CHAPTER - IV

ANALYSIS OF THE DATA, INTERPRETATION AND COMPARISON

The investigator analysed the data separately for IGNOU and Conventional Colleges according to the percentage opinion of the Students, Counsellors / Teachers and Co-ordinators / Principal of the college and finally pooled their opinion, interpreted and presented them with a comparative view. The following points were taken into consideration.

- Admission Procedure
- Infrastructure
- Staff Pattern
- Physics Course Content
- Methodology of Teaching - Learning Process
- Library Facilities
- Physics Laboratory Facilities
- Co-curricular Activities
- Evaluation, Result and Award.
ADMISSION PROCEDURE
ADMISSION PROCEDURE - IGNOU

In the IGNOU study centres admission for B.Sc. physics course is given with the following pre-requisite qualification.

1) He/She should have passed PUC-II stage with science subjects or its equivalent qualification.

2) No age restriction.

3) No entrance test / exam

4) Can complete B.Sc. within 3-8 years maximum.

Following is the fee structure, schedule of payment, reservation, scholarship and reimbursement of fees.

Fee Structure

IGNOU has moderate programme fee structure for B.Sc. course. The following table shows the fee structure and the mode of payment of fees.

Table :13 - Showing the fee structure of IGNOU B.Sc. course and mode of payment.

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount Rupees(P.F+LF+EF)</th>
<th>When and how to pay</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.Sc.-I</td>
<td>Rs.1600/- p.a</td>
<td>Along with the admission form</td>
</tr>
<tr>
<td>B.Sc.-II</td>
<td>Rs.1600/-p.a</td>
<td>During Ist August -1st October along with prescribed re-registration form.</td>
</tr>
<tr>
<td>B.Sc.-III</td>
<td>Rs.1600/-p.a</td>
<td>During Ist August -1st October along with prescribed re-registration form.</td>
</tr>
</tbody>
</table>

P.F. - Programme fee, L.F. - Laboratory fee, E.F. - Examination fee
It clearly shows that IGNOU B.Sc. students have to pay Rs.1600/- per annum every year for all the three years of B.Sc. I, II and III which includes the programme fee, laboratory fee and the examination fees. The mode of payment is along with the admission form. The second year fee is paid during the 1st August -1st October along with prescribed re-registration form and the third year fee is paid in the similar way.

Reservation

The university provides reservation of seats for scheduled castes, scheduled tribes, other backward classes, wards of defence personnel who either live or were seriously injured and for the physically handicapped students as per the Government of India rules.

Scholarships and Reimbursement of Fees

Reserved categories, viz scheduled castes, scheduled tribes, other backward classes and physically handicapped students have to pay the fees at the time of admission to the university along with other students.

Physically handicapped students admitted to IGNOU are eligible for Government of India scholarships. They are advised to collect scholarship forms from the respective State Government Directorate Of Social Welfare or Office of the Social Welfare Officer and submit the filled in forms to them through the Regional Director concerned.

Similarly, SC/ST, and other backward class students also have to collect and submit the filled in scholarship forms to the respective States Directorate of Social Welfare or Office of the Social Welfare Officer, through the concerned Regional Director of IGNOU for reimbursement of programme fee.
Terms: There are two terms every year at IGNOU B.Sc. course. Apart from this students have to attend practical work which will be commencing usually during summer and autumn vacations when the conventional colleges are free.

ADMISSION PROCEDURE - CONVENTIONAL COLLEGES

In the conventional colleges all the six universities in Karnataka the admission procedure for B.Sc. course is more or less similar.

1) He/She should have passed PUC-II stage with science subjects or its equivalent qualification.

2) Twelfth class passed with science subjects or its equivalent qualification.

3) Diploma degree holders.

4) Age restriction within 20 years

5) No entrance exam

6) Selection of students on the basis of merit / rosterwise.

7) Seats restriction as per university rules.

Following is the fee structure, schedule of payment, reservation, scholarship and reimbursement of fees.

Fee Structure

The fee structure of conventional colleges of all the six universities is not uniform. Some universities are opting more fee than the others but it is lesser than the IGNOU.
The students belonging to scheduled caste / scheduled tribe and category-I will get full freeship along with scholarship for hostel facility and other equipments. Such students are also eligible to take admission in any of the colleges of six universities.

Similarly economically weaker section students will get freeship facility likewise Physically Handicapped / Children of Defence Academy / Children of Political Sufferers.

There is a wide scope for students to opt for particular group of the B.Sc. course.

**Following table Shows the Age Group of B.Sc. Physics Course Students of IGNOU Study Centres**

Table :14- Showing the study centres and age group of B.Sc. Physics Course Students of (IGNOU).

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Study centre</th>
<th>Age Group of B.Sc. PHE -(Physics) course students (IGNOU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dharwad</td>
<td>20-38</td>
</tr>
<tr>
<td>2.</td>
<td>Bangalore</td>
<td>21-45</td>
</tr>
<tr>
<td>3.</td>
<td>Goa</td>
<td>20-43</td>
</tr>
</tbody>
</table>

It clearly shows that at Dharwad study centre the physics course students are in the age group of 20-38. Bangalore study centre ranges from 21-45 and Goa study centre ranges from 20-43 years age group.
Following table shows the Age Group of B.Sc. Physics Course Students of 12 Science Colleges of Six Conventional Universities in Karnataka.

Table: 15 - Showing the age group of B.Sc. physics course students of 12 science degree colleges of six conventional universities in Karnataka.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Conventional universities</th>
<th>Name of the science degree colleges</th>
<th>Age-group of B.Sc. physics course students.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bangalore</td>
<td>a) Government science college</td>
<td>91-22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N.R.circle, Bangalore</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Venkatappa college of arts</td>
<td>19-21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>science &amp; commerce college</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chikkaballapur.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gulbarga</td>
<td>a) Vijayanagar college, Hospet</td>
<td>19-21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Veersaiva college, Bellary</td>
<td>19-21</td>
</tr>
<tr>
<td>3</td>
<td>Karnataka</td>
<td>a) J.S.S. college, Dharwad</td>
<td>19-21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) G.H. college, Haveri</td>
<td>19-22</td>
</tr>
<tr>
<td>4</td>
<td>Kuvempu</td>
<td>a) S.B. college Sagar</td>
<td>19-21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Sahayadri college, Shimoga</td>
<td>19-21</td>
</tr>
<tr>
<td>5</td>
<td>Mangalore</td>
<td>a) M.G.M. college, Udupi</td>
<td>19-22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Yenupoya college, Mangalore</td>
<td>19-21</td>
</tr>
<tr>
<td>6</td>
<td>Mysore</td>
<td>a) Yuvaraja's college, Mysore</td>
<td>19-21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Arts and science college,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mandya.</td>
<td></td>
</tr>
</tbody>
</table>

It clearly shows that majority of the colleges are in the age group of 19-21 years of age, but in one or two colleges some students are in the age group of 19-22 years of age group.
COMPARISON OF ADMISSION PROCEDURE OF IGNOU AND CONVENTIONAL B.Sc. COURSE.

Regarding the admission procedure, IGNOU and conventional colleges have same status for the students. IGNOU has not specified the age limit for admission which is more flexible and there is no restriction also about the total number of admission. They admit all eligible candidates whereas, in conventional colleges there is age restriction. There is also restriction imposed for the strength of the students according to the capacity and the infrastructure of the college.

Regarding the fee structure no doubt IGNOU has little higher fees than the conventional colleges but if we look into the different component of fee structure it will be less than the conventional colleges. This means the fees include tuition fee, examination fee, laboratory fee etc.

Whereas in conventional colleges they take examination fee separately and the term fee includes tuition fee, laboratory fee, gymkhana fee etc. which will be more than IGNOU fee structure. Another important point to be noted is that of print material supplied to each and every student which includes in the programme fee of B.Sc. course. Such facilities are not found in the conventional colleges.

In the IGNOU fee structure, we are unable to trace the gymkhana fees etc. But in the conventional colleges a lot of scope and other facilities are provided for the scheduled caste, tribe, category-I students than IGNOU.
INFRASTRUCTURE
Opinion of the IGNOU B.Sc. - PHE (Physics) Students Regarding the Infrastructure.

1) 75% of the students expressed that the building of the study centre is fairly satisfactory.

2) 85% of the students expressed that the office room is single in nature.

3) 80% of the students expressed that the staff room is not separately available.

4) 80% of the students expressed that the class rooms for counselling are satisfactory.

5) 80% of the students expressed that they are not sure about the availability of the PHE department.

6) 81% of the students expressed that they are not satisfied with the library building / facilities.

7) 46% of the students expressed that they are satisfied with the PHE laboratory facilities.

8) 50% of the students expressed that the hostel facility is not available for boys.

9) 50% of the students expressed that the hostel facility is not available for girls.

10) 75% of the students expressed that the computer facility is not available in the study centre.
11) 85% of the students expressed that internet facility does not exist.

12) 94% of the students expressed that the xerox facility is not available in the study centre.

Opinion of the IGNOU PHE - Counsellors Regarding the Infrastructure.

1) 52% of the counsellors expressed that the building of the study centre is fairly satisfactory.

2) 55% of the counsellors expressed that the office room is single in nature.

3) 88% of the counsellors expressed that the staff room is not found.

4) 55% of the counsellors expressed that the class rooms are available for counselling.

5) 50% of the counsellors expressed that the PHE department is available.

6) 53% of the counsellors expressed that the library building / facilities is fairly satisfactory.

7) 55% of the counsellors expressed that the PHE - laboratory facility is satisfactory.

8) 52% of the counsellors expressed that they do not know about the availability of boys hostel.

9) 52% of the counsellors expressed that they do not know about the availability of girls hostel.
10) 50% of the counsellors expressed that they do not know about the availability of the computer facility.

11) 50% of the counsellors expressed that they do not know about the availability of the internet facility.

12) 91% of the counsellors expressed that the xerox facility is not available.

Opinion of all the Three IGNOU Coordinators of the Study Centres Regarding the Infrastructure.

The Coordinators of all the three IGNOU study centres have expressed as follows.

1) that the building of the study centre is fairly good.

2) that the office room is available.

3) that there is no separate staff room for counsellors.

4) that the classrooms are sufficient.

5) that the PHE (physics) department is available.

6) that the library building / facilities is fairly satisfactory.

7) that PHE laboratory is available.

8) that the girls hostel is available.

9) that the boys hostel is available.
10) that the computer facility is available

11) that the internet facility is not available

12) that the xerox facility is not available.

**IGNOU - Infrastructure**

The investigator pooled out the opinion of B.Sc. physics students, counsellors and the coordinators and concluded as follows.

1) The building of the study centre is fairly good. This is because IGNOU is housed in a well reputed college.

2) Only an office room for each IGNOU study centre is available with necessary furnitures.

3) In any of the three IGNOU study centres there is no separate staff room. The counsellors are seated in the co-ordinators chamber. This may be because the counsellors are not permanent employees of IGNOU.

4) There are enough class rooms with necessary furnitures in all the three IGNOU study centres. This is again due to the memorandum of Understanding (MOU) with respect to colleges and universities. Apart from this there is one counselling room available within the study centre.

5) In all the three study centres the physics department of the conventional colleges where the IGNOU is housed has been utilised. The department will be kept open when IGNOU students are performing experiments. But no conventional college staff are found.
6) The physics laboratory of the conventional college where the IGNOU study centre is housed has been utilised. Hence the laboratory is well equipped. This may be due to MOU with universities and respective colleges.

7) In any of the three IGNOU study centres separate library building or library section is not found in a systematic manner. However the study centre libraries are only reference libraries for students. Any how the investigator noted few racks and cupboards full of books kept in the office room. The services which are provided at the central library and regional libraries are not available in all the three study centre libraries.

8) Hostel facilities for both ladies and gents are available only on demand. Investigator came to know that during term-end examination and laboratory session such facilities are extended on demand.

9) There is one computer found in each of the three study centres. It is kept in the coordinator's room/office room of the study centre which is used for office purpose only. Hence the computer is not utilised for the instruction or information purpose.

10) So far there is no internet facility available in all the three study centres. However the coordinators expressed that they are likely to get internet facility within a short period of time.

11) No xerox facility is found in all the three study centres.

1) 90% of the students expressed that the college building is very good.

2) 88% of the students expressed that the office room is well equipped.

3) 90% of the students expressed that the staff room is separately available.

4) 91% of the students expressed that the class rooms are sufficient and full in number.

5) 85% of the students expressed that the physics laboratory is well equipped.

6) 88% of the students expressed that the physics laboratory is well equipped.

7) 88% of the students expressed that the library is sufficient and well equipped.

8) 94% of the students expressed that the ladies room is available.

9) 92% of the students expressed that the hostel for boys is available.

10) 94% of the students expressed that the hostel for girls is available.

11) 85% of the students expressed that the recreation hall is available.

12) 88% of the students expressed that the computer facility is available.

13) 71% of the students expressed that the internet facility is available.

14) 80% of the students expressed that the xerox facility is available.

15) 93% of the students expressed that the canteen facility is available.
Opinion of the Physics Teachers of Conventional Colleges regarding the Infrastructure.

1) 85% of the teachers expressed that the college building is very good.

2) 92% of the teachers expressed that the office room is well equipped.

3) 96% of the teachers expressed that the staff room is separately, available.

4) 95% of the teachers expressed that the class rooms are sufficient and full in number.

5) 91% of the teachers expressed that the physics department is well equipped.

6) 90% of the teachers expressed that the physics laboratory is well equipped.

7) 92% of the teachers expressed that the library is sufficient and well equipped.

8) 98% of the students expressed that the ladies room is available.

9) 90% of the teachers expressed that the hostel for boys is available.

10) 90% of the teachers expressed that the hostel for girls is available.

11) 89% of the teachers expressed that the recreation room is available.

12) 91% of the teachers expressed that the computer facility is available.

13) 76% of the teachers expressed that the internet facilities are available.
14) 84% of the students expressed that the xerox facility is available.

15) 90% of the students expressed that the canteen facilities is available.

Opinion of the Principals of Conventional Colleges Regarding the Infrastructure.

1) 95% of the principals expressed that the college building is good.

2) 93% of the principals expressed that the office room is well equipped.

3) 96% of the principals expressed that the staff room is separately available.

4) 96% of the principals expressed that the class rooms are sufficient and full in number.

5) 93% of the principals expressed that the physics department is well equipped.

6) 94% of the principals expressed that the physics laboratory is well equipped.

7) 95% of the principals expressed that the library is sufficient and well equipped.

8) 100% of the principals expressed that the ladies room is available.

9) 91% of the principals expressed that the hostel for boys is available.
10) 95% of the principals expressed that the hostel for girls is available.

11) 100% of the principals expressed that the recreation room is available.

12) 95% of the principals expressed that the computer facility is available.

13) 80% of the principals expressed that the internet facility is available.

14) 88% of the principals expressed that the xerox facility is available.

15) 95% of the principals expressed that the canteen facility is available.

**Conventional Colleges Infrastructure - Combined Opinion**

The investigator also pooled out the opinion of B.Sc. physics students, teachers and the principals of the conventional science colleges and came to a conclusion as follows.

1) The building of the science college is very good.

2) A big separate office room is seen with well equipped furnitures and other necessary equipments.

3) All the colleges have a well equipped staff room.

4) There are enough classrooms with sufficient furnitures for both teachers and students.

5) All the colleges have a separate physics department of its own which is well equipped.
6) The physics laboratory of all the colleges is well equipped with required amenities and is satisfactory.

7) All the colleges have a separate library building or library section. The investigator noted large number of racks cupboards, shelves full of books like text books, reference books, source books periodically encyclopedias and journals of physics education.

8) Separate hostel facilities are available for both boys and girls which is well equipped with all amenities.

9) There are one or two computers found in almost all the colleges with internet facility also. These computers are utilised for the office purpose and for other instructions and information.

10) Xerox facilities is available in all the colleges.

**Comparison of IGNOU and Conventional Colleges about Infrastructure.**

The investigator duly analysed and interpreted the infrastructure facilities existing in both IGNOU study centres as well as in the conventional science colleges selected for the study.

The main objective of the study is to know the comparative view of the IGNOU B.Sc. physics course to that of other conventional colleges physics course at the degree level. Hence the investigator duly compared the infrastructure facilities of the IGNOU as well as the conventional colleges and found the following aspects

1) The building of IGNOU study centre and the space available is fairly satisfactory.
Whereas, the building and the space available for B.Sc. physics course students is very good and adequate in all the conventional colleges.

The IGNOU study centres are established in a highly reputed colleges in accordance with Memorandum of Understanding (MOU) with the respective universities and colleges. Hence the IGNOU study centres are located in a well established colleges and hence the infrastructural facilities are fairly satisfactory and good. However the conventional colleges where physics course is run are bounded by 2F and 12B of the UGC regulation and every year University Grant Commission gives a lot of funds to improve the infrastructural facilities of the colleges. Hence we find the best infrastructural facilities in all the science degree colleges.

2. The IGNOU study centre is normally having a single office room wherein a clerk and a peon are found to be working. The Coordinator & Assistant Coordinator are accommodated there itself. The whole staff of IGNOU are not the permanent employes. They are working on honorarium bases. The furnitures are enough.

Whereas, in conventional science colleges one or two office rooms, many clerks, peons, attainers and other supporting staff are seen. Separate principals chamber, superintendent’s chamber both for cash and office is also found. There is store room, type writer & computer room is also seen.

3. No separate staff room is found in any of the IGNOU study centres. But sufficient number of class rooms are found along with staff rooms in almost all the science colleges.
4. Every IGNOU study centre do not have a separate PHE-(physics) department. As regards the number of staff to teach the PHE course are also too less in number.

Whereas, in each of the conventional colleges we find separate physics department with full facilities. There is head of the physics department and about 8-16 teaching staff are present in the college.

5. It is observed that no separate library building is available in all the three IGNOU study centres. Library is located as a portion of the study centre with some relevant books kept in the racks and cupboards. No reading room is seen. Whereas, in conventional colleges, library building is seen separately. There are large number of racks, cupboards, shelves found with sufficient books.

6. In all the IGNOU study centres the physics laboratory of the conventional college is being utilised. Hence IGNOU do not have its own physics laboratory set up. Again this is due to Memorandum of Understanding (MOU) with colleges and universities.

Whereas every conventional college have its own physics laboratory set up with all the facilities like human and material resources.

7. There is no permanent hostel facility for IGNOU students. However such facility will be extended to the students during the term end examinations and laboratory session, only on demand. But the Coordinator's expressed that so far no such demand was made by the students.

Whereas, most of the science colleges have 2-3 separate hostel for both boys and girls with all facilities. There will be a hostel warden appointed for hostel purpose which is necessarily the staff of the conventional college. Hence the hostels for both boys and girls are very good.
8. In IGNOU study centres only a computer is seen which is utilised for office purpose only, and not for instruction and information for the students. The investigator did not see the internet facility and xerox facility in all the three study centres.

Whereas, in the conventional colleges a separate computer laboratory has been established both for instruction and information purpose. Internet facilities are also seen. Xerox facilities are also available in all the colleges either in the library or in the office room. Apart from this 2-3 computers are also seen in the office room.

Conclusion

IGNOU has succeeded in providing adequate infrastructural facilities like building staff, teaching as well as non teaching, basic equipments, library, furniture etc. This is based on Memorandum of Understanding (MOU) with the State Government for providing them rent free accommodation and hence no rent is paid to the conventional colleges where the IGNOU study centre is located. However as far as utilisation part is concerned it was much below the expected standards. Whereas, conventional colleges have very good infrastructure of its own. It is also expressed by the students, teachers and principals that they are very much satisfied with the facilities of the college.
STAFF PATTERN - IGNOU STUDY CENTRES

Right up to present, IGNOU science study centres do not have permanent staff of its own but they are experienced teachers coming from different conventional colleges to counsel at these study centres in the required discipline. For PHE (Physics) course also, IGNOU has invited the experienced teachers from the science colleges around the study centre.

Table :16 - Showing the name of the study centres and the total number of counsellors

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Study centre</th>
<th>Total Number of counsellors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>J.S.S.College Vidyagiri</td>
<td>06</td>
</tr>
<tr>
<td>2.</td>
<td>Government science college N.R.Circle Bangalore</td>
<td>10</td>
</tr>
<tr>
<td>3.</td>
<td>Dhempe college of Arts and Science Miramer, Panaji Goa.</td>
<td>08</td>
</tr>
</tbody>
</table>

By looking into the above table it is quite clear that Dharwad study centre has six counsellors, Bangalore study centre has ten counsellors and Goa study centre has eight counsellors to counsel. All the counsellors are working on a temporary basis.
Staff Pattern of Physics Department of Conventional Colleges.

Every science college is having a separate physics department of its own wherein we find a senior most teacher as Head of the Department and there are at least 8-16 staff members in each department.

Table: 17 - Showing the name of the College and the numbers of Teachers in the Conventional Colleges in Physics Department.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the college</th>
<th>Total number of teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Govt Sc. College Bangalore</td>
<td>12</td>
</tr>
<tr>
<td>2.</td>
<td>Venkatappa College of Arts Science Chikkaballapur</td>
<td>10</td>
</tr>
<tr>
<td>3.</td>
<td>Vijayanagar college Hospet</td>
<td>08</td>
</tr>
<tr>
<td>4.</td>
<td>Veerasaiva college Bellary</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>J.S.S. college Vidyagiri, Dharwad</td>
<td>14</td>
</tr>
<tr>
<td>6.</td>
<td>G.H.College Haveri</td>
<td>08</td>
</tr>
<tr>
<td>7.</td>
<td>S.B.college Sagar</td>
<td>06</td>
</tr>
<tr>
<td>8.</td>
<td>Sahyadri college Shimoga</td>
<td>06</td>
</tr>
<tr>
<td>9.</td>
<td>M.G.M.college, Udupi</td>
<td>06</td>
</tr>
<tr>
<td>10.</td>
<td>Yenu Pooya college Mangalore.</td>
<td>08</td>
</tr>
<tr>
<td>11.</td>
<td>Yuvarajas college, Mysore</td>
<td>12</td>
</tr>
<tr>
<td>12.</td>
<td>Arts and Science college, Mandya.</td>
<td>09</td>
</tr>
</tbody>
</table>
By looking into the table :17- it is quite clear that all the colleges have sufficient teachers to teach different areas of physics. Most of them are working on permanent basis. Only one or two are working on a temporary basis.

**Comparative View of Staff Pattern of IGNOU and Conventional Science Colleges.**

By looking into the staff pattern of IGNOU and conventional colleges the investigator observed that

1. All the three study centres do not have permanently appointed staff members to counsel physics course. The counsellors are necessarily appointed from the conventional science colleges around the study centre on temporary basis. Whereas all the twelve science colleges have full fledged permanently appointed physics teachers to teach the students.

2. The academic counsellors are paid honorarium as per guest lecture basis. The investigator found that only 3-4 teachers from each study centre are trained by IGNOU and hence they are called as academic counsellors to counsel IGNOU B.Sc. students. Whereas, conventional teachers are permanently appointed and they are getting U.G.C. scales and the teachers are getting monthly salary and all the twelve colleges are of affiliated type and they come under Grant-in-aid system.

3. IGNOU has meagre counsellors to counsel different areas of physics.

Whereas conventional colleges have sufficient teachers to teach different areas of physics.
4. Most of the counsellors of IGNOU are holding good academic qualification like M.Phil and Ph.D. It is quite known fact that most of the counsellors are drawn from the conventional colleges and hence these counsellors hold good academic qualification.

Whereas, conventional college teachers have well qualified teachers holding M.Phil and Ph.D. degree.

5. IGNOU does not have a separate physics department. The counsellors are made to be seated in coordinators chamber. They come at the time of counselling and go away immediately after completing the counselling session. So there is no separate department for the counsellors to sit and discuss the subject. Whereas, in conventional colleges there is a separate physics department wherein all the teachers teaching physics subject are seated in one roof. We find senior most as the Head of the Department who manages the whole instructional process. There are 8-16 staff members. Each teacher is having a minimum of 5 years of teaching experience to the maximum of 32 years. One or two teachers are working on temporary basis.
PHYSICS COURSE CONTENT
PHYSICS COURSE CONTENT

Indira Gandhi National Open University (IGNOU) B.Sc-PHE (Physics) Course Content.

IGNOU follows the credit system for its Bachelor's degree programme in science (B.Sc.). The school of sciences has prepared courses for the Bachelor's degree programme in science. IGNOU has a common course content for PHE (physics) throughout the nation. It constitutes PHE-01 to PHE-12. But recently in January 2000, PHE-13 and PHE-14 have been newly introduced. The investigator has taken only from PHE-01 to PHE-12 under study. These units include the total physics content for the degree course. PHE-3(L), 8(L) and 12(L) are laboratory course content. The major topics containing the physics course content are.

1. Elementary mechanics (PHE-01)
   - Concept in Mechanics, System of Particles

2. Oscillations and Waves PHE-02
   Oscillations - Simple Harmonic Motion, Damped
   Harmonic Motion, Coupled Oscillations
   Waves - Wave Motion, Waves at the boundary of two media, Superposition of waves I and II

3. Physics Laboratory - I (PHE - 03 (L)
   a) Some Experiments on Oscillations and Waves (About - 5 experiments)
   b) Some Experiments on Mechanical and Electrical properties of materials (about six experiments)

   - Vector calculus
   - Probability and Statistics.

5. Mathematical Methods in physics -II (PHE - 05)
   - Ordinary Differential Equations
6. Thermodynamics and statistical Mechanics (PHE-06)

- The zeroth and the first hours of thermodynamics
- The second and the third hours of thermodynamics
- Elementary kinetic theory

7. Electric and Magnetic phenomena (PHE - 07)

- Electrostatics in free space
- Electrostatics in medium
- Electric current and magnetic field
- Electromagnetics

8. Physics laboratory -II (PHE-08(L)

- Electrical Circuits and Electronics
- Optics and Thermodynamics

( About 1-14 experiments )

9. Optics & (PHE - 09)

- Introducing light - Interference diffraction
10. Electrical circuits and electronics (PHE-10)
  - Network analysis and devices
  - Electronic circuits
  - Linear integrated circuits
  - Digital electronics

11. Modern physics (PHE -11)
  - Special theory of relativity
  - Introduction to quantum mechanics
  - Application of quantum mechanics to some systems.
  - Nuclear physics.

12. Physics laboratory - III (PHE -12(L))
  - Experiments on wave optics
  - Experiments on Galvanomagnetic phenomena and electronic circuits.
  - Experimental data analysis

13. PHE -13 Physics of solids

14. PHE -14 Mathematical Methods in physics -III
While going through the above syllabi of course it is noted that each course has been divided into a number of blocks generally 8 blocks for 8 credits courses and 4 to 5 blocks for 4 credits courses. Each block has a number of units (lessons). The units of a block have a certain thematic unity. The physics course material is provided to the students in the form of well designed printed booklets. Each booklet is called a block and contains a few units. The first page of each block indicates the numbers and titles of the units comprising the block. In the first block of each course it starts with course introduction. This is followed by a brief introduction to the block. Each unit begins with an introduction in which it tells about the contents of the unit. This is divided into various sections and sub-sections. Then each unit ends by summarising its contents so that a student enables to recall the main points. In each unit, there are several Self-Assessment Questions (SAQs) / exercises. These help the student to assess his/her understanding of the subject matter. So all the units are very systematically dealt and are represented in the form of print material.

The bachelor's degree programme has three major components:

<table>
<thead>
<tr>
<th>1. Foundation courses</th>
<th>24 credits</th>
<th>24 credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Elective courses</td>
<td>64 credits or 56 credits</td>
<td></td>
</tr>
<tr>
<td>3. Application Oriented course</td>
<td>8 credits</td>
<td>16 credits</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>96 credits</td>
<td>96 credits</td>
</tr>
</tbody>
</table>

The university follows credits system for its bachelor's degree programme. Each credit amounts to 30 hours of study comprising all learning activities. Thus, a four credit course involves 120 study hours and an eight credit course involves
240 hours of study hours. To successfully complete this programme one has to earn 96 credits over a period of 3 to 8 years depending upon convenience. However, he/she will not be allowed to earn more than 32 credits in a year.

**Foundation course**

Foundation courses are compulsory for all the students who want to obtain bachelor's degree. A learner has to earn 24 credits of foundation courses. Following is the list of Foundation Course.

Table : 18 - List of Foundation Course - IGNOU

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compulsory course</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FHS - 1</td>
<td>Foundation course in humanities and social sciences</td>
<td>8</td>
</tr>
<tr>
<td>FST - 1</td>
<td>Foundation course in science and technology</td>
<td>8</td>
</tr>
<tr>
<td>FEG - 1</td>
<td>Foundation course in English - I</td>
<td>4</td>
</tr>
<tr>
<td>And any one of the following courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEG-2</td>
<td>Foundation course in English</td>
<td>4</td>
</tr>
<tr>
<td>FHD-1</td>
<td>Foundation course in Hindi</td>
<td>4</td>
</tr>
<tr>
<td>FAS-1</td>
<td>Foundation course in Assamese</td>
<td>4</td>
</tr>
<tr>
<td>FBG-1</td>
<td>Foundation course in Bengali</td>
<td>4</td>
</tr>
<tr>
<td>Course code</td>
<td>Course title</td>
<td>Credits</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>FGT-1</td>
<td>Foundation course in Gujarati</td>
<td>4</td>
</tr>
<tr>
<td>FKD-1</td>
<td>Foundation course in Kannada</td>
<td>4</td>
</tr>
<tr>
<td>FML-1</td>
<td>Foundation course in Malayalam</td>
<td>4</td>
</tr>
<tr>
<td>FMT-1</td>
<td>Foundation course in Marathi</td>
<td>4</td>
</tr>
<tr>
<td>FOR-1</td>
<td>Foundation course in Oriya</td>
<td>4</td>
</tr>
<tr>
<td>FPB-1</td>
<td>Foundation course in Punjabi</td>
<td>4</td>
</tr>
<tr>
<td>FTM-1</td>
<td>Foundation course in Tamil</td>
<td>4</td>
</tr>
<tr>
<td>FTG-1</td>
<td>Foundation course in Telugu</td>
<td>4</td>
</tr>
<tr>
<td>FUD-1</td>
<td>Foundation course in Urdu</td>
<td>4</td>
</tr>
</tbody>
</table>

To earn 24 credits in foundation courses, one has to compulsorily take FHS-1, FSF-1, FEG-1 and any one of the remaining courses.

**Elective Courses**

The elective courses are basically discipline oriented courses. Under the category of elective courses, one has to earn 56 to 64 credits. Total credits (56-64) in electives can be spread over a minimum of two and a maximum of four science disciplines - physics, chemistry, life sciences and mathematics. At least 25 (percent) of the total elective credits that he / she registers for in physics, chemistry and life sciences must be from laboratory courses. Laboratory courses
will be conducted for 1 or 2 weeks at a time as residential programmes at selected study centres for 2 credits and 4 credits courses respectively.

If one wishes to study any discipline he/she has to take a minimum of 8 credits in the maximum of 48 credits in any one of the four science disciplines, in the first few years. IGNOU will be able to offer only 40 credits in each discipline.

**B.Sc. Major Course of IGNOU**

If one wishes to undertake an in-depth study of any discipline, he/she should opt for maximum number of elective courses put on offer (i.e. 40 credits presently) in that discipline. If he/she opts for elective courses worth 40 credits in chemistry, physics or mathematics, he/she would be awarded a B.Sc. (Major) degree in physics and 8 credits in the application oriented courses, human environment necessity. If a student opts for 40 full credits in life sciences electives and 8 credits in human environment, he/she would be awarded a B.Sc. Degree with specialisation in life sciences.

The further table shows the List of Elective Courses
Table :19 - List of elective courses

The list of elective courses, which are offered in a phased manner for the B.Sc. programme is given below.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHE-01</td>
<td>Elementary Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>PHE-02</td>
<td>Oscillations and waves</td>
<td>2</td>
</tr>
<tr>
<td>PHE-03(L)</td>
<td>Physics Laboratory - I</td>
<td>4</td>
</tr>
<tr>
<td>PHE-04</td>
<td>Mathematical Methods in physics-I</td>
<td>2</td>
</tr>
<tr>
<td>PHE-05</td>
<td>Mathematical Methods in physics-II</td>
<td>2</td>
</tr>
<tr>
<td>PHE-06</td>
<td>Thermodynamics and statistical mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHE-07</td>
<td>Electric and Magnetic phenomena</td>
<td>4</td>
</tr>
<tr>
<td>PHE-08(L)</td>
<td>Physics laboratory -II</td>
<td>4</td>
</tr>
<tr>
<td>PHE-09</td>
<td>Optics (physical and laers)</td>
<td>4</td>
</tr>
<tr>
<td>PHE-10</td>
<td>Electrical circuits and electronics</td>
<td>4</td>
</tr>
<tr>
<td>PHE-11</td>
<td>Modern physics</td>
<td>4</td>
</tr>
<tr>
<td>PHE-12(L)</td>
<td>Physics laboratory -III</td>
<td>4</td>
</tr>
<tr>
<td>PHE-13</td>
<td>Physics of solids</td>
<td>4</td>
</tr>
<tr>
<td>PHE-14</td>
<td>Mathematical methods in physics -</td>
<td>4</td>
</tr>
</tbody>
</table>

*PHE-04 and PHE-05 are to be taken together.*
<table>
<thead>
<tr>
<th>Course</th>
<th>Course title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE-01</td>
<td>Atoms and molecules</td>
<td>2</td>
</tr>
<tr>
<td>CHE-03(L)</td>
<td>Chemistry lab-I</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Table taken together</td>
<td></td>
</tr>
<tr>
<td>CHE-01</td>
<td>CHE-01 is pre-requisite</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*for CHE-04, CHE-05 &amp; CHE-10</td>
<td></td>
</tr>
<tr>
<td>CHE-02</td>
<td>Inorganic chemistry</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>CHE-02 is a pre-requisite</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* for CHE-10</td>
<td></td>
</tr>
<tr>
<td>CHE-04</td>
<td>Physical chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHE-05</td>
<td>Organic chemistry</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>CHE-05 is a Co-requisite</td>
<td></td>
</tr>
<tr>
<td>CHE-06</td>
<td>Organic Action Mechanism</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>for CHE-06 and pre-requisite</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* for CHE-09 and CHE-10</td>
<td></td>
</tr>
<tr>
<td>CHE-07(L)</td>
<td>Chemistry labs-II</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>to be taken together</td>
<td></td>
</tr>
<tr>
<td>CHE09(L)</td>
<td>Chemistry lab-III</td>
<td>2</td>
</tr>
<tr>
<td>CHE-09</td>
<td>Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHE-10</td>
<td>Spectroscopy</td>
<td>4</td>
</tr>
<tr>
<td>CHE-11(L)</td>
<td>Chemistry Lab-IV</td>
<td>4</td>
</tr>
<tr>
<td>CHE 12(L)</td>
<td>Chemistry lab-V</td>
<td>4</td>
</tr>
<tr>
<td>MTE-03</td>
<td>Mathematical methods</td>
<td>4</td>
</tr>
</tbody>
</table>

MTE-03 credits will not be given to any student who opts for any mathematics electives.
<table>
<thead>
<tr>
<th><strong>Life Sciences</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LSE -01 Cell Biology</td>
<td>4 LSE-01 is a pre-requisite for LSE-03, 05 and 06</td>
</tr>
<tr>
<td>LSE -02 Ecology</td>
<td>4</td>
</tr>
<tr>
<td>LSE-03 Genetics</td>
<td>4</td>
</tr>
<tr>
<td>LSE-04(L) Laboratory course -I</td>
<td>4</td>
</tr>
<tr>
<td>LSE-05 Physiology</td>
<td>4</td>
</tr>
<tr>
<td>LSE-06 Developmental and Evolution</td>
<td>4</td>
</tr>
<tr>
<td>LSE-07 Taxonomy and Evolution</td>
<td>4</td>
</tr>
<tr>
<td>LSE - 08 (L) Laboratory course -II</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mathematics</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MTE-01 Calculus</td>
<td>4 MTE-01 is a pre-requisite * for MTE-07 to MTE-10</td>
</tr>
<tr>
<td>MTE-02 Linear Algebra</td>
<td>4</td>
</tr>
<tr>
<td>MTE-04 Elementary Algebra</td>
<td>2 [To be taken together]</td>
</tr>
<tr>
<td>MTE-05 Analytical Geometry</td>
<td>2</td>
</tr>
<tr>
<td>MTE-06 Abstract Algebra</td>
<td>4</td>
</tr>
<tr>
<td>Course</td>
<td>Title</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>MTE-07</td>
<td>Advanced calculus</td>
</tr>
<tr>
<td>MTE-08</td>
<td>Differential equation</td>
</tr>
<tr>
<td>MTE-09</td>
<td>Real analysis</td>
</tr>
<tr>
<td>MTE-10</td>
<td>Numerical analysis</td>
</tr>
<tr>
<td>MTE-11</td>
<td>Probability and statistics</td>
</tr>
<tr>
<td>-12</td>
<td>Linear programming</td>
</tr>
<tr>
<td>-13</td>
<td>Discrete mathematics</td>
</tr>
<tr>
<td>-14</td>
<td>Mathematical modelling</td>
</tr>
</tbody>
</table>

* Pre-requisite and Co-requisite refer to the courses which the students are strongly advised to register for an complete, so that the related courses could be followed easily. Otherwise it is not a compulsory directive.

**Application Oriented Courses of IGNOU**

The third component of the B.Sc. programme is Application - Oriented Courses. These courses are developed to equip a learner in some area of his/her choice which requires application of skills. One must select at least 8 credits worth of courses from this group. One is allowed to select a maximum of 16 credits from this group. If one has opted for a total of 64 credits in elective courses, he/she...
should take only 8 credits under application oriented courses. Alternatively, if one has taken only 56 credits in elective courses, he/she is allowed to take 16 credits in application oriented courses. The detailed list of the application oriented courses currently available is given below.

Table: List of Application Oriented Courses - IGNOU.

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMK-1</td>
<td>Marketing</td>
<td>4</td>
</tr>
<tr>
<td>AFD-1</td>
<td>Export procedure and documentation</td>
<td>4</td>
</tr>
<tr>
<td>ATR-1</td>
<td>Translation</td>
<td>8</td>
</tr>
<tr>
<td>AFW(W)-1</td>
<td>Feature writing</td>
<td>4</td>
</tr>
<tr>
<td>AFW(H)-1</td>
<td>Feature lekhan</td>
<td>4</td>
</tr>
<tr>
<td>AWR(E)-1</td>
<td>Writing for radio</td>
<td>4</td>
</tr>
<tr>
<td>AWR(H)-1</td>
<td>Radio lekhan</td>
<td>4</td>
</tr>
<tr>
<td>AHE-1</td>
<td>Human environment</td>
<td>8</td>
</tr>
<tr>
<td>ACC-1</td>
<td>Organising children services</td>
<td>8</td>
</tr>
<tr>
<td>ANC-1</td>
<td>Nutrition for the community</td>
<td>8</td>
</tr>
<tr>
<td>AOM-1</td>
<td>Office organisation and management</td>
<td>4</td>
</tr>
<tr>
<td>ASP-1</td>
<td>Secretarial practice</td>
<td>4</td>
</tr>
<tr>
<td>AMT-1</td>
<td>Teaching of primary school mathematics</td>
<td>8</td>
</tr>
<tr>
<td>ACS-1</td>
<td>Consumer studies</td>
<td>8</td>
</tr>
</tbody>
</table>
Opinion of the IGNOU B.Sc. Physics Course Students Regarding the Course Content.

When the investigator gave the questionnaire to the IGNOU B.Sc. physics course students following opinions were observed. These observations were pooled and presented in the form of percentages.

1) 70% of the students expressed that some of the units/topics are left out without counselling.

2) 80% of the students expressed that some topics need more explanation.

3) 82% of the students expressed that there is co-relation between the different topics in the syllabus.

4) 80% of the students expressed that the arrangement of the topics in the syllabus is logically and psychologically arranged.

5) 60% of the students expressed that IGNOU has prescribed good syllabus when compared to other universities.

6) 80% of the students expressed that they do not know since how long the syllabus is in existence.

7) 78% of the students expressed that they are not certain whether the syllabus is containing modern topics based on present situation and needs.

8) 80% of the students expressed that the syllabus should be modified at present.
9) 80% of the students expressed that the syllabus prescribed is too heavy.

10) 81% of the students expressed that the theory portion is supported by laboratory work.

11) 80% of the students expressed that the present B.Sc. physics course is prospective for the future.

12) 82% of the students expressed that the course content for each chapter/credit is too much.

13) 79% of the students expressed that the syllabus is not covered well in time.

14) 70% of the students expressed that there is a lot of difference in the course content of IGNOU and conventional universities.

15) 84% of the students expressed that they do not get reference materials according to the course content.

16) 85% of the students expressed that equal importance has been given for each unit in the syllabus for each year of B.Sc. course.

17) 83% of the students expressed that it is difficult to solve the problems of each topic/unit.

18) 81% of the students expressed that it is very difficult to remember the equations and formulas from the print material.
19) 76% of the students expressed that it is difficult to do the calculation on their own even after explaining.

20) 84% of the students expressed that it is difficult to understand some of the theory topics like.

   a) Mathematical methods in physics
   b) Thermodynamics and statistics mechanics.
   c) Electric and Magnetic phenomena
   d) Electrical Circuit and Electronics
   e) Modern physics etc.

21) 81% of the students expressed that the print material is difficult to understand without proper counselling in the class.

22) 72% of the students expressed that the duration is very short to understand and write in examination.

23) 65% of the students expressed that the counsellors do not solve the relevant examples in the class.

24) 84% of the students expressed that they feel to study regularly but they are not finding sufficient time.

25) 90% of the students expressed that a subject like physics needs regular touch.
26) 68% of the students preferred to go for extra tuition classes to understand some of the topics.

27) 72% of the students expressed that they would contact some of the students of conventional colleges to understand the subject.

28) 86% of the students found difficult to write the assignments on their own without proper guidance by the counsellors.

29) 89% of the students expressed that the counsellors should adopt different methods of teaching.

30) 59% of the students expressed that the counsellors counsel very fastly.

31) 65% of the students expressed that the counsellors do not solve subject based problems in the class.

32) 74% of the students expressed that there is a lack of specialised counsellors to counsel different areas of physics.

33) 77% of the students expressed that the counsellors do not clarify the doubts to their satisfaction.

Opinion of the IGNOU PHE - Physics Counsellors Regarding the Course Content.

When the researcher gave the questionnaire to the IGNOU-PHE (physics) counsellors following opinions were observed. Those observations were pooled and presented in the form of percentages.

1) 50% of the counsellors expressed that some of the topics are left out without counselling.
2) 60% of the counsellors expressed that some topics need more counselling.

3) 82% of the counsellor's expressed that there is correlation between the different topics in the syllabus.

4) 85% of the counsellors expressed that the arrangement of the topics in the syllabus is logically and psychologically arranged.

5) 79% of the counsellors expressed that IGNOU has prescribed good syllabus when compared to other universities.

6) 95% of the counsellors expressed that the syllabus is existing since 8-10 years.

7) 61% of the counsellors expressed that the syllabus is containing some modern topics.

8) 58% of the counsellors expressed that the syllabus should be modified at present.

9) 76% of the counsellors expressed that the syllabus prescribed is too heavy.

10) 78% of the counsellors expressed that the theory portion is well supported by laboratory work.

11) 86% of the counsellors expressed that the present B.Sc. physics course is prospective for the future.
12) 68% of the counsellors expressed that the course content for each chapter/credit is too much.

13) 53% of the counsellors expressed that there is difference in the course content of IGNOU and conventional universities.

14) 69% of the counsellors expressed that they do not get reference material according to the course content.

15) 76% of the counsellors expressed that equal importance has been given for each unit for each year of B.Sc. course.

16) 70% of the counsellors expressed that the portion are not covered well in time.

17) 80% of the counsellors expressed the difference in the course content as follows.
   a) Content
   b) Approach
   c) Methodology
   d) Practicals
   e) Assignments

18) 82% of the counsellors expressed that it is difficult for students to solve the problems of each topic.

19) 80% of the counsellors expressed that it is difficult for students to remember the equations and formulas of print material.
20) 86% of the counsellors expressed that the print material is easy for the students to understand.

21) 78% of the counsellors expressed that it is very difficult for the students to write assignments without proper guidance.

22) 72% of the counsellors expressed that the students do not submit assignments well in time.

23) 81% of the counsellors expressed that the students are not properly attentive in the class.

24) 84% of the counsellors expressed that the students do not come well prepared in the class.

25) 65% of the counsellors expressed that studying by regular mode is easy when compared through distance mode.

26) 89% of the counsellors expressed that the subject like physics need regular touch.

27) 72% of the counsellors expressed that it is difficult for students to find the answers to the questions asked in assignments.

28) 50% of the counsellors expressed that they are not trained by IGNOU for counselling.

29) 50% of the counsellors expressed that they are not trained to check the assignments written by students.

30) 69% of the counsellors expressed that their doubts could not be clarified completely.
Opinion of the Co-ordinators’ of IGNOU Study Centres Regarding the B.Sc. PHE (Physics) Course Content.

When the investigator gave the questionnaires to the Co-ordinators of all the three study centres following opinions were observed. These observations were commonly pooled and present in the following form.

Following are the opinions of all the three Coordinators commonly pooled and expressed.

1) That some units / topics are left out by the counsellors without counselling.

2) That some topics need more explanation as per opinion of students.

3) That there is correlation between different topics in the syllabus.

4) That the topics are logically arranged.

5) That IGNOU has prescribed good syllabus.

6) That the syllabus is in existence since 8-10 years.

7) That the syllabus contains modern topics based on present situation and needs.

8) That the syllabus should be modified.

9) That the syllabus prescribed is too heavy.

10) That the theory portion is supported by laboratory work.
11) That present B.Sc. physics course is prospective for the students future.

12) That the course content for each credit is too much.

13) That the course content of IGNOU has lot of difference with conventional universities.

14) That the reference material is not properly supplied according to course content.

15) That equal importance is given for each unit in the syllabus.

16) That the students feel difficult to solve the problems of each topics/unit.

17) That according to the opinion of the students they feel difficult to remember the equations and formulas from print material.

18) That according to the opinion of the students they feel it difficult to do the calculations on their own even after explanation.

19) That the students felt difficulty in understanding some of the topics like.

a) Mathematical methods in physics

b) Electrical circuits and electronics

20) That the print material is easy to understand

21) That the time period is very short to write in examination.

22) That the counsellors solved the relevant examples in the class.
23) That a subject like physics needs a regular touch in the subject.

24) The students expressed that they feel difficult in writing the assignments.

25) That the counsellors adopted only counselling and discussion method in the class.

26) That the attendance of students was poor.

27) That the students would not come prepared for the class.

28) That the counsellors solved the difficulties of students in the class.

Interpretation of the Course Content of IGNOU B.Sc. PHE (physics) Course.

Following are the opinion of the students, counsellors and the coordinators of B.Sc. physics course of IGNOU.

1) Some topics/units remains unexplained which means that some topics needs more explanation and clarification.

2) There is correlation between different topics in the syllabus and they are arranged in a logically and psychological manner.

3) The existing syllabus of B.Sc. physics course is quite good but organisation of the content is not up to satisfactory.

4) The existing syllabus is 8-10 years old. It also contains some of the modern topics.

5) Students need some modification in the existing syllabus, since they feel that it is little heavy.
6) The theory portion of the syllabus is well coordinated with laboratory work prescribed.

7) The students are of the opinion that the syllabus is prospective but the course content for each credit is exhaustive.

8) Students are of the opinion that the portions are not completed well in time. The counsellors are also of the same opinion since they are getting very less periods for counselling and they are also not allowed to take any extra classes. The coordinators' are of the opinion that the portions will be covered on time only when the students are regular during the counselling session.

9) The students expressed that except the print material they are not issued library books reference books and other materials required for study, but the books are issued to the counsellors' only.

10) Students opinned that equal importance has been given to both the theory and practicals. But they also expressed that the organisation of both the theory and practical work is not up to satisfactory.

11) Students expressed that they were unable to solve the problems of each topic/unit without the proper guidance of the counsellors. They also expressed that the counsellors are not available many a time.

12) The students expressed that it is very difficult to solve the equations and formulas of the print material without the continuous guidance of the counsellors. They also expressed that the counselling session is not
conducted if the students are less than ten in number. They feel difficult to understand the print material even though it is written in self-instructional type. Hence they feel that regular counselling is necessary.

13) Students felt very difficult to understand some of the topics like.

   a) Mathematical methods in physics
   b) Thermodynamics and statistical mechanics
   c) Electric and magnetic phenomena
   d) Electrical circuits and electronics
   e) Modern physics etc.

Hence they felt that regular counselling and touch in the subject was necessary. This may be possible only through regular conducting of the counselling session even if the students are less than ten in number. Besides this the students expressed that the print material provided has to be explained in the class. But the counsellors opinned that the students are most of the times absent and hence they cannot clarify the terms and concepts completely.

14) Students expressed that the counselling period is too short to understand the concepts, definitions. They also felt difficult to understand some of the aspects in practical also. This may be because the students are distance learners and are staying in far away places and are doing jobs and hence they could not attend regularly.

15) The students opinned that the counsellors does not solve the relevant examples in the class.
16) They wish to study in regular colleges. But because of their jobs they are unable to do so.

17) It is an unanimous view of students, teachers & principals that abstract subject like physics has to be studied in regular college only.

18) There is provision to attend extra tuition classes for getting solved the subject based difficulties. This may due to the fact that IGNOU does not have here extra coaching centres to teach such students when difficulties arises.

19) The students desired to meet the students of regular colleges to get the problems solved.

20) The students feel that it is very difficult to write the assignments and submit without proper guidance and they also expressed that the questions given is not easily located and understood in the print material.

21) Only counselling and discussion method is utilised for the instruction and the counsellors are not adopting different methods like problem solving method, demonstration method and project method etc.
Opinion of the Conventional Science Colleges B.Sc. Physics Course Students Regarding the Course Content.

When the investigator gave the questionnaire to the conventional B.Sc. physics course students following opinions were observed. Those observations were pooled and presented in the form of percentages.

1) 92% of the students expressed that some of the topics / units are not left out without teaching.

2) 40% of the students expressed that some topics need more explanation.

3) 90% of the students expressed that there is Co-relation between the different topics in the syllabus.

4) 93% of the students expressed that, the arrangement of the topics in the syllabus is logically and psychologically arranged.

5) 85% of the students expressed that conventional universities has prescribed good syllabus.

6) 88% of the students expressed that the syllabus is existing since 3-5 years.

7) 85% of the students expressed that the syllabus is containing modern topics based on present situation and needs.

8) 55% of the students expressed that the syllabus should be modified at present.
9) 88% of the students expressed that the syllabus prescribed is not too heavy.

10) 90% of the students expressed that the theory portion is supported by laboratory work.

11) 92% of the students expressed that the present B.Sc. physics course is prospective for the future.

12) 89% of the students expressed that the course content for each topic/unit is not too much.

13) 86% of the students expressed that the syllabus is covered well in time.

14) 81% of the students expressed that there is difference in the course content of IGNOU and conventional universities.

15) 91% of the students expressed that they get reference materials according to the course content.

16) 94% of the students expressed that equal importance has been given for each unit in the syllabus for each year of B.Sc. course.

17) 88% of the students expressed that it is not difficult to solve the problems of each topic/unit.

18) 86% of the students expressed that it is not difficult to remember the equations and formulas.

19) 80% of the students expressed that it is not difficult to do the calculations on their own after explanation.
20) 85% of the students expressed that it is not very difficult to understand some of the theory aspects like.

a) Mechanics

b) Thermodynamics

c) General physics

d) Atomic molecular and Nuclear physics.

e) Solid state physics.

21) 91% of the students expressed that the written notes provided by teachers is easy to understand.

22) 93% of the students expressed that the duration is sufficient to understand and write in examination.

23) 86% of the students expressed that the teachers solve the relevant examples in the class.

24) 93% of the students expressed that they feel to study in regular colleges as they find proper time.

25) 94% of the students expressed that a subject like physics needs regular touch.

26) 90% of the students expressed that they do not prefer to go for extra tuition classes to understand the topics / units.
27) 92% of the students expressed that they do not contact some of the B.Sc. physics course students studying in other college for understanding the subject matter.

28) 90% of the students expressed that the teachers adopted different method of teaching.

29) 76% of the students expressed that the teachers do not teach very fastly.

30) 75% of the students expressed that the teachers solves subject based problems in the class.

31) 81% of the students expressed that there are specialised subject teachers to teach different areas of physics.

32) 82% of the students expressed that the teachers clarify the doubts to their satisfaction.

Opinion of the Conventional College Physics Teachers Regarding the Course Content.

When the researcher gave the questionnaire to the conventional college physics teachers following opinions were observed. Those observations were pooled and presented in the form of percentages.

1) 90% of the teachers expressed that some of the topics are not left out without teaching.

2) 30% of the teachers expressed that some topics need more teaching.
3) 90% of the teachers expressed that there is correlation between the different topics in the syllabus.

4) 95% of the teachers expressed that the arrangement of the topics in the syllabus is logically and psychologically arranged.

5) 86% of the teachers expressed that the syllabus prescribed is good.

6) 96% of the teachers expressed that the syllabus is existing since 3-5 years.

7) 89% of the teachers expressed that the syllabus is containing modern topics based on present situation and needs.

8) 83% of the teachers expressed that the syllabus should not be modified at present.

9) 90% of the teachers expressed that the syllabus prescribed is not too heavy.

10) 91% of the teachers expressed that the theory portion is well supported by laboratory work.

11) 89% of the teachers expressed that the present B.Sc. physics course is prospective in future.

12) 86% of the teachers expressed that the course content is not too much.

13) 93 of the teachers expressed that there is difference in the course content of IGNOU and Conventional Universities.
14) 76% of the teachers expressed that they get the reference material according to the course content given.

15) 91% of the teachers expressed that equal importance has been given for each unit for each year of physics course.

16) 93% of the teachers expressed that the portions are covered well in time.

17) 90% of the teachers expressed that there is difference in the course content as follows

   a) Approach

   b) Methods of teaching

   c) Conducting practicals.

18) 90% of the teachers expressed that it is not difficult for the students to solve the problems of each topic.

19) 75% of the teachers expressed that it is not difficult for students to remember the equations and formulas.

20) 94% of the teachers expressed that the students are attentive in the class.

21) 90% of the teachers expressed that the students come well prepared in the class.

22) 92% of the teachers expressed that studying by regular mode is easy when compared to distance mode.
23) 95% of the teachers expressed that the subject like physics need regular touch.

24) 86% of the teachers expressed that the students doubts were clarified.

**Opinion of the Principal's of the Conventional Colleges Regarding the B.Sc. Physics Course Content.**

When the researcher gave the questionnaire to all the principals of all the twelve colleges following opinions were observed, These observations were pooled and presented in the form of percentages.

1) 85% expressed that the topics are not left out by teachers without teaching.

2) 30% expressed that some topics need more explanation.

3) 90% expressed that there is correlation between different topics in the syllabus.

4) 92% expressed that the topics are logically arranged.

5) 96% expressed that conventional universities has prescribed good syllabus.

6) 100% expressed that the syllabus is in existence from 2-3 years.

7) 88% expressed that syllabus contains modern topics.

8) 75% expressed that the syllabus need not be modified.
9) 84% expressed that the syllabus prescribed is not too heavy.
10) 94% expressed that the theory portion is supported by laboratory work.
11) 88% expressed that the present B.Sc. physics course is prospective for the students future.
12) 81% expressed that the course content is not too much.
13) 70% expressed that the course content of IGNOU has lot of difference with conventional universities.
14) 94% expressed that the reference materials is properly supplied according to the course content.
15) 96% expressed that equal importance is given for each topic in the syllabus.
16) 88% expressed that the students feel easy to solve the problems of each topic.
17) 91% expressed, based on students opinion that they do not feel difficult to remember the equations and formulas.
18) 85% expressed based on students opinion that they do not feel difficult to do calculations on their own.
19) 90% expressed that the students did not feel difficulty in understanding some difficult topics.
20) 92% expressed that the students felt easy in understanding the written notes given by teachers.
21) 95% expressed that the time is sufficient to write in examination.

22) 90% expressed that the teachers solved relevant examples in the class.

23) 96% expressed that a subject like physics needs a regular touch in the subject.

24) 85% expressed that the teachers adopted different methods of teaching in the class.

25) 92% expressed that the students attendance was good.

26) 80% expressed that the students would come prepared for the class.

27) 92% expressed that the teachers solved the difficulties of the students in the class.

As we have already noted that all the six conventional universities established in the Karnataka state are running B.Sc. course with physics as one of the optional subjects, but not as an entire physics course. Hence the students seeking physics as one of the subject should opt other two combination subjects as optionals according to the available combination of subjects.

The investigator collected the physics syllabi of B.Sc. course of all the six universities and found that more or less same units are being introduced.
Following is the condensed common syllabus of IGNOU and six conventional universities in comparison to each year of B.Sc. physics course of IGNOU.

Common Syllabus of Six Conventional Universities in Karnataka to that of IGNOU with Respect to B.Sc. Physics Course.

First year B.Sc. Physics Course of IGNOU.

PHE -01 : Elementary Mechanics
Block 1 : Concepts in mechanics
Block 2 : Systems of particles

PHE-02 : Oscillations and waves
Block 1 : Oscillations
Block 2 : Waves.

PHE -03 (L) : Laboratory 1
Block 1 : Some experiments on oscillations and waves
Block 2 : Some experiments on mechanical and electrical properties of material.
First year B.Sc. Physics Course of Six Conventional Universities in Karnataka
(Theory)

Properties of matter
Heat and thermodynamics
Mechanics
Sound

Practicals; (Laboratory work )

Some experiments on properties of matter, Sound, Mechanics, Heat and Thermodynamics (For details see in Appendix - )

Second Year B.Sc. Physics Course of IGNOU

PHE - 01, 02, 03(L), 04, 05, 06, 07, 08(L)

PHE - 01 : Concepts in mechanics
PHE - 02 : Oscillations and waves
PHE - 03(L) : Some experiments on oscillations and waves.
   : Some experiments on mechanical
   : and electrical properties of material
PHE - 04 : Mathematical methods in physics-I
Block 1 : Vector calculus
PHE 2 : Probability and statistics
PHE - 05 : Mathematical methods in physics -II

Block 1 : Ordinary differential equations
Block 2 : Practical differential equations.

PHE - 06 : Thermodynamics and statistical mechanics

Block 1 : The zeroth and the first laws of thermodynamics
Block 2 : The second and the third laws of thermodynamics
Block 3 : Elementary kinetic theory
Block 4 : Elementary of statistical mechanics

PHE - 07 : Electric and magnetic phenomena

Block 1 : Electrostatics in free space
Block 2 : Electrostatics in medium
Block 3 : Electric current and magnetic field
Block 4 : Electromangetics.

Phe - 08(L) : Physics laboratory - II

Some experiments on electrical circuits and electronics
Some experiments on optics
Some experiments on thermodynamics.
Second Year B.Sc. Physics Course of Six Conventional Universities in Karnataka

Optics, Electricity, Sound, Light, Electromagnetism and Waves.

Experiments: Laboratory Work.

Some experiments on Optics, Electricity, Sound, Light, Electromagnetism and Waves [For details see Appendix-]

Third year B.Sc. Physics Course of IGNOU

PHE-01 : Elementary mechanics
PHE-02 : Oscillations and waves
PHE-03(L) : Physics laboratory - I
PHE-04 : Mathematical methods in physics-I
PHE-05 : Mathematical methods in physics-II
PHE-06 : Thermodynamics and statistical mechanics.
PHE-07 : Electric and magnetic phenomena
PHE-08 : Physics laboratory - II
PHE-09 : Optics

Block 1 : Introducing light
Block 2 : Interference
Block 3 : Diffraction
Block 4 : Lasers and their applications

PHE-10 : Electrical circuits and electronics

Block 1 : Network analysis and devices
Block 2 : Electronic circuits
Block 3 : Linear integrated circuits
Block 4 : Digital electronics.

PHE-11 : Modern physics

Block 1 : Special theory of relativity
Block 2 : Introduction to quantum mechanics
Block 3 : Application of quantum mechanics to some systems.
Block 4 : Nuclear physics.

PHE-12(L) : Physics laboratory -III

Block 1 : Experiments on waves, optics
Block 2 : Experiments on galvanometer phenomena and electronic circuits and experimental data analysis.
Third year B.Sc. Physics Course of Six Conventional Universities in Karnataka.

Paper - III

Atomic, molecular and nuclear physics, modern physics, classical physics.

Paper - IV

Modern physics, Relativity, Solid State physics and Electronics, Quantum mechanics.

[For details see Appendix- ]


To sum up following are the opinion of the students, teachers and the principals of B.Sc. physics course content of conventional colleges.

1) All the units are covered within the stipulated time for all the three years of study.

2) All the units for the three year B.Sc. degree course is prospective in future and interesting.

3) The theory portion is well related with the practicals.

4) The units are life oriented and progressive.

5) The course content is prompting the students to study still higher to get mastery and develop the skills.
6) There is lot of scope for further creative thinking.

7) There is logical relationship among the preceding units in the syllabus.

8) The existing syllabus of five years old still contains some modern topics.

9) Still some modern topics are yet to be introduced in future.

10) Teachers are also well versed with theory and practical work for the B.Sc. physics course.

11) Some students felt the syllabi is heavy it may be because of their irregularity in the class.

12) The syllabi of the physics course content is well defined and well organised.

13) Lot of scope is given for discussing, problem solving and undergoing the projects.

14) The content is very convenient for continuous evaluation but such system is to be introduced in the colleges.

15) Most of the students say that the content is easy to understand and there is not necessary of private tuitions.

16) The units included for each leads to curiosity among the students to learn for the next year and so for all the three years of study.

17) The course develops scientific attitude reflective thinking, reasoning power and power of discrimination.
18) The course content shows a symbol of modernity and is research oriented.

19) Every unit is designed with proper methodology and distribution of time.

20) There is fixed time-table for the practical work.

21) The course content gives the list of reference books, source books, periodical's from which they are chosen at the end of the syllabus.

22) Keeping objectives in mind the course content is framed by a team of experts from the universities including the dean faculty of physics which will be approved by inter university board.

23) There is lot of scope for revision of content.

23) The content is more of inductive-deductive type.

24) It contains definite activities to be done for each unit and also the exercises to be done by the students.

25) It arouses interest among the students to undertake seminar, symposia, exhibition, discussion to clarify the difficulties among themselves.

26) It gives scope for teachers to use the different methods of teaching different topics.
Comparative View of B.Sc. Physics Course Content of IGNOU and Conventional Colleges.

If we look into the course content of B.Sc. physics course of IGNOU to that of conventional colleges of six universities in Karnataka state it is quite clear that.

1) IGNOU has framed broad based B.Sc. physics course which is in the form of credits. Whereas conventional colleges of all six universities has more or less same syllabi for all the three years of study.

2) Both the IGNOU and conventional universities have exhaustive content and is prospective in nature.

3) There are two types of degree offered at IGNOU namely

a) B.Sc.

b) B.Sc. (Major)

The B.Sc. degree constitutes PHE-(physics) CHE-(chemistry) LSE- Life sciences and MTE (mathematics) subjects wherein a student has to take 32 credits for each year whereas B.Sc. (Major) is another type wherein a student has to take all 40 credits allotted for PHE(physics) subject and the remaining from other subjects and hence he will be given certificate as B.Sc.-major physics that he has to study entire physics course.

Whereas, in conventional colleges physics is one of the optional subject amongst the three subjects. All the three subjects are given equal importance. Hence the students has to study all the three subjects along with two of the languages (MLL)'s.
4) The course content of IGNOU is condensed in the form of print material supplied to each student and hence the students have to mainly rely on the print material only to know the whole syllabi and hence they do not have scope to refer other books.

   Whereas, conventional colleges teachers prepare fresh well prepared written notes by themselves and provide it to students which means there is wide scope for both students and teachers to refer different source books, reference books as to know from where the basic concept is taken or origined. So also there are different combination subjects to be taken.

   IGNOU has given more flexible time to complete the B.Sc. course that is within three to eight years maximum.

   Whereas conventional students has to complete within three years duration.

6) There is less scope for IGNOU students to continue Post Graduation from other conventional universities and also to undertake research projects.

   Whereas conventional colleges students have ample scope to continue Post Graduation from any conventional universities and also to undertake research projects.

7) In both IGNOU and conventional colleges equal importance has been given for practicals.

8) Depending upon the credits the print material is prepared in the form of units and in blocks.
Whereas, conventional college teachers prepare well prepared notes by referring recent edition books for each unit in the syllabus.

9) IGNOU conducts laboratory work for the students during summer and autumn vacations and the experiments are then and there evaluated and the marks are included for the term end examination.

Whereas conventional colleges conduct the whole year experiments according to the fixed time table and every week one or two experiments are done. All the experiments which are allotted for each year are completed within the stipulated time that is one year. So for other two years also it is the same.

10) IGNOU students expressed that the syllabus is quite old and it should be modified.

Whereas, conventional college students have not asked to modify since the university takes steps to modify the syllabus once in three to five years.

IGNOU students also expressed that the present syllabus is a good one.

11) IGNOU students and counsellors are of the opinion that the credit system is exhaustive and the counselling hours are very much limited.

Whereas in conventional colleges there is definite portion and regular classes are conducted by teachers and hence the syllabus is covered within stipulated time.

12) IGNOU students find it very difficult to solve the problems of each topic, unit from the print material and they are not getting proper help from the counsellors wherever necessary.
Whereas conventional students did not find it difficult as the teachers are easily accessible to clarify the doubts during the course.

13) IGNOU students expressed that they found some topics difficult to understand on their own. But this is not true with conventional college. Here specialised teachers are available to teach different areas of physics.

14) IGNOU students expressed that B.Sc. physics should be studied through regular universities this may be because they are not getting sufficient time to join the regular course. They also expressed that it is difficult to pass in the examination.

Whereas, conventional students did not face such difficulty this may be because the students are regularly attending the class and the teachers are available easily to solve the difficulties during the course.
METHODOLOGY OF TEACHING - LEARNING PROCESS
METHODOLOGY OF TEACHING - LEARNING PROCESS

Methodology of Teaching - Learning Process of Physics Course in IGNOU.

The methodology of instruction at IGNOU is more learner-oriented and the student is a passive learner in the teaching-learning process. Here most of the instructions are imparted through distance mode rather than face-to-face communication. IGNOU is an international educational organisation in which students are learning through distance mode. The traditional method of teaching learning process will not be found in all the IGNOU study centres. The teachers are temporary appointed for counselling purpose and not for teaching purpose. The students have to learn a lot from the printed material and through multimedia's. Only students have to clarify difficulties during counselling session. So following methodology is adopted in IGNOU study centres to teach physics course.

IGNOU follows a Multi-Media approach for Instruction. It comprises of:

a) Self-instructional printed material.

b) Audio and Video cassettes

c) Audio-Video programmes transmitted through the National Network of Doordarshan and the All India Radio (Selected stations).

d) Face-to-face counselling at study centres by Academic Counsellors.

e) Assignments

f) Laboratory work.

g) Project work in some course not compulsory and

h) Teleconferencing

i) Library.

Print Material

Properly planned self-instructional print material is the mainstay. The study material prepared by the university is self-instructional in nature. Lessons, which are called units are structured to facilitate self-study.

While going through the syllabi of courses will note that each course has been divided into a number of blocks - generally 8 blocks for 8 credit courses and 4 to 5 blocks for 4 credit courses. Each block has a number of units (lessons). The
unit of a block have a certain thematic unity. The course material is provided to the students at home in the form of well designed printed booklets. Each booklet is called a block and contains a few units.

The first page of each block indicates the numbers and titles of units comprising the block. In the first block of each course it starts with course introduction. This is followed by a brief introduction to the block. Each unit begins with an introduction in which it tells you about the contents of the unit. An outline of a list of objects is given which IGNOU expects a student to achieve after working through the unit. This is followed by the main body of the unit which is divided into various sections and sub-sections. Each unit ends by summarising its contents. The summary of whole unit is given at the end to enable a student or the learner to recall the main points.

In each unit, there are several Self Assessment Questions (SAQs)/exercises. These are meant to assess the students understanding of the subject contents.

Audio-Video Material

IGNOU has prepared audio-video programmes for each course other than print material. The audio-video material is supplementary to print material. These help to understand the subject better. Video programmes are transmitted by Doordarshan on National Network from Monday to Friday from 6:25 am to 6:55 am in the morning. The schedule of transmission is communicated to the students and study centre through the IGNOU Newsletter. The Audio-Video material is made available at the study centres wherein the students may watch during the counselling session. Anyone desirous of buying the audio-video tapes can
procure them from M/s, New Age International P.Ltd., Educational Films Division, Ansari Road, Daryaganj, New Delhi-110 002.

**Counselling**

IGNOU has arranged the face-to-face contact between learners and their tutors/counsellors at the study centres itself. The purpose of such a contact is to answer some of the students/learner's questions and clarify the doubts. It provides an opportunity for a student to meet his fellow students. There are experienced academic counsellors to provide counselling and guidance to the student(s) in the courses that he/she has chosen for study. The counselling session for PHE course will be held at suitable intervals throughout the whole academic session. Attendance during counselling session is not compulsory. The counsellors will only try to help the learner to overcome difficulties (Academic as well as Personal). The subject based difficulties are usually clarified. On availability Audio Video cassettes are played during counselling sessions.

Before going to the next counselling session the learner has to go through the course materials and note down the points to be discussed. Generally there will be 10 counselling sessions for an 8-credit course and 5 sessions for a 4-credit course. The detailed schedule of the counselling sessions will be made known by the coordinator of the study centre.

**Study Centres**

To provide effective student support services like Audio-Video, Library, Teleconferencing, Term-end examinations, Counselling, Assignment rules and regulation IGNOU has set up study centres. The students at their convenience has to choose the study centre taking into consideration of learners place of residence or work.
• A coordinator who will coordinate different activities at the study centre.

• An assistant coordinator and other supporting staff appointed on a part-time basis.

• Counsellors to provide counselling and guidance in the subjects chosen.

**Assignments**

The learner has to write two types of assignments.

a) Tutor-Marked Assignments (TMA). Within the assignments are written by the learners and submitted well in time. The schedule and due date is notified to the students. The evaluation of these assignments is done by the counsellors with comments if necessary, the study centre and returned to the coordinator. The coordinator returns to the students all the assignments at the study centre itself.

**Laboratory Work.**

The learner has to choose at least 25% of the elective credits from physics, chemistry and life science from the laboratory courses. It is planned to phase the laboratory phase during suitable periods (such as summer or autumn vacations). So that in-service persons can take them without difficulty. Facilities for laboratory courses will be provided at one study centre in each region, more study centres will be activated depending on the environment.

Laboratory courses carry 2 or 4 credits. A 2-credit laboratory course will require full-time presence of the student at the study centre for one week continuously. During this time a student has to work for around 60 hours. Around 40 hours would be spent on experimental work and the remaining will be used for
doing calculations, preparation of records, viewing or listening to the video/audio programmes. The requirement for a 4-credit laboratory course would be 120 hours of work spread over two consecutive weeks with time distribution similar to a 2-credit course. However, attendance in the laboratory course is compulsory. Every experiment is evaluated and is included for final evaluation, the weightage being 70%. Hence, a student has to perform all the experiments in order to be able to secure maximum marks. The remaining 30% will be assigned for the unguided experiment to be performed by the student at the end of lab course. As far as possible, a student should complete the laboratory courses in the year in which he/she registers for them. Details of number of sessions required to complete each laboratory course in the year in which he/she registers for them. Details of number of sessions required to complete each laboratory course are given below.

Table: 21- Showing the details of B.Sc. PHE Physics Laboratory Course.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course</th>
<th>Credits</th>
<th>No of sessions to be conducted</th>
<th>Total No. of days required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Introduction</td>
<td>Experiments</td>
</tr>
<tr>
<td>1.</td>
<td>PHE-03(L)</td>
<td>04</td>
<td>01</td>
<td>+26</td>
</tr>
<tr>
<td>2.</td>
<td>PHE-08(L)</td>
<td>04</td>
<td>04</td>
<td>+26</td>
</tr>
<tr>
<td>3.</td>
<td>PHE-12(L)</td>
<td>04</td>
<td>01</td>
<td>+26</td>
</tr>
</tbody>
</table>

Note: i) Each lab session is of four hour duration ii) Two sessions of four hour each will be held each day. iii) First session of each laboratory course will be utilised as introductory session.
Project Work.

Project work is a compulsory component of some of the courses. For example, the human environment (AHE-1) and the teaching of primary school mathematics (AMT-1) are application-oriented courses worth 8 credits each, of which 2 credits in each course are allotted for project work. It is mandatory for all the students to successfully earn the credits of the project work. To help the student, a detailed project guide is sent to them in which different steps involved in doing a project are given, along with detailed examples.

Teleconferencing

Teleconferencing, using one way video and two way audio transmission via satellite, is another medium, to impart instruction to and facilitate learning for a distance learner. The students concerned would be informed about the teleconferencing schedule and the place where it is to be conducted. The teleconferencing schedule is also published in the IGNOU newsletter.

Library

Every study centre have a library having relevant course materials, reference books suggested for supplementary reading as well as audio-video materials prepared for the course(s).
Methodology of Teaching - Learning Process of Physics Course in the Conventional Science Colleges.

In almost all the regular sciences colleges (Sample taken for study) physics course is taught by multifarious methods. As we have already noted that physics is one of the optional subject of equal importance is studied along with two other subjects other than two MIL’s (languages) for first year and second year. But for the third year a student has to study only three optionals without the MIL(s) as mentioned earlier. Following methodology is adopted during the teaching -learning process.

1) Lecture Method 
2) Lecture - Cum Demonstration Method 
3) Discussion Method 
4) Problem Solving Method 
5) Laboratory Method 
6) Project Method 
7) Heuristic method 
8) Self Study 
9) Supervised Learning 
10) Computer Assisted Method 
11) Guided Discovery Method
There is ample scope for a physics teacher to adopt proper methodology at proper times according to the units. There is no time restriction of using other resources like library, laboratory, teachers guidance etc. There is regular time-table planned well in advance for both the theory and practicals. Hence both teachers and students are fully involved and engaged in the teaching-learning process. The teachers have full freedom to utilise the services of other teachers like from the department of chemistry, mathematics, botany, zoology, statistics, electronics, computer science etc. Even the teachers can take the students to the community resource centres like, All India Radio (AIR) stations Doordarshan and other factories as educational trip and tours.

Methodology of Teaching-Learning Process - A Comparative View of IGNOU to that of Conventional Colleges.

The teaching learning process at IGNOU centres is dominated by counselling and the teachers are known as Academic Counsellors. Both students and teachers are wholly depending upon the print material supplied to them.

Usually each year of teaching includes ten counselling session. Each counselling class constitutes about two and half hour duration. During such hours only the doubts are clarified by the students. When the students are less than ten in number usual counselling session is not held. It is held by the Distance Learning Facilitation (DLF). Counselling is usually conducted during Sundays and other holidays depending upon the counsellors.

Counselling included discussion, problem solving lecturing, the use of audio-visual aids are utilised during teaching learning process depending upon the availability of the audio video cassettes. Face to face interaction,
teleconferencing, AIR, Gyan darshan etc. which will be unique experience for students both in theory and practice. Such methods are not in practice in conventional colleges we find lecture method, demonstration method, discussion method, project method and laboratory method. The time-table is fixed for both theory and practical. Weekly 4-5 theory classes are conducted for each year of study. So also one or two laboratory experiments are conducted per week which shows the regular theory and practicals are held and the teachers are also easily accessible during the working hours to solve the problems of students and clarify the doubts of the course content.

During the counselling session at IGNOU very few students are seen. The students who attend during first counselling session are not seen during the second counselling session and so on. So there is no friendship, cooperation and coordination seen among IGNOU students. Usually all age group students are seen during each counselling session. Hence the group discussion, project work etc will not be possible. Whereas in conventional colleges there is much cooperation, coordination unity and friendship is seen among the peer groups. At IGNOU community experiences are not seen much whereas in conventional colleges it is almost seen more. Community activities is the nerve centre of the conventional system and hence we find student activities in the form of Gymkhana Activities, Cultural Activities, Study Circles, Field Trips, excursion and so on.
IGNOU B.Sc. Physics Course Students Opinion Regarding the Print Material and Assignments

IGNOU students expressed that the physics course print material is very good wherein the contents are of high standard with well defined objectives and the language is easy and understandable. Sometimes they felt to consult some source books or reference books to know some of the technical words that has been arised in the print material. The students opinion is that the structure is logically presented with well framed questions and model answers at the end of each block. The references at the end were also benefitted to them but they could not get those books in the study centres.

They felt that the print material contains all the volumes with appropriate sketches / graphs / diagrams which are clear and informative with summaries and the whole printing was easily visible and attractive with good binding and cover. They expressed that the assignments to be worked out are too much and the problems in the assignment are difficult to answer. They expressed that they felt difficulty in finding the answer to the assignment questions even though the questions are based on the course content. Having all the good & positive points on the print material is not delivered well in time. Most of them expressed that they received it when half of the session is over. The students opinned that they do not get sufficient time to write good assignments and the counsellors did not give sufficient comments to improve the assignments.

Investigator was interested to know more about the type of interaction going on in the class room while teaching. For this purpose she personally visited the study centres and colleges and observed the lessons during counselling and teaching hours according to the observation schedule used for observation of the
lesson and rated the different items and came to the following conclusions about IGNOU and conventional colleges teacher behaviours and activities during teaching-learning process.

1) It was found that the counselling was not appropriate according to instructional objectives

2) The organisation of course content was not proper.

3) The counsellors introduced the unit properly.

4) The approach adopted was not convenient to the students

5) The counsellors had mastery over the subject matter.

6) Students were passive observer

7) The language was adequate for students

8) The counsellors did not use any teaching aids

9) The Black Board work was not sufficient

10) Counsellor did not use any reinforcement words.

11) The class-room was well managed

12) Counsellors asked some questions

13) The time period was found to be long.

14) There was no social climate in the class

15) The lesson was completed through discussion

16) The counsellor's were having good personality
Conventional Colleges

1) It was found that the teaching was appropriate according to the objectives.

2) The organisation of course content was proper.

3) The teachers introduced the unit properly.

4) The approach adopted was convenient to the students.

5) The teachers had mastery over the subject matter.

6) Active involvement of the students in the class was observed.

7) The language was adequate for students.

8) The teacher's used some teaching aids.

9) The Black Board work was sufficient.

10) Teachers' asked number of questions.

11) The classroom was well managed.

12) Teachers asked number of questions.

13) The time period was found to be adequate.

14) There was social climate in the class.

15) The lesson was over adopting different methods of teaching.

16) The teacher's were having good personality.
Comparative View of IGNOU and Conventional Colleges About-Teaching Methods Through Observation Schedule

1) It was found that IGNOU counselling was not appropriate according to the instructional objectives when compared to conventional colleges.

2) The organisation of the course content was not proper at IGNOU when compared to the conventional colleges.

3) The counsellors at IGNOU and the teachers at conventional colleges introduced the unit properly.

4) The approaches adopted during counselling at IGNOU is not convenient to the students when compared to the students of conventional colleges.

5) The counsellors at IGNOU and teachers at conventional colleges has mastery over the subject matter.

6) Students were passive observers at IGNOU where as at conventional colleges the students involvement was active during the class.

7) The language was adequately adopted by the counsellors at IGNOU and the teachers at conventional colleges.

8) Counsellors did not use any teaching aids during the teaching learning process at IGNOU whereas the conventional college teachers used some of the teaching aids during the teaching - learning process.

9) The blackboard work was not sufficient at IGNOU when compared to the conventional colleges.
10) IGNOU Counsellors did not use any reinforcement words for the students during the class as it is used by the teachers in conventional colleges.

11) At IGNOU and conventional colleges both the counsellors and teachers managed the class rooms nicely.

12) Counsellors asked some questions to the students of IGNOU. So also the teachers asked some questions during the class to the students at conventional colleges.

13) The time period was found to be long at IGNOU when compared to conventional colleges.

14) There was no social climate found in the class at IGNOU when compared to conventional colleges.

15) The closure of the lesson at IGNOU was with discussion whereas at conventional colleges the teachers adopted different methods of teaching and ended the lesson.

16) IGNOU counsellors and teachers of conventional colleges had good personality.
LIBRARY FACILITIES
LIBRARY FACILITIES

Opinion of the IGNOU B.Sc. Physics Course Students Regarding the Library Facilities.

The investigator gave the questionnaire to the students and collected the responses and following observations were pooled and presented in the form of percentages.

1) 96% expressed that libraries is not available
2) 90% expressed that assistant librarian is not available
3) 93% expressed that only a clerk is available
4) 96% expressed that a peon is present
5) 88% expressed that the text books are not sufficient in number with respect to physics.
6) 85% expressed that the reference books in physics are not sufficient.
7) 89% expressed that the journals are not available.
8) 94% expressed that the periodicals are not sufficiently available.
9) 91% expressed that the encyclopedias are not available.
10) 70% expressed that some new books are added to the library.
11) 92% expressed that books are not issued for home reading.
12) 88% expressed that catalogue system is not present.
13) 62% expressed that computer facility is available.
14) 62% expressed that internal facility is not available.
15) 89% expressed that xerox facility is not present.
16) 76% expressed that the staff extended good cooperation.
17) 95% expressed that the working hours is not sufficient.
18) 58% expressed that the library is kept open during examinations.
19) 91% expressed that the television set is available.
20) 92% expressed that video cassette receiver is present.
21) 87% expressed that audio cassette in physics are not available for all the blocks.
22) 90% expressed that video cassette in physics are not available for all the blocks.

Opinion of the IGNOU B.Sc. PHE (Physics) Counsellors Regarding the Library Facilities.

The researcher gave the questionnaire to the counsellors and collected the responses. These responses were observed and pooled and later on were presented in the form of percentages.

1) 100% expressed that the librarian is not available
2) 100% expressed that the assistant librarian is not available.
3) 100% expressed that only one clerk is available.

4) 100% expressed that only one peon is available

5) 60% expressed that the text books in physics are not sufficient.

6) 58% expressed that the reference book in physics are not sufficient.

7) 55% expressed that the journals are not available.

8) 56% expressed that the periodicals are not sufficiently available.

9) 55% expressed that the encyclopedias are not available.

10) 74% expressed that some new books are added to the library.

11) 100% expressed that books are issued for home reading.

12) 91% expressed that catalogue system is not present.

13) 90% expressed that computer facility is available.

14) 90% expressed that internet facility is not available.

15) 100% expressed that xerox facility is not available.

16) 81% expressed that the staff extended good cooperation.

17) 81% expressed that the working hours is not sufficient.

18) 100% expressed that the library is kept open during examination.

19) 100% expressed that the television set is available
20) 100% expressed that the video cassette receiver is present.

21) 76% expressed that audio cassette in physics are not available for all the blocks.

22) 83% expressed that video cassette in physics are not available for all the blocks.

Opinion of all the Three IGNOU Study Centre Coordinators Regarding the Library Facilities.

The researcher gave the questionnaires to the coordinators of all the three study centres and collected the responses. The responses were observed and commonly pooled and presented in the form of percentages. All the three coordinators expressed that.

1) The Librarian is not available

2) The Assistant librarian is not available

3) Only a clerk is available.

4) Only a peon is available.

5) The text books in physics are not sufficient.

6) The reference books in physics are not sufficient.

7) The journals are not sufficiently available.

8) The periodicals are not sufficiently available.
9) The encyclopedias are not available.
10) Some new books are added to the library.
11) The books are not issued for students.
12) The books are issued only for counsellors.
13) Catalogue system is not followed.
14) The computer facility is available.
15) The internet facility is not available.
16) The working hours is not sufficient.
17) The library is kept open during examinations.

Opinion of Students, Counsellors and Coordinators of IGNOU Study Centres Regarding the Library.

To sum up following is the opinion of the Students, Counsellors and Coordinators of all the three study centres with respect to Library.

1) IGNOU study centres do not have a librarian appointed for the library, so also there is no assistant librarian also.

2) All the three study centre's have a clerk and a peon in the study centre to assist the whole work of study centre.

3) The study centres - libraries do not have sufficient text books, encyclopedias, periodicals, journals in physics subject. They also expressed that some new books are added to the library.
4) Students opined that books are not issued for them. However the counsellors expressed that the books are sufficiently issued for them which is a source for supplementary reading.

5) Computer facility is available but internet facility is not available.

6) That working hours of library is not sufficient. The library does not follow the catalogue system.

7) Audio-Video cassettes are not available sufficiently for all the blocks.

8) The television set and a video cassette receiver is available.

Opinion of the Conventional B.Sc. Physics Course Students Regarding the Library Facilities

The investigator gave the questionnaire to the students and collected the responses. The responses thus observed were pooled and presented in the form of percentages.

1) 100% expressed that the librarian is available.

2) 100% expressed that the assistant librarian is available.

3) 86% expressed that there are 1-2 clerks.

4) 90% expressed that there are 3-4 peons.

5) 92% expressed that the text books are sufficient in number with respect to physics.
6) 88% expressed that the reference books in physics are sufficient.

7) 76% expressed that the journals are sufficient.

8) 73% expressed that the periodicals are sufficiently available.

9) 88% expressed that the encyclopedias are available.

10) 86% expressed that some new books are added to the library.

11) 92% expressed that the books are issued sufficiently for home reading.

12) 84% expressed that catalogue system is available.

13) 91% expressed that computer facility is available.

14) 62% expressed that internet facility is available.

15) 93% expressed that the xerox facility is present.

16) 91% expressed that the working hours is sufficient.

17) 86% expressed that the staff executed good cooperation.

18) 96% expressed that the library is kept open during examinations.
Opinion of the Conventional B.Sc. Physics Course Teachers Regarding the Library Facilities

The researcher after giving the questionnaires collected the responses and observed these responses, pooled and presented in the form of percentages.

1) 100% expressed that the librarian is present
2) 100% expressed that the Assistant librarian is present
3) 94% expressed that there are 1-2 clerks.
4) 88% expressed that there are 3-4 peons.
5) 85% expressed that the text books are sufficient in number with respect to physics.
6) 89% expressed that the reference books in physics are sufficient.
7) 86% expressed that the journals are sufficient.
8) 82% expressed that the periodicals are sufficient.
9) 86% expressed that the encyclopedias are available.
10) 90% expressed that some new books are added to the library.
11) 94% expressed that the books are issued sufficiently for home reading.
12) 94% expressed that the catalogue system is available.
13) 91% expressed that the computer facility is available.

14) 81% expressed that the internet facility is available.

15) 92% expressed that the xerox facility is available.

16) 93% expressed that the working hours is sufficient.

17) 88% expressed that the staff extended good cooperation.

18) 100% expressed that the library is kept open during examinations.

Opinion of the Conventional Science College Principals Regarding the Library Facilities

The investigator gave the questionnaire to all the twelve college principals and collected the responses. The responses were observed, pooled and presented in the form of percentages.

1) 100% expressed that the librarian is present

2) 100% expressed that the assistant librarian is present.

3) 100% expressed that there are 1-2 clerks

4) 100% expressed that there are 2-3 peons.

5) 82% expressed that the text books in physics are sufficient in number.

6) 91% expressed that the reference books in physics are sufficient.

7) 89% expressed that the journals are sufficient.
8) 90% expressed that periodicals are sufficient.

9) 91% expressed that the encyclopedias are available.

10) 96% expressed that new books are added to the library.

11) 100% expressed that the catalogue system is followed.

12) 100% expressed that computer facility is available.

13) 84% expressed that internet facility is available.

14) 94% expressed that the xerox facility is available.

15) 100% expressed that the library is kept open during examinations.

Interpretation

Opinion of the Conventional College Students, Teachers and Principals Regarding the Library Facilities

To sum up following is the opinion of the students, teachers and the principals of all the twelve colleges with respect to library.

1. All conventional colleges have a permanently appointed librarian who is responsible for getting relevant books to the library for the convenience of students and staff. They also opined that there is assistant librarian who looks after the whole library and assists the librarian. He is also permanently appointed so all the twelve colleges have the librarian and the assistant librarian.
2. There are 1-2 clerks and 2-4 peons are seen in almost all the collages to assist the library work. They are also appointed on permanently basis.

3. There are sufficient text books, reference books, source books in physics course. All the colleges are full fledged with library source material in physics to support teaching learning process and the catalogue system is followed in all the colleges.

4. The libraries are independently located with sufficient furnitures, journals in physics periodicals and encyclopedia's. The student's teacher's and the principal's expressed that every year some new books in physics subject are added to the library.

5. The staff extended good cooperation to the students and teachers in issuing the books. The students are issued home reading books on identity and system and yearly books are issued for home reading. They also expressed that the working hours is sufficient and flexible. The libraries are open during examinations.

6. All the college libraries have computer facility however most of the computers are also having internet facility. Also xerox facility is seen in all the college libraries for the convenience of students and staff.
Comparison of Library Facilities of IGNOU Study Centres and Conventional Colleges.

1. IGNOU study centre libraries do not have the Librarian, Assistant librarian, clerk and peons appointed. On the whole each study centre has appointed a Coordinator, Assistant coordinator, clerk and a peon who looks after the whole programmes of the study centres. The clerk and a peon issues books for counsellors and guides the students. The clerk and the peon looks into office matters and looks also the library aspects. So there is no right person who looks after the library.

Whereas the conventional college have independent library building or section of its own with permanently appointed librarian an assistant librarian, clerks and peons. Each library has at least two clerks and two to four peons to assist library work.

2. All the three study centres do not have sufficient supporting material like text books source books and reference books in physics. As per opinion of the students they expressed that periodicals, journals, encyclopedias are not available. They also expressed that books are not issued for home reading whereas, all the conventional college libraries are well equipped with physics journals, periodicals and encyclopedias they expressed that books are issued to them sufficiently on identity card system.

3) IGNOU study centre libraries do not follow catalogue system. Book are kept on racks with other subjects. There is no specific rack or cupboard meant for physics subject whereas, in conventional college libraries, there are large number of racks and cupboards seen with well equipped books. Catalogue system is followed in all the colleges. Physics books are separately kept on cupboards and racks. The books are located easily since each library follows catalogue system through various access points such as author, title, publisher series, subject, class number, accession number and any word from the title.

4. All three study centres libraries of IGNOU have the computer facility. As
per opinion of students & counsellors they expressed that the internet facility is not available. But the co-ordinator expressed that they are likely to get the internet services within some time. All the three expressed that the working hours of library is not sufficient. So also xerox facility is not existing in all the three study centres.

On the other side, the conventional libraries in all the twelve colleges have computer facility and internet facility. So also xerox facility is available. The students and teachers are satisfied with the working hours of the library so also the libraries are kept open during examinations and also some times on Sundays when the examination is approaching. The students and staff are well satisfied with the cooperation extended by the library staff.

5. The three study centres of IGNOU has the facility of television set with the video cassette receiver. The students and counsellors are of the opinion that audio-video cassettes in physics course are not available for all the blocks. The IGNOU study centre libraries are only acting as reference libraries.

Conclusion

If can be concluded that IGNOU study centres have meagre facilities for students and staff with respect to text books, source books, reference books, journals, periodicals, encyclopedias and other supporting services. The supporting material and supplementary material are not relevant to the physics course. The working hours is not enough. Audio-video cassettes are not available for all the blocks of physics course. However computer is available in all the three study centres without internet facility and no xerox facility is available. IGNOU libraries are only reference library.

The library books are not utilised by the students because these libraries function as reference libraries only they are not operating as running libraries. Thus the information obtained through the questionnaire gave the clear picture of the IGNOU study centre libraries and to that of conventional college libraries.

Whereas conventional science college libraries are full fledged libraries with all good amenities in all respect.
PHYSICS LABORATORY FACILITIES
IGNOU - PHE (physics) Laboratory Work

Laboratory courses are an integral component of the IGNOU B.Sc. programme. At least 25% of the elective credits in non-mathematics science course, i.e. physics, chemistry and life science must be from laboratory courses. The curriculum for laboratories is well prepared to weed out experiments not significant to the present day state of discipline. Importance has been given to the utility of an experiment with respect to real life experience development of experimental skills, and industrial applications. The laboratory courses is planned during suitable periods such as summer or autumn vacations so that in-service persons can take them easily without difficulty. Facilities for laboratory courses will be provided at one study centre in each region. More study centres will be activated depending on the enrolment. Laboratory courses carry 2 or 4 credits. A 2-credit laboratory course will require full time presence of the student at the study centre for one week continuously. During time a student has to work for around 60 hours. Around 40 hours would be spent on experimental work and the remaining time will be used for doing calculations, preparation of records, viewing or listening to the video/audio programmes. The requirement for a 4-credit laboratory course would be 120 hours of work spread over two consecutive weeks with time distribution similar to a 2-credit course.
Attendance in the laboratory course is compulsory, every experiment is evaluated and is included for final evaluation. The experiments done by the students under the guidance of the counsellors constitutes the continuous evaluation and carries 70% weightage. On the other hand the unguided experiments are done by the students and carries 30% weightage and constitutes term-end evaluation. Hence a student has to perform all the experiments to secure maximum marks. As far as possible he/she should complete the laboratory courses in the year in which a student register for them.

Details of number of sessions required to complete each laboratory course are given below.

Table: 22 - Showing the details of the B.Sc. Laboratory Courses of Chemistry, Physics and Life Science.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course</th>
<th>No. of Sessions to be conducted</th>
<th>Total No. of days required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CHE-03(L)</td>
<td>02 01 + 12 + 01 +14</td>
<td>07</td>
</tr>
<tr>
<td>2.</td>
<td>CHE-07(L)</td>
<td>02 01 + 12 + 01 +14</td>
<td>07</td>
</tr>
<tr>
<td>3.</td>
<td>CHE-08(L)</td>
<td>02 01 + 12 + 01 +14</td>
<td>07</td>
</tr>
<tr>
<td>4.</td>
<td>CHE-11(L)</td>
<td>04 01 + 26 + 01 +28</td>
<td>14</td>
</tr>
<tr>
<td>5.</td>
<td>CHE-12(L)</td>
<td>04 01 + 26 + 01 +28</td>
<td>14</td>
</tr>
<tr>
<td>6.</td>
<td>PHE-03(L)</td>
<td>04 01 + 26 + 01 +28</td>
<td>14</td>
</tr>
<tr>
<td>7.</td>
<td>PHE-08(L)</td>
<td>04 01 + 26 + 01 +28</td>
<td>14</td>
</tr>
<tr>
<td>8.</td>
<td>PHE-12(L)</td>
<td>04 01 + 26 + 01 +28</td>
<td>14</td>
</tr>
<tr>
<td>9.</td>
<td>LSE-04(L)</td>
<td>04 01 + 26 + 01 +28</td>
<td>14</td>
</tr>
<tr>
<td>10.</td>
<td>LSE-08(L)</td>
<td>04 01 + 26 + 01 +28</td>
<td>14</td>
</tr>
</tbody>
</table>

Note: (i) Each session is of four hours duration ii) Two session of four hour each will be held each day. iii) First session of each laboratory course will be utilised as introductory session.
Opinion of the Students of IGNOU Study Centres Regarding the PHE (physics) Laboratory Work.

The following is the opinion of B.Sc. PHE (physics) course students regarding the physics laboratory.

1) 91% expressed that 1 or 2 teaching staff is available to guide the experiments during the laboratory work.

2) 88% expressed that 1-2 supporting staff is available during the laboratory work.

3) 85% expressed that the apparatus and other equipments are sufficiently available.

4) 84% expressed that the attendance is compulsory during the laboratory work.

5) 90% expressed that 30 ‘/ weightage is given for laboratory work.

6) 91% expressed that instructions given by counsellors during laboratory work is not sufficient.

7) 92% expressed that IGNOU provides laboratory work sheet during laboratory work.

8) 83% expressed that repetitions of experiments is not in practice during the laboratory work.

9) 95% expressed that the working hours of laboratory work is not sufficient.
Opinion of the IGNOU PHE Counsellors Regarding the Laboratory work in PHE Course.

Following is the opinion of the PHE counsellors regarding the laboratory work.

1) 95% expressed that 1-2 teaching staff is available to guide the experiments during the laboratory work.

2) 93% expressed that 1-2 supporting staff is present.

3) 96% expressed that the apparatus and other equipments are sufficiently available.

4) 97% expressed that the attendance during the laboratory work is compulsory.

5) 100% expressed that 30 '% weightage is given for laboratory work.

6) 100% expressed that IGNOU provides work sheets during the laboratory work.

7) 100% expressed that repetitions of experiments is not in practice.

8) 90% expressed that the working hours of laboratory work is not sufficient.
Opinion of the Co-ordinators Regarding Laboratory Work in PHE Course.

Following is the opinion of all the coordinators of the study centres regarding the PHE laboratory work.

1) expressed that 1-3 teaching staff is available to guide the experiments during the laboratory work.

2) expressed that 1-2 supporting staff is present.

3) expressed that the apparatus and other equipments are sufficiently available.

4) expressed that attendance is compulsory during the laboratory work.

5) expressed that 30 weightage is given for laboratory work.

6) expressed that instructions given by counsellors is sufficient.

7) expressed that IGNOU provides work sheets during the laboratory work.

8) expressed that repetitions of experiments is not in practice.

9) expressed that working hours of laboratory work is not sufficient.
**Interpretation**

**IGNOU -PHE (physics) Laboratory Course**

When the investigator noted down the opinion of the IGNOU students, counsellors and the coordinators the opinion were pooled and presented in the form of percentage analysis.

1) The laboratory of the college where IGNOU study centre is situated is being used for IGNOU students. This is in accordance with Memorandum of Understanding (MOU) with respect to universities and respective colleges. Hence a well equipped laboratory is available for IGNOU students.

2) Only one or two guiding counsellors are found during the laboratory session and 1-2 peons are available to support the students and counsellors which is not sufficient according to the students.

3) Laboratory session is usually conducted during the summer or autumn vacations.

4) Students are finding very difficult to perform the experiments because of the following reasons.
   a) No proper guidance
   b) lack of demonstration
   c) lack of assistance during the experimentation
   d) Many a times electricity and water failure
e) Inadequate time

f) Restrictions and compulsion in the laboratory

g) Experiments are hurriedly done

h) Lack of counsellors.

5) Students find difficult to do calculations, preparation of records and no laboratory journal maintenance

6) Lack of time in viewing or listening to audio video programmes.

7) There is no provision for repetitions of experiments in the laboratory.

8) Some of the modern experiments are not included in the laboratory syllabus.

9) There are 2 types of experimentation process

a) Guided experiments - sufficient counsellors are not available to teach.

b) Unguided experiments - feel difficult to do calculations and prepare the records.

10) Only 3-4 experiments will be guided and remaining are unguided which are done only with the help of instructions.

11) Laboratory work sheets given are not sufficient.

12) There is no university level examination for practical work. Only evaluation is done then and there itself.
Opinion of the Conventional College Students Regarding the Physics Laboratory Work.

Following is the opinion of the students regarding the physics laboratory work.

1) 96% of the students expressed that 4-6 teachers are available during the laboratory work.

2) 97% expressed that 5-6 supporting staff are present.

3) 98% expressed that the apparatus and other equipments are sufficiently available.

4) 90% expressed that attendance is compulsory during the laboratory work.

5) 85% expressed that (7-10) marks weightage is given for laboratory work.

6) 94% expressed that instruction given by the teachers is sufficient during the laboratory work.

7) 100% expressed that work book journal is maintained for laboratory work.

8) 96% expressed that repetition of experiments is in practice.

9) 98% expressed that the working hours is sufficient during the laboratory work.
Opinion of the Physics Teachers of the Conventional Colleges Regarding the Physics Laboratory Work.

Following is the opinion of the physics teachers regarding the laboratory work.

1) 92% expressed that 4-7 teaching staff is present during the laboratory work.

2) 91% expressed that 5-6 supporting staff are present.

3) 95% expressed that apparatus and other equipments are sufficient.

4) 100% expressed that attendance is compulsory during the laboratory work.

5) 96% expressed that (10-15) marks weightage is given for laboratory work.

6) 100% expressed that laboratory work book is maintained.

7) 96% expressed that repetition of experiments is in practice.

8) 98% expressed that working hours of laboratory work is sufficient.

Opinion of the Principals of the Conventional Colleges Regarding the Physics Laboratory Work.

Following is the opinion of the principals regarding the physics laboratory work.

1) 100% expressed that 4-7 teachers are available during the laboratory work.

2) 100% expressed that 4-6 supporting staff are present.

3) 100% expressed that the apparatus and other equipments are sufficient.
4) 100% expressed that attendance is compulsory during the laboratory work.

5) 100% expressed that (10-15) marks weightage is given for laboratory work.

6) 100% expressed that instruction given by teachers is sufficient during the laboratory work.

7) 100% expressed that work / book journal is maintained for laboratory work.

8) 100% expressed that repetitions of experiments is in practice.

9) 100% expressed that the working hours is sufficient during the laboratory work.

Combined Opinion of Conventional College Physics Students, Teachers and Principals Regarding the Laboratory Facilities.

Investigator pooled out the opinion of the B.Sc. physics students, teachers and the principals of the conventional science colleges chosen for the study and the following opinions are presented based on the percentage analysis.

1. Every science college where physics is taught as one of the optional subject has well equipped laboratory having separate amenities wherein all the materials of the experiments are neatly kept. There are big experiment tables where in the practicals are conducted according to the batches. These batches are again framed by the head of the department in consultation to the other staff members of the department. There is dark room facility to do dark room experiments. Computer room, store room, weighing room, HOD cubical, small library, demonstrators room is seen. One or two laboratory assistants 2-3 peons and a clerk are always present during the laboratory work to assist the students as well as teachers.
2. There is a regular time-table of laboratory work for B.Sc.-I, IInd and IIIrd year students. The number of each year students are divided into batches and each day one or two practicles are conducted. The time table is as follows.

<table>
<thead>
<tr>
<th>Day</th>
<th>B.Sc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, Tuesday</td>
<td>B.Sc. -I</td>
</tr>
<tr>
<td>Wednesday, Thursday</td>
<td>B.Sc.-II</td>
</tr>
<tr>
<td>Friday, Saturday</td>
<td>B.Sc.-III</td>
</tr>
</tbody>
</table>

The students come in batches and do the practicals. Usually three hours / day will be the laboratory timings for each batch. On every last week of the month repetitions of the experiments will be arranged. Those who could not do properly in the usual practical hours or some other reason could do the practicles in the repetition hours.

3. The college supply laboratory journals / work book to the students which has well guided instructions and so on. So the students does all the laboratory work in the journal itself. So that he can revise it now and then. These journal are to be certified by the Head of the department on completion of all the experiments within the stipulated time.

4. During the experimentation session the concerned teachers will first demonstrate the experiment to a small batch of students and gives proper directions to do the same. Hence the students in groups of two each will be performing the experiment. The teacher takes individual interest towards the students for achieving the objectives of the experiment and development of skills usually there will be two shifts; i.e morning and afternoon if the students strength is large in number.
5. There are laboratory manuals, procedure books, source books kept for the reference.

6. Every year there is a laboratory budget. The Head of the department will place the orders for new equipments, apparatus and other requirements in the laboratory for smooth conduct of the experiments.

7. Attendance in the laboratory session is compulsory for all the students. The teachers take regular attendance during the practicles usually there are 5-6 teachers working in the laboratory for each batch of practicles belonging to difficulties of physics.

8. Sometimes experimental session will go up to 4-5 hours each day wherein the students are allowed to perform the experiments if they are free and the laboratory is free enough. So the experiments sometimes are continuously conducted until they get the accurate result or solutions.

9. At the end of the academic year there is a university level practical examination wherein each student has to score 50% of marks and (10-15) marks are assigned for maintenance of laboratory journal, calculations and for other records.

**Comparison of Physics Laboratory Facilities of IGNOU to that of Conventional Colleges.**

The investigator duly analysed and integrated the physics laboratory setups existing in both the IGNOU study centres as well as in the conventional colleges selected for the study.
The main objective of the study is to know the comparative view of laboratory work conducted during IGNOU laboratory work and so also during the conventional colleges. Hence the investigator duly compared the laboratory work in physics course at IGNOU as well as conventional colleges and found the following aspects.

1. As we have already noticed that IGNOU adopts well established physics laboratories from the conventional colleges based on Memorandum of Understanding (MOU) with the State Government for providing them rent free accommodation and hence no rent is paid by IGNOU to the conventional colleges for the laboratory work conducted. Hence the infrastructure and the laboratory set up is similar for both the conventional as well as IGNOU B.Sc. course.

2. IGNOU has one or two guiding counsellors for guiding the students during the laboratory session which leads to some difficulty for the students to clarify the difficulty during the experimentation.

Whereas, in the conventional colleges 5-6 teachers and an HOD are there to guide the experiments with sufficient supporting staff like demonstrator, peons, lab assistant, attender to assist the students as well as teachers. Hence the experiments are smoothly conducted in the laboratory without any hurry. The students get sufficient time to perform the experiments and get accurate readings, calculations result and come to a conclusion.

3. IGNOU students are provided with work sheets for writing calculations and noting the readings and observations whereas the conventional colleges provide a laboratory work book or a journal to maintain the whole number of experiments in each year. Hence a student writes all the experiments in one work book itself.
4. IGNOU students usually are allowed to do practicals during the summer or autumn vacations which ever is suitable for them which leads to irregular approach there is lot of time lag between the two sessions. Hence the students may forget the experimental skills and knowledge whereas, the conventional college laboratory work is regularly conducted without any gap. Depending upon the number of students, the batches are planned - Usually there will be large number of students in each college during every academic year. Hence the students get sufficient time to perform the experiments attend regularly, maintain the records, do calculations and come to a conclusions systematically.

5. IGNOU conducts the examinations then and there itself during the laboratory session. Each and every experiment is evaluated and the marks and grades are included in for the final result. Guided experiments carry 70% weightage and unguided experiments 30%. Hence it has continuous evaluation system.

Whereas, conventional universities conduct annual examination for the laboratory work each year at the end of the academic year and hence they get proper guidance for all the experiments and the weightage is only 10 marks for lab journal, maintenance of records and calculations etc.

6. There is no provision for repetition of experiments at IGNOU. But the conventional college students have the provision for repetition of experiments to develop the desired skills.

7. IGNOU experiments are time bound whereas the conventional students get sufficient time for completion of experiments.
CO-CURRICULAR ACTIVITIES
CO - CURRICULAR ACTIVITIES

Co-curricular Activities - IGNOU

IGNOU is conducting B.Sc. course through distance mode and hence the students do not have opportunity to involve in the community service activities that is how the co-curricular aspect is not at all considered. How ever Teleconferencing, radio talks, Gyan darshan, Video play, Disc includes some of the activities these cannot be considered as the co-curricular activities. All The whole time is utilised in counselling or writing assignments and performing practicals. Hence these courses are said to be academic oriented courses. Lack of resources are some of the factors that affect the organisation of such activities.

According to the opinion of the students all are interested to participate in various co-curricular activities. They have also expressed that some indoor game materials may be provided for recreation purpose for which the coordinators are not willing this may be because he has to obey the rules and regulations framed by IGNOU.

Co-curricular Activities- Conventional Colleges

This is one of the important components in the conventional college curriculum. Along with academic activities co-curricular activities are the integral part of the college routine. Throughout the year we find one or the other activities conducted in the college. There is Gymkhana department separately located in the college campus where the Physical Director and his supporting staff are permanently appointed conducts the sports activities and competitions for students at College Level, Inter College Level, Inter University Level and Zonal Level. The students participate in these activities and some times they get prize and awards at different level of sports activities. Sometimes even sports
activities are also conducted for staff members. Hence these activities are the regular feature of the conventional colleges. Most of the students take part in one or the other sports activities and also cultural activities are well organised in the college. Students participate even during youth festivals conducted at the university every year for students. They also get prizes and medals. So these rewards, medals, certificates are given which will help them in the future carrier to get jobs etc.

Comparison of Co-curricular Activities of IGNOU and Conventional Colleges.

Another important point investigator noted was that of organisation of Co-curricular activities for which the investigator collected the opinion of students and the opinions were pooled and noted the following observations.

In the conventional science colleges of all the six universities we see ample of scope is given to each student to develop socially, culturally, emotionally and morally. In doing so the students develop leadership qualities, becomes good orator, sportsman and becomes social mobiliser through cooperation, coordination and coexistence. They develop competitive nature and come in contact with different peoples of national and International Structure. The students get recognition throughout the country and outside the country also.

Moreover students will get terminal benefits like reservation in job opportunities and in higher education etc. Hence Co-curricular activities has become an integral part of the whole B.Sc. curriculum. Along with the academic work students develop National and International Understanding and will get recognition and rewards.

Whereas, in IGNOU the main concept is distance education. Very little scope is given for co-curricular programmes and activities. Moreover students have very little time to participate in such activities.
EVALUATION, RESULT AND AWARD
EVALUATION, RESULT AND AWARD

Evaluation Procedure in IGNOU

The evaluation system in IGNOU consists of two components: (1) Continuous evaluation through assignments, and (2) Term-end examination. A learner must pass both in continuous evaluation as well as in term-end examination of a course to earn the credits assigned to that course. In the final result all the assignments of a theory course carry 30% weightage while 70% weightage is given for the term-end examination. The university follows a marking as well as grading system on a 5 point scale for continuous evaluation as well as for term-end examination. The notional correlates of the letter grades and percentage of marks are as under.

<table>
<thead>
<tr>
<th>Letter grade</th>
<th>Qualitative value</th>
<th>Point Grade</th>
<th>Equivalent % of numerical marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Excellent</td>
<td>5</td>
<td>70% and above</td>
</tr>
<tr>
<td>B</td>
<td>Very Good</td>
<td>4</td>
<td>Above 50% and below 70%</td>
</tr>
<tr>
<td>C</td>
<td>Good</td>
<td>3</td>
<td>Above 45% and below 55%</td>
</tr>
<tr>
<td>D</td>
<td>Satisfactory</td>
<td>2</td>
<td>Above 35% and below 45%</td>
</tr>
<tr>
<td>E</td>
<td>Unsatisfactory</td>
<td>1</td>
<td>Less than 35%</td>
</tr>
</tbody>
</table>

A learner has to score at least a 'D' grade (35% marks) in both continuous evaluation (assignments) as well as the term-end examination. In the overall computation also he/she must get at least a 'D' grade in each course to claim the B.Sc. degree. Scores of continuous evaluation (assignments) and term-end examination are not complementary to each other.
Division is awarded on the basis of total marks obtained by a student in all courses as given below.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 60 %</td>
<td>First Division</td>
</tr>
<tr>
<td>50 - 59 %</td>
<td>Second Division</td>
</tr>
<tr>
<td>35 - 49 %</td>
<td>Pass</td>
</tr>
<tr>
<td>&lt; 35 %</td>
<td>Unsuccessful</td>
</tr>
</tbody>
</table>

The students who do not qualify in the term-end examination are also allowed to take up the term-end examination in courses of the next year. It means a student can take the term-end examination of the first year courses in the second year of study. But he/she can appear in examination for not more than 48 credits in one year. A student can also carry the first and second year courses over to the third year.

**Assignments**

Assignments constitute the continuous evaluation component of a course. The assignments of a course carry 30% while 70% weightage is given to the term-end examinations. The marks got by a student in the assignments will be counted in final the assignments seriously. However, there will be no written assignments for lab course. He/She has to complete the assignments in time and will not be allowed to appear for the term-end examination for a course if the specified number of assignments are not submitted in time for that course.

The main purpose of assignments is to test the learner comprehension of the learning material that he/she receives from IGNOU and also to help a student
get through the courses by providing feedback. The assignments are designed in such a way as to help a student concentrate mainly on the printed course material and make use of his/her personal experience.

**There are two Type of Assignments**

1) Tutor-Marked Assignment (TMA) which is evaluated by the counsellors and

2) Computer Marked Assignment (CMA) which is evaluated by the computer.

For a 8 credit course one will have to do three assignments in all.

In the case of a 4 credit course, one will have to attempt two assignments, For a 2 credit course, there will be only one assignments. Before he/she submits the assignments care has to be taken to see that all the questions has been answered. Incomplete answer sheets brings him poor grades. The assignments is to be submitted before due date which is indicated in the assignment itself. In case a student receives study material and assignments late, the assignment responses can be submitted with one month of the date of receipt of material of the last date printed in the assignment booklet whichever is later. The university Co-ordinator has the right to reject the assignments which is received after evaluated by the counsellor at the study centre. The tutor gives comments on the assignment. This may help a student to improve for further assignments.

A student has to maintain an account of all the corrected assignment responses received after evaluation.

In case he/she is unable to submit the assignments or unable to score minimum qualifying grade(D), then he/she has to wait for the assignments meant for
the next batch of students and submit them. The request for the new assignments may be addressed to the Assistant Registrar, Material production and Distribution Division, IGNOU, Delhi in the month of November/December in the prescribed form printed in the programme guide.

Once a student gets the pass grade in an assignment, he/she cannot resubmit it for improvement of grade. Assignments are not subject to re-evaluation except for factual errors, if any.

Evaluation of laboratory courses is done then and there at the time of conducting the laboratory courses. Each and every experiment is evaluated. Evaluation of experiments under the guidance of counsellor, constitutes continuous evaluation and carries 70% weightage. The evaluation of unguided assigned experiment(s) done during the last session of the lab course, carries 30% weightage and thus it constitutes term-end evaluation.

Investigator pooled out the opinion of the students, counsellors and the coordinators of B.Sc. physics course of IGNOU and noted the following points.

1) Students agree that the evaluation system of IGNOU is exhaustive and comprehensive.

2) They are made to study with the print material throughout the years.

3) Too much dependence on the print material.

4) Sufficient time is given to write the assignments.
5) Lack of guidance leads to write the assignments improperly.

6) Lack of guidance to counsellors to evaluate the assignments.

7) Grading system is not liked by the students, and thus grading system may further leads to complexities in getting the jobs or deciding the merit.

8) The credit system is not liked by the students.

9) There will be term end examinations that is in June and December.

10) Awarding of class/division is on the basis of total marks obtained by him/her in all the courses. Investigator is of the opinion that there is no provision for Distinction award.

11) Assignment carry 30% weightage and 70% for term end examination.

12) Submission of assignments is compulsory.

There are two type of assignments

   a) Tutor-marked Assignment (TMA) which is evaluated by the counsellors) and

   b) Computer Marked Assignments(CMA) which is evaluated by the computer.

13) No provision to resubmit assignments for improvement of grade after getting pass grade.
14) No provision for revaluation and rechecking.

15) Feedback/Comments on assignments is given by the counsellors but it is not sufficient.

16) No comments are given on Computer Marked Assignment written by students.

17) Question paper constitutes of both objective and subjective type and short paragraph answer type.

18) Paper valuation is done at IGNOU Head quarters-New Delhi.

19) Duration of each term-end examination paper is two and half to three hours.

20) Very few first class, distinction is got by the students and lot of failures and drop-outs is seen.

21) Carry over Benefit scheme is available.

22) Maximum duration is 3-8 years to complete the B.Sc. course.

23) Throughout the nation same system of evaluation and same type of curriculum.

24) After degree, certificate is given as B.Sc (major) in physics.

25) Convocation is held once in a year mainly at the Head quarter New Delhi.
Evaluation System in Conventional Colleges

Investigator is at last to know the evaluation system existing in the conventional colleges of all the six universities in Karnataka.

1) There is no common procedure adopted since some universities give the weightage of (10 - 15) marks for practicals.

2) Even though assignment system is present, but the marks secured by a student in the assignment will not be considered for awarding the degree.

3) Only one examination i.e., annual examination is conducted by the respective universities at the end of academic year both for theory as well as practicals during April / May.

4) There will be supplementary examination during October month.

5) Duration of exam is of two and half hour to three hours.

6) System of revaluation of answer scripts is available.

7) System of 1st, 2nd and 3rd valuation of answer scripts is available.

8) Retotalling of marks facility is available.

9) Carry Over Benefit (COB) system is available i.e., student has to pass in two of the theory subjects.

10) More Distinction, Ranks, 1st class are seen.

11) Very meagre failure and dropouts are seen.
12) No restriction of time to complete the course. But students are advised to take examination according to new course syllabus as on time available.

13) Award of Class

- Above $\geq 70\%$ Distinction
- $\geq 60\%$ First Class
- 50 - 59\% Second Division
- 35 - 49\% Pass
- < 35\% Fail

14) Ranks and Gold medals will be given to the meritorious students.

15) Evaluation system is different in different universities.

16) Award of degree as B.Sc.

17) Award of degree as B.Sc. (Major) physics is not given by any of the six universities.

18) Convocation address is conducted twice in a year i.e., June and December.

19) Universities follow central valuation system where the evaluation of answer scripts is done at university campus or in some college’s selected for central valuation.

20) Duration of each theory examination in physics is of 3 hours and that of practical is of 3-4 hours.

21) Question paper pattern is both subjective and long answer type.

22) Mid-term examination is conducted in September and preparatory examination in the last week of January of each academic year.

23) Some one or two monthly tests are conducted and these results are submitted by the teachers to the principals.
Comparison of Achievement of IGNOU Physics Degree Students to those of Conventional College Students.

The investigator was further interested to know whether there is any significant difference between the Achievements of IGNOU students to that of Conventional Colleges Students. For this purpose she collected the marks of physics subject pertaining to B.Sc. I, II and III of IGNOU students. For this purpose she collected the marks list from Student Registration and Evaluation Division IGNOU New Delhi. So the investigator choose 150 students from B.Sc. I, II and III (50 each). So in all she choose randomly 150 students from conventional colleges B.Sc. I, II & III. The marks of both theory and practicals were noted separately for the purpose of comparison. Then the researcher calculated Mean & Standard deviation for all the three years of study.

IGNOU Students

Table :23 - Showing B.Sc. I Students of IGNOU and Conventional Colleges Mean and Standard Deviation.

<table>
<thead>
<tr>
<th></th>
<th>IGNOU</th>
<th>Conventional</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory</td>
<td>Practical</td>
<td>Theory</td>
</tr>
<tr>
<td>Mean</td>
<td>36.02</td>
<td>54.66</td>
<td>67.98</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>= 8.56</td>
<td>= 12.54</td>
<td>= 12.32</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>= 12.54</td>
<td>= 12.32</td>
<td>= 8.32</td>
</tr>
</tbody>
</table>

The table 23- clearly indicates the mean of B.Sc. I students of IGNOU is 36.02 and that of conventional college is 67.98 with respect to theory. Standard Deviation is 8.56 and 12.32. Similarly, with respect to practicals, IGNOU's mean
is 54.66 and that of conventional is 75.02, the standard deviation being 12.54 and 8.86 respectively.

To know the significance, significant difference between the two sets of theory and practical scores of B.Sc. I students.

The investigator calculated ‘t’ value

Table shows ‘t’ values of the theory and practical of B.Sc. I students of both IGNOU and conventional colleges.

Theory ‘t’ value  - 15.08
Practical ‘t’ value  - 9.66

Both the ‘t’ values are significant at 0.05 level of significance which means the conventional students of B.Sc. I physics course significantly achieved more than the IGNOU B.Sc.-I physics course students.

Similarly, the investigator calculated Mean and Standard Deviation of B.Sc.-II physics course of IGNOU as well as conventional college students.

Table :24-Showing B.Sc.-II Students of IGNOU and Conventional Colleges

<table>
<thead>
<tr>
<th></th>
<th>IGNOU</th>
<th>Conventional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory</td>
<td>Practical</td>
</tr>
<tr>
<td>Mean</td>
<td>30.26</td>
<td>49.32</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>10.12</td>
<td>12.6843648</td>
</tr>
</tbody>
</table>

Table 24 - clearly indicates the Mean of B.Sc.-IInd year students of IGNOU is 30.26 and that of conventional college is 68.58 Standard Deviation is 10.12 and 11.42. Similarly, with respect to practicals, IGNOU’s students mean is 49.32 and that of conventional is 80.16 the standard deviation being 12.68 and 8.17.
To know the significance, significant difference between the two sets of theory and practical scores of B.Sc.-II students, the investigator calculated 't' value.

Table shows 't' values of the theory and practical of B.Sc.-II students of both IGNOU and conventional colleges.

<table>
<thead>
<tr>
<th></th>
<th>Theory t Value</th>
<th>Practical t Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17.82</td>
<td>14.47</td>
</tr>
</tbody>
</table>

Both the 't' value are significant at 0.05 level of significance, which means the conventional colleges students of B.Sc-II physics course significantly achieved more than the IGNOU B.Sc.-II physics course students.

Similarly, the investigator calculated mean and standard deviation of B.Sc.-III physics course students of IGNOU of that of conventional college students.

Table :25- shows B.Sc.-III students of IGNOU and conventional colleges Mean and Standard Deviation

<table>
<thead>
<tr>
<th></th>
<th>IGNOU</th>
<th>Conventional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory</td>
<td>Practical</td>
</tr>
<tr>
<td>Mean</td>
<td>26.82</td>
<td>49.16</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>9.02</td>
<td>15.09</td>
</tr>
</tbody>
</table>

Table 25 - clearly indicates the mean scores of B.Sc.-III students of IGNOU is 26.82 and that of conventional science students is 70.68 and the standard deviation is 9.02 and 12.83. Similarly with respect to practicals, IGNOU students
mean score is 49.16 and that of conventional students is 82.08 respectively and the Standard Deviations is 15.09 and 7.59 respectively.

To know further the significance, significant difference between the two sets of theory and practicals scores of B.Sc.-III students the investigator calculated also 't' value.

Table shows the 't' value of the theory and practical of B.Sc. -III students of both IGNOU and conventional colleges.

<table>
<thead>
<tr>
<th></th>
<th>'t' Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory</td>
<td>19.74</td>
</tr>
<tr>
<td>Practical</td>
<td>13.83</td>
</tr>
</tbody>
</table>

Both the 't' values are significant at 0.05 level of significance, which means the conventional college students of B.Sc. -III physics course significantly achieved more than the IGNOU B.Sc.-III physics course students.
Comparative view of Achievements of IGNOU and Conventional College Students

Table :26 - Showing the Mean, Standard Deviation and ‘t’ value of B.Sc.-I conventional and IGNOU students.

<table>
<thead>
<tr>
<th>Year of Study</th>
<th>Mean Conventional</th>
<th>Mean IGNOU</th>
<th>Standard Deviation Conventional</th>
<th>Standard Deviation IGNOU</th>
<th>‘t’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.Sc.-I Theory</td>
<td>67.98</td>
<td>36.02</td>
<td>12.32</td>
<td>8.56</td>
<td>15.08</td>
</tr>
<tr>
<td>B.Sc.-I Practical</td>
<td>75.20</td>
<td>54.66</td>
<td>8.32</td>
<td>12.54</td>
<td>9.66</td>
</tr>
</tbody>
</table>

From the above table it is clear that the mean of the conventional theory B.Sc.-I students is 67.98 and to that of IGNOU B.Sc.-I students is 36.02 and Standard Deviation’s are 12.32 and 8.56 respectively. The ‘t’ value calculated is 15.08 which is significant at 0.05 level of significance. This means that the conventional college B.Sc.-I students have scored significantly more than the IGNOU B.Sc. -I students. Similarly, it is quite clear from the above table that the mean of the conventional practical B.Sc.-I students is 75.20 and to that of IGNOU B.Sc.-I students is 54.66 and Standard Deviation’s are 8.32 and 12.54 respectively. This ‘t’ value calculated is 9.66 which is significant at 0.05 level of significance this means that the conventional college B.Sc.-I students have scored significantly more than the IGNOU B.Sc.-I students.
Table: 27- showing the Mean, Standard Deviation and 't' value of B.Sc.-II conventional and IGNOU students.

<table>
<thead>
<tr>
<th>Year of Study</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conventional</td>
<td>IGNOU</td>
</tr>
<tr>
<td>B.Sc.-II Theory</td>
<td>68.58</td>
<td>30.26</td>
</tr>
<tr>
<td>B.Sc.-II Practical</td>
<td>80.16</td>
<td>49.32</td>
</tr>
</tbody>
</table>

From the above table it is clear that the Mean of the conventional theory B.Sc.-II students is 68.58 and to that of IGNOU is 30.26 and Standard Deviation's are 11.42 and 10.12 respectively. The 't' value calculated is 17.82 which is significant at 0.05 level of significance. This means that the conventional college B.Sc.-II students have scored significantly more than the IGNOU B.Sc.-II students.

Similarly it is quite clear from the above table that the mean of conventional practical B.Sc.-II students is 80.16 and to that of IGNOU is 49.32 and Standard Deviation's are 8.17 and 12.68 respectively. The 't' value calculated is 14.47 which is significantly at 0.05 level of significance. This means that the conventional college B.Sc.-II students have scored significantly more than the IGNOU B.Sc.-II students.
Table 28 - Showing the Mean, Standard Deviation and 't' value for B.Sc.-III Conventional and IGNOU students.

<table>
<thead>
<tr>
<th>Year of Study</th>
<th>Mean Conventional</th>
<th>Mean IGNOU</th>
<th>Standard Deviation Conventional</th>
<th>Standard Deviation IGNOU</th>
<th>'t' Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.Sc.-III Theory</td>
<td>70.68</td>
<td>26.82</td>
<td>12.83</td>
<td>9.02</td>
<td>19.74</td>
</tr>
<tr>
<td>Practical</td>
<td>82.08</td>
<td>49.16</td>
<td>7.59</td>
<td>15.09</td>
<td>13.83</td>
</tr>
</tbody>
</table>

From the above table it is quite clear the Mean of the Conventional B.Sc.-III students is 70.68 and to that of IGNOU is 26.82 and Standard Deviation are 12.83 and 9.02 respectively. The 't' value calculated is 19.74 which is significant at 0.05 level of significance. This means that the conventional college B.Sc.-III students have scored significantly more than the IGNOU B.Sc.-III students.

Similarly, it is quite clear from the above table that the Mean of the Conventional practical B.Sc.-III students is 82.08 and to that of IGNOU is 49.16 and Standard Deviations are 7.59 and 15.09 respectively. The 't' value calculated is 13.83 which is significant at 0.05 level of significance. This means that the conventional college B.Sc.-III students have scored significantly more than the IGNOU B.Sc.-III students.
Table 29 - showing the 't' value of B.Sc.-I, II and III year of conventional colleges and IGNOU physics course.

<table>
<thead>
<tr>
<th>Year of Study</th>
<th>'t' Value</th>
<th>'t' Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory</td>
<td>Practical</td>
</tr>
<tr>
<td>B.Sc.-I</td>
<td>15.08</td>
<td>9.66</td>
</tr>
<tr>
<td>B.Sc.-II</td>
<td>17.82</td>
<td>14.47</td>
</tr>
<tr>
<td>B.Sc.-III</td>
<td>19.74</td>
<td>13.83</td>
</tr>
</tbody>
</table>

It is quite obvious that the 't' value in all the cases is highly significant. This means that the conventional college students have better scores than the IGNOU students.