geographically distributed learner population who are pursuing various IT and Non-IT related Degree, Diploma and Masters Programme, the university hasestablished the Campus Placement Cell (CPC). The mission and endeavour of CPC is to enhance and facilitate the process of prospective suitable employment opportunities that are commensurate with the personal profiles of our learners. All learners interested in seeking the assistance of CPC for procuring suitable job opportunities are requested to send their current resume/bio-data to campusplacement@ignou.ac.in. They are further advised to visit our home page www.ignou.ac.in for regular updates on placement related activities.

6.8 Some Useful Contact Addresses

1.	Identity Card, Fee Receipt, Bonafide Certificate, Migration Certificate, Scholarship forms, Change of Courses / Electives / Opting of left over electives	Concerned Regional Centre. The demand Draft for the requisite should be drawn in favour of 'IGNOU' payable at city of the Regional Centre.
3.	Schedule/Information regarding Exam-form, Entrance Test, Date-sheet, Hall Ticket	Asst. Registrar (Exam. II), SED, Block-12, Room No. 02, IGNOU, Maidan Garhi, New Delhi-110068. Ph.: 011-29536743, 29572202, 29572209
4.	Result, Re-evaluation, Grade Card. Provisional Certificate, Early Declaration of Result, Transcript	Deputy Registrar (Exam.III), SED, Block-12, Room No. 01, IGNOU, Maidan Garhi, New Delhi-110068. Ph.: 011-29536103, 29572201, 29571316
5.	Non-reflection of Assignment Grades/marks	Assistant Registrar (Assignment), SED, Block-03, IGNOU, Maidan Garhi, New Delhi-110068. assignment@ignou.ac.in. Ph.: 011-29571312, 29571319, 29571325
7.	Original Degree/Diploma/ verification of degree/diploma	Deputy Registrar (Exam. I), SED, Block-9, IGNOU, Maidan Garhi, New Delhi-110068. Ph.: 011-29535438, 29572224, 29572213
8.	Student Grievance (SED)	Asst. Registrar (Student Grievance), SED, Block-3, Room No.13, IGNOU, Maidan Garhi, New Delhi-110068. Ph.: 011-29532294, 29571313
9.	Academic Content	Director, School of Sciences, IGNOU, Maidan Garhi, New Delhi-110068. sos@ignou.ac.in. Ph.: 011-29532167; 29572832

10.	Student Support Services	Regional Director, Student Service Centre, IGNOU, Maidan Garhi, New Delhi-110068. ssc@ignou.ac.in, Ph.: 011-29535714, 29533869,2953380, Fax: 011-29533129

7. LINKS TO FORMS AND ENCLOSURES

In this section, we are listing the IGNOU website links to various forms, which are useful for you. Whenever you have to correspond with the university, please **download the form from the IGNOU website**, fill it carefully and send it as per the instructions in the form. The detailed instructions for all these forms are provided in the form itself. Some of these links may change, in that case please use the search option to find the desired link. An important page for all students is the following:

http://ignou.ac.in/ignou/studentzone

You must familiarize yourself with all the links on this page.

Note: You may download the Forms from the Website

1. **Assignment related links**
   Link to Latest Assignment(s): https://webservices.ignou.ac.in/assignments/

2. **Re-registration**
   Link to Online Re-Registration https://onlinerr.ignou.ac.in/

   Last date of Re-Registration is announced on the IGNOU website. In general, the re-registration is to be done 2-3 months prior to the start of Session. For example, the last date of re-registration for the session starting from July cycle is typically the end of May. Similarly, the last date for session starting January cycle may be in the last of November.

   You must verify the cut off dates and fees from the website prior to filling up form.

3. **Term-end Examination and Related Links**

   The link to the **online Term End Examination form** is available on

   https://exam.ignou.ac.in/

   Links to application forms for

   - Early Declaration of Result
   - Obtaining Photocopy of the Answer Script
   - Re-evaluation of Answer script
   - Duplicate Grade Card/Mark-sheet
   - Issue of Official Transcript

   are all available on: http://ignou.ac.in/ignou/studentzone/forms/1

   The form for **the Issue of Migration Certificate** is available at

   http://ignou.ac.in/ignou/studentzone/download/Applicationformc

Please keep checking the **News and Announcements** section of the IGNOU website for all important announcements regarding admissions, assignment submission dates, term-end examination schedules and re-registration.

4. Other Important Links

Link for Checking Study Material Status
http://www.ignou.ac.in/ignou/aboutignou/division/mpdd/material