

# PROGRAMME GUIDE

## Bachelor of Science

### (BSCM)



**School of Sciences**  
Indira Gandhi National Open University  
New Delhi  
2024

# PROGRAMME GUIDE

## **Bachelor of Science (Multidisciplinary) (BSCM)**



School of Sciences

**Indira Gandhi National Open University  
New Delhi  
2025**

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....., 2025

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Dear learner,

Welcome to the family of distance learners and IGNOU's Bachelor Degree Programme, namely the **Bachelor of Science (Multidisciplinary)** (BSCM) under UGC-FYUP scheme. It is a 3-year programme during which you will study a wide range of courses in the area of Sciences such as Botany, Chemistry, Geology, Geography, Mathematics, Physics and Zoology. Apart from these discipline specific courses, you will also study a host of other courses such as skill enhancement courses, interdisciplinary courses, vocational courses, ability enhancement courses, and value added courses. You will receive support from IGNOU through the Regional Centre and Study Centre which will be allotted to you and also from IGNOU's website. We expect you to be directly in contact with us and your peers through the Internet also, at the email address given below. This Programme Guide contains instructional system of IGNOU B.Sc. programme, syllabus of the courses which are presently on offer, details of evaluation scheme and links to assignments and other important information and forms. You can download the assignments of the semester in which you have enrolled from our website. Each course contains prescribed number of assignments that will be assessed by a counsellor at your study centre. All these assignments are to be submitted at your study centre within the stipulated time mentioned against last date of submission. In case, a student needs the assignments of previous semesters, you can obtain a copy of the same from the IGNOU website.

At your study centre, you will be able to avail yourself of the counselling for all the courses. It is not mandatory to attend the counselling sessions of theory courses but ***it is necessary to attend all lab sessions for laboratory courses***. You are supposed to pay the examination fee and the re-registration fee online. However, in exceptional cases, you can also submit the fee offline. It is to be noted that the fees that ismentioned in various forms/format is as on date and is subject to revision from time to time. You are advised to check the website/study centre/regional centre for any revision/modification. Some useful forms and formats (or the link to useful forms and formats) are also given at the end of this booklet. You may use the photocopies of those. The Programme Guide, forms and formats are also available on the website. Please confirm the fees with the Regional Centre / Study Centre / Website before you pay. As a distance learner, you may have several queries. You will find answers to many of them in this booklet. This booklet is a very important guide for you. Read it and preserve it until you successfully complete the B.Sc. programme. This Programme Guide contains the information related to the B.Sc. Multidisciplinary programme. However, during your studies, if you have any feedback, suggestions and comments to make, please write to us immediately. In case, you have specific query, you can write to us on iGRAM (<http://igram.ignou.ac.in>).

Learners are advised to register on the Student Portal: <https://ignou.samarth.edu.in/> after confirmation of their admission and create their own Student Account. You should be always in touch with your study centre for advice / theory and lab counselling schedules/ day-to-day information or visit the website with URL [www.ignou.ac.in](http://www.ignou.ac.in) and your region service website.

**We wish you all the success in pursuing the B.Sc. Programme!**

**Programme Coordination Team**

**bscm.sos@ignou.ac.in**

## **Important Dates**

Both Re-Registration and registration for term-end examination are now being done online only. The last date of registration is announced on the IGNOU website. In general, these are to be done 2-3 months prior to the start of Session. You must visit IGNOU website for actual cutoff dates.

The soft copy of the learning material for B.Sc. programme can be downloaded from E-Gyankosh (E Content repository of education resources: <https://egyankosh.ac.in>) and also IGNOU E-Content mobile App (can be downloaded from Google Play Store)

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**QR Code of Some of the Useful Web Links**



eGyankosh Online  
(for Online Course Materials)



Re-Registration Online



iGRAM  
(IGNOU Grievance control Room)



To Watch Live Telecast/  
To listen live Broadcast



On-line Examination form



Assignments

**Note:** The above QR Codes can be scanned and open through and QR Code Scanner Application/App of your smart mobile phone.

## **1. School of Sciences**

The School of Sciences was established in 1985 and has been offering Science programmes successfully through the distance mode of education. Presently, there are eight disciplines, namely, Biochemistry, Chemistry, Geography, Geology, Life Sciences, Mathematics, Physics and Statistics in the School.

The functions of the School are to:

- ❖ plan, develop and offer academic programmes at the Awareness, Certificate, Diploma, Under-Graduate, Post-Graduate and Research levels;
- ❖ collaborate with the other Schools of the University in the development of various programmes/courses;
- ❖ participate in the development and academic monitoring of the student services; and
- ❖ carry out research in systemic and discipline-based areas of Science.

## **2. Bachelor of Science (Multidisciplinary) Programme under UGC- FYUP Scheme**

Ministry of Human Resource Development (MHRD), Govt. of India, has brought the new National Education Policy (NEP-2020) in our country to carry out reforms in Indian education system with the help of University Grants Commission (UGC). UGC has initiated several steps to bring equity, efficiency and academic excellence in the National Higher Education System. The important ones include innovation and improvement in course curricula, bringing about a paradigm shift in learning and teaching pedagogy, examination and education system. Undergraduate programmes under the UGC-FYUP(Four Year Undergraduate Programme) scheme have been started by many renowned universities including IGNOU, and are currently gaining wide popularity all over the country.

The design of undergraduate programmes under UGC-FYUP scheme offers opportunities and avenues to learn not only core subjects but also to explore additional avenues of learning beyond the core subjects for holistic development of an individual. The B.Sc. (Multidisciplinary) programme will orient the learners towards how different disciplines interplay with each other, and contribute to the advancement of knowledge in a holistic manner, apart from making the learners aware with the best international academic practices.

The salient advantages of the programme are as follows:

- ❖ Shift in focus from the teacher-centric to learner-centric education.
- ❖ Learners may undertake as many credits as they can cope up without repeating all the courses in a given semester if they fail in one/more courses.
- ❖ Learners can choose a wide variety of courses from the basket of discipline specific courses, inter-disciplinary courses, skill enhancement courses, ability enhancement courses, value added courses and vocational courses according to their learning needs, interests and aptitude.

UGC's uniform grading system is already in place and is applicable for the entire higher education system in India. This will benefit the students to move across the institutions within India to begin with and across the countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on learner's performance in examinations, the UGC has formulated the guidelines to be followed. Hence, adoption of FYUP helps to overcome the gap between the university degree and employability by inculcating vocational skills and competencies in our graduates.

Following UGC guidelines, University has launched the Bachelor of Science (Multidisciplinary) under the FYUP scheme. The details of the programme are given below:

## **2.1 Programme Objectives**

The main objectives of the programme are:

- to provide higher education required for a B.Sc. degree in conformity with the NEP-2020
- to provide higher education to the aspirants (including learners from the deprived sections and those living in remote and rural areas)
- to provide degree for employment, further higher education, promotion in career and professional development.

The programme follows a multidisciplinary approach. The Bachelor's Degree in Science is offered in the following Disciplines:

- 1) Botany
- 2) Chemistry
- 3) Geography
- 4) Geology
- 5) Mathematics
- 6) Physics, and
- 7) Zoology

## **2.2 Duration of the Programme:** (Minimum - 3 Years, Maximum - 6 Years)

To fulfil the requirements for acquiring the B.Sc. a student may clear all the courses in a minimum of 3 years and a maximum of 6 years. In case the student is unable to pass all the courses of the B.Sc. programme in 6 years, s/he can do so by seeking fresh admission in the programme then s/he can request the University for the credit transfer for those courses which s/he has successfully completed. But, you are advised to pass all the courses successfully in 3 years.

## **2.3 Eligibility:** 10+2 with science subjects or its equivalent

## **2.4 Medium of Instruction:** English and Hindi

## **3 Structural Framework of BSCM Programme**

The University follows the credit system for offering all its programmes. One credit is equal to 30 hours of learners study time. To earn Bachelor's Degree in Science, a learner has to complete 120 credits in minimum six semesters (Three years). The 120 credits of the programme have to be earned by completing the following categories of courses:

- a) Discipline Specific Courses (DSC)
- b) Vocational Courses (VOC)
- c) Ability Enhancement Compulsory Courses (AECC)
- d) Skill Enhancement Courses (SEC)
- e) Interdisciplinary Courses (IDC)
- f) Value Added Courses (VAC)

The Structural Framework of the 3-year BSCM programme under FYUP is given in Table 1.

**Table 1: Structural Framework of BSCM Programme**

| Year                         | Semester                 | Discipline Specific Courses              | Minor / Vocational Courses | Ability Enhancement Courses (language)                             | Inter-disciplinary Courses (Introductory level)<br>Skill Enhancement Courses / Internship /Dissertation | Common Value-Added Courses | Total Credits          |
|------------------------------|--------------------------|--|----------------------------|--|---|----------------------------|------------------------|
| (1)                          | (2)                      | (3)                                      | (4)                        | (5)  | (6)   | (7)                        | (8)                    |
| I yr                         | 1 <sup>st</sup> Semester | DSC-1A (6 credits)<br>DSC-1B (6 credits) |                            |  | IDC (6 credits)   |                            | 18                     |
|                              | 2 <sup>nd</sup> Semester | DSC-1C (6 credits)<br>DSC-2A (6 credits) |                            | AEC-1<br>BEVAE-181 (4 credits)                                     |   | VAC-01 (6 credits)         | 22                     |
| <b>Exit 1:UG Certificate</b> |                          |  |                            |  |   |                            | 40<br>(+4 credits VOC) |
| II yr                        | 3 <sup>rd</sup> Semester | DSC-2B (6 credits)<br>DSC-2C (6 credits) |                            | AEC-2 (BEGAE-182/ BHDAE-182)/ BUDAE-182/ BSDAE-182)<br>(4 credits) | SEC-1 (4 credits)   | —                          | 20                     |
|                              | 4 <sup>th</sup> Semester | DSC-3A (6 credits)<br>DSC-3B (6 credits) | VOC [4 credits]            | —  | SEC-2 (4 credits)   | —                          | 20                     |
| <b>Exit 2:UG Diploma</b>     |                          |  |                            |  |   |                            | 80<br>(+4 Credits VOC) |
| III yr                       | 5 <sup>th</sup> Semester | DSC-3C (6 credits)<br>DSC-4A (6 credits) | VOC (4 credits)            | —  | SEC-3 (4 credits)   | —                          | 20                     |

|                          |                          |  |                    |               |                      |               |                |
|--------------------------|--------------------------|--|--------------------|---------------|----------------------|---------------|----------------|
|                          | 6 <sup>th</sup> Semester | DSC-4B<br>(6 credits)<br>DSC-4C<br>(6 credits) | VOC<br>(4 credits) | –             | SEC-4<br>(4 credits) |               | 20             |
| <b>Total</b>             |                          | <b>72 Cr.</b>                                  | <b>12 Cr.</b>      | <b>08 Cr.</b> | <b>22 Cr.</b>        | <b>06 Cr.</b> | <b>120 Cr.</b> |
| <b>Exit 3: UG Degree</b> |                          |  |                    |               |                      |               | <b>120 Cr.</b> |

The students will choose any three disciplines from Discipline Specific Courses Category (Column-3) which will be studied by him/her in the rest of the semesters.

### 3.1 Selection of Courses from Different Categories

a) **Discipline Specific Courses (DSC):** The total credit weightage under this category will be 72 credits i.e. 24 credits from each of the disciplines. Each course is worth 6 credits. The Disciplines have been distributed in 5 Groups and students can choose three Disciplines from the Groups. Only one Discipline will be allowed per Group e.g. if a student has chosen Mathematics from Group-3, he/she will not be able to choose another discipline from this Group. He/She can take second and third Disciplines from other Groups in the same way.

#### Groups of Disciplines

|         |             |           |
|---------|-------------|-----------|
| Group-1 | Physics     |           |
| Group-2 | Chemistry   |           |
| Group-3 | Mathematics | Botany    |
| Group-4 | Zoology     | Geography |
| Group-5 | Geology     |           |

b) **Vocational Courses (VOC):** Each of the course is of 4 credits. The students have to study three courses worth 12 credits from this in a span of 3 years (one course in each of the 4<sup>th</sup> 5<sup>th</sup> and 6<sup>th</sup> semester).

c) **Ability Enhancement Compulsory Courses (AECC):** Two courses worth 8 credits (4 credits each) will be offered from this category in 2<sup>nd</sup> and 3<sup>rd</sup> semesters.

d) **Skill Enhancement Courses (SEC):** Students are required to study four courses of 4 credits each from this Category. One course in each semester will be on offer starting from 3<sup>rd</sup> semester.

e) **Interdisciplinary Courses (IDC):** The students are required to take one Course of 6 credits under this Category from the disciplines **OTHER THAN** the three Disciplines chosen.

f) **Value Added Courses (VAC):** One course of 6 credits is offered to the students from this Category. The course is on offer only in the first Semester.

### Exit from the Programme

The students who would like to take exit from the programme after completion of first or second year, will have to complete a Vocational Course of 4 credits in addition to the

required number of courses in these years (40+4 credits after first year and 80+4 credits after 2<sup>nd</sup> year).

### 3.2 Semester-wise Distribution of Courses

In the first Semester, the credit load of courses under different categories is 18 credits. However, in the second Semester, the credit load will be 22 credits. In the subsequent Semesters i.e. from 3<sup>rd</sup> to 6<sup>th</sup> semesters, the credit load will be 20 credits per semester. The semester-wise distribution of courses in different Categories is given in the Table 2. As can be seen from Column (3) from the Table, the students are required to opt for two Disciplines in the first Semester and the third Discipline in the second Semester. The courses have been divided into 5 Groups and the students can chose only one Discipline from a Group as explained earlier. Thus, the students will be able to complete 4 courses of each of the Disciplines making a total of 24 credits in each discipline in a span of 3 years (6 semesters).

**The courses given in pairs need to be taken in pairs only.**

**Table 2: Semester-wise Course options for BSCM**

| Year     | Semester     | Discipline Specific Courses<br><i>(Only one course pair from a Group can be Chosen)</i>  | Minor / Vocational Courses | Ability Enhancement Courses (language)           | Inter-disciplinary Courses (Introductory level) Skill Enhancement Courses / Internship /Dissertation  | Common Value-Added Courses                        | Total Credits |
|----------|--------------|--|----------------------------|--|---|---|---------------|
| (1)      | (2)          | (3)  | (4)                        | (5)  | (6)   | (7)   | (8)           |
| 1st Year | 1st Semester | <p><b>Choose any two courses as Discipline A and Discipline B (For Disciplines A &amp; B)</b></p> <p>BPHCT 131 &amp; BPHCL132<br/>BCHCT 131 &amp; BCHCL132<br/>BBYCT 131 &amp; BBYCL132<br/>BMTC 131<br/>BZYCT 131 &amp; BZYCL 132<br/>BGGCT 131<br/>BGYCT 131 &amp; BGYCL 132</p> |                            |  | <p><b>IDC (6 credits)</b></p> <p>BEGG 171<br/>BPAG 171<br/>BPCG 171<br/>BSOG 171<br/>BSOG 173<br/>BABG 171<br/>BPYG 171<br/>BHDG 175<br/>BSKG 178</p> |   | 18            |
|          | 2nd Semester | <p><b>Choose two courses (one from same Discipline A and one new course as Discipline C (For Discipline A)</b></p> <p>BBYCT 133 &amp; BBYCL134</p>   |                            | <p><b>AEC-1 (4 credits)</b></p> <p>BEVAE-181</p> |   | <p><b>VAC-01 (6 credits)</b></p> <p>BEDSV-101</p> | 22            |

| Year          | Semester            | Discipline Specific Courses<br><i>(Only one course pair from a Group can be Chosen)</i>   | Minor / Vocational Courses | Ability Enhancement Courses (language) | Inter-disciplinary Courses (Introductory level)<br>Skill Enhancement Courses / Internship /Dissertation | Common Value-Added Courses | Total Credits             |
|---------------|---------------------|---|----------------------------|--|---|----------------------------|---------------------------|
|               |                     | BCHCT 133 & BCHCL134<br><br>BGGCT 132<br><br>BGYCT 133 & BGYCL 134<br><br>BMTC 132<br><br>BPHCT 133 & BPHCL134<br><br>BZYCT 133 & BZYCL 134<br><br><b>(For Discipline C)</b><br>BPHCT 131 & BPHCL132<br><br>BCHCT 131 & BCHCL132<br><br>BBYCT 131 & BBYCL132<br><br>BMTC 131<br><br>BZYCT 131 & BZYCL 132<br><br>BGGCT 131<br><br>BGYCT 131 & BGYCL 132 |                            |  |   |                            |                           |
| <b>Exit 1</b> |                     | <i>(6 credits)</i>  |                            | <b>UG Certificate</b>                  |   |                            | <b>40(+4 credits VOC)</b> |
|               | <b>3rd Semester</b> | Repeat the same Three disciplines. Any from each discipline*<br><br>BBYCT-133 & BBYCL-134<br><br>BCHCT-133 & BCHCL-134<br><br>BGGCT-132<br>BGYCT-133 &  |                            |  |   |                            |                           |

| Year          | Semester                           | Discipline Specific Courses<br><i>(Only one course pair from a Group can be Chosen)</i>   | Minor / Vocational Courses | Ability Enhancement Courses (language) | Inter-disciplinary Courses (Introductory level)<br>Skill Enhancement Courses / Internship /Dissertation | Common Value-Added Courses | Total Credits |
|---------------|------------------------------------|---|----------------------------|--|---|----------------------------|---------------|
|               |                                    | BGYCL-134<br>BMTC-132<br><br>BPHCT-133 &<br>BPHCL-134<br><br>BZYCT-133 &<br>BZYCL-134   |                            |  |   |                            |               |
|               | <b>4<sup>th</sup><br/>Semester</b> | <b>Repeat the same Three disciplines. Any from each discipline*</b><br><br>BBYCT-135 &<br>BBYCL-136<br><br>BCHCT-135 &<br>BCHCL-136<br><br>BGGCT-133 &<br>BGGCL-134<br><br>BGYCT 135 &<br>BGYCL-136<br><br>BMTC-141<br><br>BPHCT-135 &<br>BPHCL-136<br><br>BZYCT-135 &<br>BZYCL-136 |                            |  |   |                            |               |
| <b>Exit 2</b> | <b>(6 credits)</b>                 |   | <b>UG Diploma</b>          |  |   |                            |               |
|               | <b>5<sup>th</sup><br/>Semester</b> | <b>Repeat the same Three disciplines. Any from each discipline*</b><br><b>(For Discipline C only)</b><br><br>BBYCT-135 &<br>BBYCL-136<br><br>BCHCT-135 &<br>BCHCL-136<br><br>BGGCT-133<br>BGGCL-134<br><br>BGYCT-135 &<br>BGYCL-136   |                            |  |   |                            |               |

| Year          | Semester            | Discipline Specific Courses<br><i>(Only one course pair from a Group can be Chosen)</i>  | Minor / Vocational Courses | Ability Enhancement Courses (language) | Inter-disciplinary Courses (Introductory level)<br>Skill Enhancement Courses / Internship /Dissertation | Common Value-Added Courses | Total Credits             |
|---------------|---------------------|--|----------------------------|--|---|----------------------------|---------------------------|
|               |                     | BMTE-141<br><br>BPHCT-135 & BPHCL-136<br><br>BZYCT-135& BZYCL-136<br><br><b>(For Discipline A)</b><br><br>BBYCT-137 & BBYCL-138<br><br>BCHCT-137 & BCHCL-138<br><br>BGGCT-135<br><br>BGYCT-137 & BGYCL-138<br><br>BMTE-144<br><br>BPHCT-137 & BPHCL-138<br><br>BZYCT-137 & BZYCL-138 |                            |  |   |                            |                           |
|               | <b>6th Semester</b> | <b>(For Disciplines B and C)</b><br><br>BBYCT-137 & BBYCL-138<br><br>BCHCT-137 & BCHCL-138<br><br>BGGCT-135<br><br>BGYCT-137 & BGYCL-138<br><br>BMTE-144<br><br>BPHCT-137 & BPHCL-138<br><br>BZYCT-137 & BZYCL-138   |                            |  |   |                            |                           |
| <b>Exit 3</b> | <i>(6 credits)</i>  |  | <b>UG Degree</b>           |  |   |                            | <b>40(+4 credits VOC)</b> |

**NOTE:**

- As per the Programme structure, in disciplines such as Botany, Chemistry, Geology, Physics and Zoology, where Laboratory work is compulsory, a 06 Credit Course is offered as a combination of two Courses in the same subject area i.e. a 04 Credits Theory Course and a 02 Credits Laboratory Course. Both these courses in a given subject area of a discipline are to be **taken together compulsorily**.
- Every course offered by the **Mathematics** discipline, which does not require Laboratory work, is a single course of 06 Credits.
- In the **Geography** discipline, some subject areas do require Laboratory work whereas, some subject areas do not require any Laboratory work. Therefore, the Courses of the Geography discipline are of two types:
  - Courses which require Laboratory work – Each such Course is a combination of a 04 Credits Theory Course and a 02 Credits Laboratory Course (both these are to be taken together compulsorily); and
  - Courses which do not require Laboratory work – Each such Course is of 06 Credits.

#### 4 List of Courses for 1<sup>st</sup> to 6<sup>th</sup> Semesters

The list of courses on offer in the first and second semesters of BSCM programme is provided here. The courses for other semesters will be provided subsequently. (when and how ?)

##### Discipline Specific Courses

| Sr No. | Course Code | Course Title  | Credits |                      |
|--------|-------------|---|---------|----------------------|
|        |             | <b>Botany</b>   |         |                      |
| 1.     | BBYCT131    | Biodiversity (Microbes, Algae, Fungi and Archegoniates )              | 4       | To be taken Together |
| 2.     | BBYCL132    | Biodiversity (Microbes, Algae, Fungi and Archegoniates ) : Laboratory | 2       |                      |
| 3.     | BBYCT133    | Plant Ecology and Taxonomy  | 4       | To be taken Together |
| 4.     | BBYCL134    | Plant Ecology and Taxonomy: Laboratory                                | 2       |                      |
| 5.     | BBYCT-135   | Plant Anatomy and Embryology  | 4       | To be taken Together |
| 6.     | BBYCL-136   | Plant Anatomy and Embryology: Laboratory                              | 2       |                      |
| 7.     | BBYCT-137   | Plant Physiology and Metabolism                                       | 4       | To be taken Together |
| 8.     | BBYCL-138   | Plant Physiology and Metabolism: Laboratory                           | 2       |                      |

|    |          | <b>Chemistry</b>   |   |                      |
|----|----------|--|---|----------------------|
| 1. | BCHCT131 | Atomic Structure, Bonding, General Organic Chemistry and Aliphatic Hydrocarbons              | 4 | To be taken Together |
| 2. | BCHCL132 | Atomic Structure, Bonding, General Organic Chemistry and Aliphatic Hydrocarbons : Laboratory | 2 |                      |
| 3. | BCHCT133 | Chemical Energetics, Equilibria and Functional Group Organic Chemistry – I                   | 4 | To be taken Together |
| 4. | BCHCL134 | Chemical Energetics, Equilibria and Functional Group Organic Chemistry - I : Laboratory      | 2 |                      |

|    |           |   |   |                      |
|----|-----------|---|---|----------------------|
| 5. | BCHCT-135 | Solutions, Phase equilibrium, Conductance, Electrochemistry and Functional Group Organic Chemistry-II             | 4 | To be taken Together |
| 6. | BCHCL-136 | Solutions, Phase equilibrium, Conductance, Electrochemistry and Functional Group Organic Chemistry-II: Laboratory | 2 |                      |
| 7. | BCHCT-137 | Coordination Chemistry, States of Matter and Chemical Kinetics  | 4 | To be taken Together |
| 8. | BCHCL-138 | Coordination Chemistry, States of Matter and Chemical Kinetics: Laboratory  | 2 |                      |

| <b>Geography</b> |           |                                 |   |                      |
|------------------|-----------|---------------------------------|---|----------------------|
| 1.               | BGGCT131  | Physical Geography              | 6 |                      |
| 2.               | BGGCT132  | Human Geography                 | 6 |                      |
| 3.               | BGGCT-133 | General Cartography             | 4 | To be taken Together |
| 4.               | BGGCL-134 | General Cartography: Laboratory | 2 |                      |
| 5.               | BGGCT-135 | Environmental Geography         | 6 |                      |

| <b>Geology</b> |           |   |   |                      |
|----------------|-----------|---|---|----------------------|
| 1.             | BGYCT131  | Physical and Structural Geology                               | 4 | To be taken Together |
| 2.             | BGYCL132  | Physical and Structural Geology : Laboratory                  | 2 |                      |
| 3.             | BGYCT133  | Crystallography, Mineralogy and Economic Geology              | 4 | To be taken Together |
| 4.             | BGYCL134  | Crystallography, Mineralogy and Economic Geology : Laboratory | 2 |                      |
| 5.             | BGYCT-135 | Petrology   | 4 | To be taken Together |
| 6.             | BGYCL-136 | Petrology: Laboratory   | 2 |                      |
| 7.             | BGYCT-137 | Stratigraphy and Palaeontology                                | 4 | To be taken Together |
| 8.             | BGYCL-138 | Stratigraphy and Palaeontology: Laboratory                    | 2 |                      |

| <b>Mathematics</b> |         |                        |   |  |
|--------------------|---------|------------------------|---|--|
| 1.                 | BMTC131 | Calculus               | 6 |  |
| 2.                 | BMTC132 | Differential Equations | 6 |  |

| <b>Physics</b> |           |   |   |                      |
|----------------|-----------|---|---|----------------------|
| 1.             | BPHCT131  | Mechanics   | 4 | To be taken Together |
| 2.             | BPHCL132  | Mechanics : Laboratory                                | 2 |                      |
| 3.             | BPHCT133  | Electricity and Magnetism                             | 4 | To be taken Together |
| 4.             | BPHCL134  | Electricity and Magnetism : Laboratory                | 2 |                      |
| 5.             | BPHCT-135 | Thermal Physics and Statistical Mechanics             | 4 | To be taken Together |
| 6.             | BPHCL-136 | Thermal Physics and Statistical Mechanics: Laboratory | 2 |                      |
| 7.             | BPHCT-137 | Waves and Optics                                      | 4 | To be taken          |

|    |          |                              |   |          |
|----|----------|------------------------------|---|----------|
| 8. | BPCL-138 | Waves and Optics: Laboratory | 2 | Together |
|----|----------|------------------------------|---|----------|

| <b>Zoology</b> |           |  |   |                      |
|----------------|-----------|--|---|----------------------|
| 1.             | BZYCT131  | Animal Diversity   | 4 | To be taken Together |
| 2.             | BZYCL132  | Animal Diversity: Laboratory   | 2 |                      |
| 3.             | BZYCT133  | Comparative Anatomy and Developmental Biology Of Vertebrates             | 4 | To be taken Together |
| 4.             | BZYCL134  | Comparative Anatomy and Developmental Biology Of Vertebrates: Laboratory | 2 |                      |
| 5.             | BZYCT-135 | Physiology and Biochemistry  | 4 | To be taken Together |
| 6.             | BZYCL-136 | Physiology and Biochemistry: Laboratory                                  | 2 |                      |
| 7.             | BZYCT-137 | Genetics and Evolutionary Biology  | 4 | To be taken Together |
| 8.             | BZYCL-138 | Genetics and Evolutionary Biology: Laboratory                            | 2 |                      |

| <b>Interdisciplinary Courses</b> |                    |                                      |                |
|----------------------------------|--------------------|--------------------------------------|----------------|
| <b>Sr No.</b>                    | <b>Course Code</b> | <b>Course Title</b>                  | <b>Credits</b> |
|                                  |                    | <b>English</b>                       |                |
| 1.                               | BEGG171            | Media and Communication Skills       | 6              |
|                                  |                    | <b>Public Administration</b>         |                |
| 1.                               | BPAG171            | Disaster Management                  | 6              |
|                                  |                    | <b>Psychology</b>                    |                |
| 1.                               | BPCG171            | General Psychology                   | 6              |
|                                  |                    | <b>Philosophy</b>                    |                |
| 1.                               | BPYG171            | Applied Ethics                       | 6              |
|                                  |                    | <b>Political Science</b>             |                |
| 1.                               | BABG171            | Understanding Ambedkar               | 6              |
|                                  |                    | <b>Sociology</b>                     |                |
| 1.                               | BSOG171            | Indian Society: Images and Realities | 6              |
| 2.                               | BSOG-173           | Rethinking Development               | 6              |

| <b>Skill Enhancement Courses</b> |                    |                              |                |
|----------------------------------|--------------------|------------------------------|----------------|
| <b>Sr No.</b>                    | <b>Course Code</b> | <b>Course Title</b>          | <b>Credits</b> |
| 1.                               | BCHS-183           | Laboratory Management Skills | 4              |

| <b>Ability Enhancement Course</b> |                    |                       |                |
|-----------------------------------|--------------------|-----------------------|----------------|
| <b>Sr No.</b>                     | <b>Course Code</b> | <b>Course Title</b>   | <b>Credits</b> |
| 1.                                | BEVAE181           | Environmental Studies | 4              |

| <b>Value-Added Course</b> |                    |                     |                |
|---------------------------|--------------------|---------------------|----------------|
| <b>Sr No.</b>             | <b>Course Code</b> | <b>Course Title</b> | <b>Credits</b> |
| 1.                        | BEDSV101           | Value Education     | 6              |

## 5. Fee Structure and Schedule of Payment

The programme fee, exclusive of examination fee is Rs. 16,500/-\* for full programme to be paid year wise @ Rs.5,500/- per year. Fee to be paid in first year, including Registration Fee of Rs.300/- is Rs.5,800/-₹ (\*As and when it is necessary, the University can revise the programme fee and the revised fee shall be payable by you as per schedule of payment notified by the University).

Learners are advised to submit the Re-Registration (RR) forms 'Online' only on the web portal [www.ignou.ac.in](http://www.ignou.ac.in). as per schedule being notified by the University from time to time for II<sup>nd</sup> and III<sup>rd</sup> years. **If the Re-Registration of this programme is not available online or for any other reason as specified by the University, learners should submit their RR forms at the respective Regional Centre ONLY and nowhere else.** If any student submits the 'Offline' Re-Registration Form at any other Regional Centre than the allocated Regional Centre, and consequently misses the scheduled date and a semester/year, he/she will have no claim on the University for regularization.

Timely payment of programme fees is the responsibility of the students. Students are expected to remit fee as early as possible without waiting for the last date. In case, you fail to remit the fee as per above schedule, you will have to wait for next cycle of fee payment schedule. Non-payment of fee results in discontinuation of the despatch of study material. Such students will not be permitted to write the examinations. In case any student wilfully appears in the examination without proper registration for a course(s), disciplinary action shall be taken against him as per rules of the University. **Note that fee once paid is not refundable.**

## 6. Instructional System

The methodology of instruction in this University is different from that in the conventional universities. The Open University system is more learner-oriented, and the student is an active participant in the teaching-learning process. Most of the instructions are imparted through distance rather than face-to-face communication.

The University follows a multi-media approach for instruction. It comprises of:

- self-instructional printed material
- audio and video programmes
- audio-video programmes transmitted through the National Network of Doordarshan and the All India Radio (selected stations).
- face-to-face counselling at study centres by academic counsellors
- assignments
- laboratory work
- project work in some courses
- teleconference/web conference
- Interactive radio counselling
- Gyan darshan channel
- associate studentship
- IGNOU web site
- Web Enabled Academic Support Portal

## 6.1 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.

### How to Study the Units

The course materials will be provided to you in the form of well-designed printed booklets. Each booklet is called a block and contains a few units. Generally, a 6 credits course has 6 blocks and a 4 credits course has 4 to 5 blocks. Each block has a number of units. The units of a block have a thematic unity.

The first page of each block indicates the numbers and titles of the units comprising the block. In the first block of each course we start with course introduction. This is followed by a brief introduction to the block. Each unit begins with an introduction in which we tell you about the contents of the unit. We also outline a list of objectives which we expect you 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. We end each unit by summarising its contents. We summarise what has been said in the whole unit to enable you to recall the main points.

In each unit, there are several Self-Assessment Questions (SAQs) and Terminal Questions (TQs)/exercises /activities. These are meant to help you to assess your understanding of the subject contents. Answers of both SAQs and TQs are given in section 'Answers' in the units. At the end of the unit books for additional reading are suggested. You may refer to some of the books which are available in the library at your study centre.

Read the Units carefully and note down the important points. You can use the space in the margin of the printed page for making notes and writing your comments. Read the unit again and again until you have understood the point. However, if you still do not understand something, consult your counsellor during the face-to-face sessions at the study centre for clarification. Try to answer SAQs after completing the unit. These exercises will help you to reinforce the information you gain through your reading of the text. You can compare your answers with the answers given at the end of the unit.

## 6.2 Audio-Video Programmes

In addition to the print material, audio and video programmes have been prepared for each course. The audio-video material is supplementary to print material. Hence, we advise you to make use of it, as it will help you to understand the subject better. Video programmes are transmitted by Doordarshan on National Network every day from 6.05 to 6.35 a.m. The schedule of transmission is communicated through the IGNOU website, through the IGNOU Newsletter and on Saptahiki aired on every Sunday on DD1 at the same time.

Audio-video material will not be supplied individually to you but will be made available to Study Centres. You can watch these programmes during counselling sessions. Anyone desirous of buying the audio-video CDs can procure them from: The Director, Electronic Media Production Centre (EMPC), IGNOU, Maidan Garhi, New Delhi-110068.

## 6.3 Academic Counselling

In distance education, face-to-face contact sessions between learners and their tutors/counsellors is an important activity. The purpose of such contact sessions is to answer some of your questions and clarify your doubts which may not be possible through any other

means of communication. It is also intended to provide you an opportunity to meet your fellow students. There are experienced academic counsellors at the study centres to provide counselling and guidance to you in the courses that you have chosen for study. The counselling sessions for each of the courses will be held at suitable intervals throughout the whole academic session.

Attending counselling sessions is not compulsory. However, they may be very useful in certain respects such as: to share your views on the subject with teachers and fellow participants, comprehend some of the complex ideas or difficult issues, and get clarification for many doubts which you would not otherwise try to raise and consult academic counsellors for selecting courses of study.

Generally, there will be 5 sessions for a 4-credit course. In some courses, there may be additional counselling sessions which will be informed to you by the Coordinator of your Study Centre. **The detailed schedule of the counselling sessions will be made known to you by the Coordinator of your Study Centre.**

Face-to-face counselling will be provided to you at the study centre assigned to you. You should note that the counselling sessions are being very different from the usual classroom teaching or lectures. Counsellors will not be delivering lectures or speeches. They will try to help you to overcome difficulties (academic as well as personal) which you face while studying for the B.Sc. programme. In these sessions you must try to sort out the subject-based difficulties and any other issue arising out of such difficulties. Besides, some of the audio and video CDs that are available at that time will be played in the counselling sessions.

Before you go to attend the counselling sessions, please go through your course materials and note down the points to be discussed. Unless you have gone through the Units, there may not be much to discuss. Try to concentrate on the relevant and the most important issues. Also try to understand each other's points of view, without making the session a seminar or a debate. You may also establish personal contact with your fellow participants to get mutual help for academic purposes. Try to get the maximum possible help from your counsellor.

#### **6.4 Teleconference/Web Enabled Academic Support**

Teleconference/web conference, 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.

##### **We are also providing Web Enabled Academic Support (WEAS Portal) of the BSCM**

You can access your course materials, assignments, and other learning resources. You can also **post your questions related to BSCM under the section Ask a Question**. Currently the site hosts material related to the Chemistry, Geology, Mathematics and Physics Discipline. Gradually, we will add content of other disciplines also. To access WEAS click the link - <https://sites.google.com/ignou.ac.in/weas>

#### **6.5 Interactive Radio Counselling**

Interactive phone-in radio counselling is available on every Sunday at all primary channels of AIR and Gyan Vani FM station. The radio counselling sessions are broadcast 'live' and are relayed by 184 radio stations across the country. Now, there is a synchronized weekly

transmission “IGNOU HOUR” on Sundays from 4.00 p.m. to 5.00 p.m. with coverage of almost all over the country.

## **6.6 Gyan Darshan**

Gyan Darshan, an 24 hours educational TV channel is a joint venture of IGNOU with Doordarshan. It is available through Cable TV network.

**Please ask your cable operator to provide this channel.**

The telecast schedule of Gyan Darshan is published in the IGNOU News letter and is also available on IGNOU web site: <http://www.ignou.ac.in>

## **6.7 IGNOU e-Content Mobile App**

IGNOU-e-Content Mobile App is an official mobile app of Indira Gandhi National Open University (IGNOU), New Delhi. This app is an ICT initiative of IGNOU to provide Digital Learning Environment to IGNOU learners and extending Technology Enhanced Learner Support Services to them. The aim of this initiative is to disseminate the digitised course materials to IGNOU Learners. IGNOU learners can use this app to access their course materials through their hand held devices such as Mobile Phones and Tablets.

## **6.8 Study Centres**

To provide effective student support, we have set up a number of study centres all over the country. You will be allotted one of these study centres taking into consideration your place of residence or work. However, each study centre can handle only a limited number of students and despite our best efforts, it may not always be possible to allot the study centre of your choice. The particulars regarding the Study Centre to which you are assigned will be communicated to you. The list of study centres is provided in Appendix-I.

**Each Study Centre will have:**

- A Coordinator who will coordinate different activities at the centre.
- An Assistant Coordinator and other supporting staff appointed on a part-time basis.
- Counsellors in different subjects to provide counselling and guidance to you in the subjects you have chosen.

**A Study Centre has six major functions:**

- i) **Tutorial/Counselling:** Tutorial/Counselling is an important aspect of Open University System. Face to face contact-cum-counselling for the Courses will be provided at the Study Centres. Generally there will be 10 counselling sessions for the 8 credit courses and 5 sessions for the 4 credit courses.

The detailed programme of the contact-cum-counselling sessions will be sent to you by the Coordinator of your Study Centre. In these sessions you will get an opportunity to discuss with the Counsellors your problems pertaining to the courses of your study.

- ii) **Evaluation of Assignments:** The evaluation of your Tutor Marked Assignments (TMA) will be done by the Counsellors at the Study Centre. The evaluated assignments will be returned to you by the Coordinator of Study Centre with tutor comments and marks obtained in TMAs. These comments will help you in your studies.

- iii) **Library:** Every Study Centre will have a library having relevant course materials, reference books suggested for supplementary reading as well as audio-video CDs prepared for the course(s).
- iv) **Information and Advice:** You will be given relevant information about the courses offered by the University. Facilities are also provided to give you guidance in choosing your courses.
- v) **Audio-Video facilities:** The Centres will be provided with audio-video equipment to help you make use of the audio and video cassettes prepared for different courses. Media notes of these audio/video programmes will also be available at the Study Centres. This will help you know the contents of each programme.
- vi) **Interaction with fellow-students:** In the Study Centre you will have an opportunity to interact with fellow students. This may lead to the formation of self-help groups.

Please take relevant Blocks and your folder of corrected assignments with you, when you go to the counselling session.

## 6.9 Laboratory Work

Laboratory courses are an integral component of the B.Sc. programme. While designing the curricula for laboratory courses, particular care has been taken to weed out experiments not significant to the present day state of the discipline. Importance has been given to the utility of an experiment with respect to real life experience, development of experimental skills, and industrial applications. It is planned to phase the laboratory courses during suitable periods (such as summer or autumn vacations) so that in-service persons can take them without difficulty. Laboratory courses worth 2 credits 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 time will be used for doing calculations, preparations of records, viewing or listening to the video/audio programmes.

Details of number of sessions required to complete each laboratory course of 2 Credits are given below.

### Details of the BSCM Laboratory Courses

| <u>No.</u> | <u>Course</u> | <u>Credits</u> | <u>No. of Sessions to be conducted</u> |                             |    |                        |              | <u>Total No. of days required</u> |    |
|------------|---------------|----------------|--|-----------------------------|----|------------------------|--------------|-----------------------------------|----|
|            |               |                | <u>Introduction</u>                    | <u>Experiments (Guided)</u> |    | <u>Test (Unguided)</u> | <u>Total</u> |                                   |    |
| 1          | XYZ           | 02             | 01                                     | +                           | 12 | +                      | 01           | 14                                | 07 |

**Note :**

- i) Each lab session is of four hours duration
- ii) Two sessions of four hours each will be held each day.
- iii) First session of each laboratory course will be utilized as Introductory Session.

You should bear in mind that **the 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 experiments to be performed by the student at the end of the Lab course.

You are advised to pace your laboratory courses. As far as possible, you should complete the laboratory courses in the year in which you register for them.

## **6.10 IGNOU Web Site**

[www.ignou.ac.in](http://www.ignou.ac.in) the official website of the University offers relevant information to the general public and student support facilities to the learners through the Single Window Information and Student Support (SWISS). These include:

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

## **6.11 Language of Instruction**

The Bachelor's Degree Programme is offered by the University in both languages, Hindi and English. You have to give your option for the language of instruction in your application for admission. However, you can change your option within one month of the first receipt of study materials on payment of the amount prescribed by the University, by Demand Draft

from any Nationalised Bank drawn in favour of IGNOU, payable at the city where your Regional Centre is situated.

## 7 Evaluation

The evaluation consists of two components: (1) continuous evaluation through assignments, and (2) term-end examination. You must pass both in continuous evaluation as well as in the term-end examination of a course to earn the credits assigned to that course. In the final result, the assignment of a theory course carries 30% weightage, while 70% weightage is given for the term-end examination. IGNOU uses 10-Point Grading System for evaluating learners' achievement for CBCS programmes as under:

### 10-Point Grading System of IGNOU in the light of UGC-CBCS Guidelines

| Letter Grade      | Numerical Grade | Percentage   |
|-------------------|-----------------|--------------|
| O (Outstanding)   | 10              | ≥ 85         |
| A+ (Excellent)    | 9               | ≥ 75 to < 85 |
| A (Very Good)     | 8               | ≥ 65 to < 75 |
| B+ (Good)         | 7               | ≥ 55 to < 65 |
| B (Above Average) | 6               | ≥ 50 to < 55 |
| C (Average)       | 5               | ≥ 40 to < 50 |
| D (Pass)          | 4               | ≥ 35 to < 40 |
| F (Fail)          | 0               | < 35         |
| Ab (Absent)       | 0               | Absent       |

You are required to score at least a 'D' grade (35% marks) in both the continuous evaluation (assignments) as well as the term-end examination. In the overall computation also, you must get at least a 'D' grade in each course to be eligible for the B. Sc. degree. Scores of continuous evaluation (assignments) and the term-end examination are not complementary to each other.

If you do not clear the term-end examination of all the courses taken in a particular semester, you can sit for the term-end examination of those courses again after 6 months, as per the University rules. However, you cannot appear more than 48 credits worth of courses in any term-end examination i.e. June or December term-end examinations.

#### 7.1 Assignments

Assignments constitute the continuous evaluation component of a course. As mentioned above assignments of a course carry 30% weightage while 70% weightage is given to the term-end examination (TEE). The marks that you get in your assignments will be counted in your final result. Therefore, you are advised to take your assignments seriously. However, there will be no written assignments for Lab courses.

**You have to complete the assignments in time. You will not be allowed to appear for the term-end examination for a course if you do not submit the specified number of assignments in time for that course. If you appear in Term End Examination without submitting the assignments then the result of term-end examination is liable to be cancelled.**

The main purpose of assignments is to test your comprehension of the learning material that you receive from us and also to help you get through the courses by providing feedback to you. The information given in the printed course material should be sufficient for answering the assignments. Please do not worry about the non-availability of extra reading material for working on the assignments. However, if you have easy access to other books, you may make use of them. But the assignments are designed in such a way as to help you concentrate mainly on the printed course material and make use of your personal experience.

For each course of this programme, you have to do a set of Tutor Marked Assignments (TMAs) which consists of two to three parts depending upon the nature of the course. **The TMA for each semester can be downloaded from the Student Zone of the University website-[www.ignou.ac.in](http://www.ignou.ac.in).** The assignment responses should be complete in all respects. Before submission, you should ensure that you have answered all the questions in the assignment. Incomplete answer sheets would bring you poor grades.

However, to derive maximum benefit out of the assignments as a teaching learning tool, you are advised to observe the schedule indicated in the assignment itself so that you can get feedback on time from the counsellors on your submitted assignment. In case you have received study material and assignment late, the assignment responses can be submitted within one month of the date of receipt of material or the last date printed in the assignment booklet whichever, is later. **In any case, you have to submit assignment before appearing in the examination for any course.**

The University/Coordinator of the Study Centre has the right to reject the assignments received after the due date. You are, therefore, advised to submit the assignments before the due date.

**For your own record, retain a copy of all the assignment responses which you submit to the coordinator of your Study Centre. If you do not get back your duly evaluated tutor marked assignments along with a copy of assessment sheet containing comments on your assignments by the evaluator within a month after submission, please try to get it from your study centre personally.** This may help you to improve upon future assignments.

- Please submit your assignment on or before the due date at your Study Centre.
- Please do the current year assignment only.

## **Specific Instructions for Tutor Marked Assignments**

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

Course Code and Assignment Code may be reproduced from the Assignment.

The top of the first page of your response sheet for each assignment should be like this:

**ENROLMENT NO: .....**

**PROGRAMME TITLE:** ..... **NAME:** .....

**ADDRESS:**.....

**COURSE CODE:** ..... **ASSIGNMENT CODE:** .....

**SIGNATURE:** .....

**STUDY CENTRE:** ..... **DATE :** .....

3. Read the assignments carefully and follow the specific instructions, if any, given on the assignment itself.
4. Go through the units on which the assignments are based. Make some points regarding the questions, rearrange those points in a logical order and draw up a rough outline of your answer. While answering an essay type question, give adequate attention to introduction and conclusion. The introduction must offer your brief interpretation of the question and how you propose to develop it. The conclusion must summaries your response to the question. Make sure that the answer is logical and coherent, and has clear connections between sentences and paragraphs. The answer should be relevant to the question given in the assignment. Make sure that you have attempted all the main points of the question. Once you are satisfied with your answer, write down the final version neatly and underline the points you wish to emphasize. While solving numerical problems, use proper units and give working notes wherever necessary.
5. Use only foolscap size for your responses and tie all the pages carefully. Avoid using very thin paper. Allow a 4 cm. margin on the left and at least 4 lines in between each answer. This may facilitate the evaluator to write useful comments on the margins at appropriate places.
6. Write the response in your own hand. Do not print or type the answers. Do not reproduce your answers from the units sent to you by the University. If you reproduce from units, you will get poor marks for the respective question.
7. Do not copy from the response sheets of other students. If copying is noticed, the assignments of such students will be rejected.
8. Write each assignment separately. All the assignments should not be written in continuity.
9. Write the question number with each answer.
10. **The completed assignments should be sent to the Coordinator of the Study Centre allotted to you. Under no circumstances you should send the tutor marked response sheets to the Student Registration & Evaluation Division at Headquarters for evaluation. Please retain a copy of the assignment.**
11. After submitting the assignment at the Study Centre, get the acknowledgment from the Coordinator on the prescribed assignment remittance-cum-acknowledgment card.
12. In case you have requested for a change of Study Centre, you should submit your Tutor Marked Assignments only to the original Study Centre until the change of Study Centre is affected by the University.

## 7.2 Term End Examination

As stated earlier, Term End examination is another component of the evaluation system. For non-laboratory courses, Term End Examination carries 70% weightage in the final result. For laboratory courses, assigned unguided experiments similar to term-end examination carry 30% weightage.

If you get a pass score (35% marks or D grade) in a course in the Term End Examination, you will not be allowed to reappear in the subsequent examinations in that course for improvement of marks. In case, you fail to get a pass score in the Tem-end Examination, you will be eligible to reappear in the next Term End Examination for that course as and when it is held, within the total span of the programme.

### General Guidelines Regarding the Term-End Examination

1. To be eligible to appear the Term-end Examination in any course, the students are required to fulfill the following conditions:
  - a) registration for the courses, in which they wish to appear is valid,
  - b) they should have opted and pursued the prescribed courses
  - c) they have also submitted the required number of assignment(s), if any.
  - d) they have submitted the online examination form of IGNOU and have paid the requisite examination fees.
2. The University conducts term-end examination twice a year, in June and December. The student can take the examination only after the minimum period prescribed for the course of study. Please note that learners enrolled in July 2022 session will have to take the Term End Examination of both first and second semesters together in June 2023. If you miss taking any examination in June 2023, you may appear in December 2023 or June 2024 for those courses. From the third semester onwards, the TEE may be conducted semester-wise or annually.
3. Examination schedule indicating the date and time of examination for each course is sent to all the Regional Centres/ Study Centres in advance. The same is also notified through IGNOU Newsletter from time to time and displays on the website of IGNOU [www.ignou.ac.in](http://www.ignou.ac.in). You are advised to see whether there is any clash in the examination dates of the courses you wish to take i.e. examination of any two courses you wish to take are scheduled on the same day at the same time. If there is any clash, you are advised to choose one of them in that examination and appear for the other course in the next examination (i.e. June or December as the case may be).
4. The online examination form is to be filled up from IGNOU website, in general, as per the schedule given on the IGNOU website (You MUST visit IGNOU website for actual cutoff dates). The details of fee and late fee are displayed on the website.
5. **Process to submit Term End Examination Form**
  - **Open the following link: <http://exam.ignou.ac.in/>**
  - **Select and Enter Programme Code from the options list available. Please note that option code for BA/BCOM/BSC is BDP & MLIS is MLS**

- Select Examination Centre Code from the options available on the website. List of Regional Centre wise Examination centres for Term-End Examination June-2019 is available for information on this web page.
- If the Examination Centre opted by the student is not activated as Examination Centre or not allotted for administrative reasons, alternative Examination Centre will be allotted to the student.
- Select course(s) carefully while filling the Examination Form as per your valid registration details available in IGNOU website. Courses for theory as well as practical needs to be selected separately from the list appearing on the screen for filling the Exam form.
- After successful submission of Examination Form, you will receive an acknowledgement with Control Number on the screen. Please retain the auto generated Control Number for your reference and record. For checking Examination Form status please visit SEARCH OPTION after 72 hours of submitting the Form. Details regarding examination form submission are not available; you may submit the form again only after following the due procedure as listed above.
- Delhi & NCR - The student may please select the location and exam centre will be allotted accordingly (change of exam centre will not be permitted in any case)

5. You can pay examination fee online using Credit Card / Debit Card /Net Banking while filling up the form. It may also be noted that in case, examination fee needs to be returned to student due to technical reasons, the fee will be refunded to the same account (Credit card/ Debit card/ Net Banking) from which the payment was made.

6. **Hall Ticket for Term-End Examination**

- Hall Ticket will be uploaded on the University Website 10 days before the commencement of the Term-end examinations. Please take print out of Hall Ticket from University website ([www.ignou.ac.in](http://www.ignou.ac.in)) and report at the Examination Centre along with the Identity Card issued by the Regional Centre/University.
- You will be allowed to appear in Term-end Examination for the course(s) for which registration is valid and not time-barred and assignment(s) is/are submitted. Examination Fee once submitted will not be refunded.
- You must carry IGNOU Identity-Card in the Examination Hall for writing Examination. In case, students do not have IGNOU Identity card due to various reasons, they must get it issued (i.e. duplicate copy of IGNOU Identity card) from Regional Centre concerned well before the start of the Examination. Students are required to contact the RC in person (by post) and get the duplicate Identity card for attending Examination.

7. **Contact Details**

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

**YOU MUST READ and FOLLOW all the instructions very carefully. You can save these instructions for any future reference. These instructions relate to:**

- **Dates for the Submission of Online Term End-Examination form**
- **Prerequisite for the submission of the Term=End Examination Form**
- **Process to submit Term-End Examination Form**
- **Examination fee and Mode of Payment**
- **Un-successful Submission of Exam Form**
- **Related to Refund excess Examination Fee**
- **Hall Ticket for Term=End Examination**
- **Contact Details**

**A learner should not apply for appearing at the Term-End Examination of any course without getting registered for the same and that if he/she does so, his /her result would not be declared and the onus shall be on him/her.**

**Important Guidelines and instructions for submission of Term End Examination form and other forms (Please note that guidelines and fee for forms may change, therefore, you are advised to read guidelines and fee details as per latest forms available online or on the IGNOU website)**

1. Please ensure that you have already submitted the assignments as applicable for the courses you are filling in the Examination Form. You are required to pay examination fee for every course of theory. At present there is no examination fee for practical courses, therefore there is no need to register you for practical courses. For the registration of practical courses you should be in touch with your allotted study centre or the Regional Director of your region.
2. You are requested to check the result status before filling examination form.
3. Select and enter Programme code and Examination Centre Code from the options available. If the centre opted by the student is not activated as examination centre or not allotted for any other reason, alternative examination centre will be allotted.
4. Select courses carefully courses for theory from the list appearing on the screen.
5. Students will be allowed to appear in Term-end Examination for the course(s) for which registration is valid and not time-barred and assignment(s) is/are submitted. Examination Fee once submitted will not be refunded.
6. Students must carry IGNOU Identity-Card in the Examination Hall for writing Examination. In case, students do not have IGNOU Identity card due to various reasons, they must get it issued (i.e. duplicate copy of IGNOU Identity card) from Regional Centre concerned well before the start of the Examination. Students are required to contact the RC in person (by post) and get the duplicate Identity card for attending Examination.
7. The students will be entitled to appear for the examination only at the examination centre allotted to them and **NOT** at any other centre without specific permission from the University. The Examination Centre once opted for in a form shall not be changed.

8. Although all efforts will be made to declare the results in time, there will be no binding on the University to declare the results of the last examination before the commencement of next examination. The students may, therefore, fill up the examination form without necessarily waiting for the result and get it cancelled at a later date, if so desired. In case the student gets result after filling up the exam form, s/he should not re-appear in the course qualified by her/him with a view to improve the qualified score.
9. Students who fail to complete the minimum required number of course(s) prescribed for the Programme within the allotted period of study shall cease to be on the rolls of this University for that programme till they re-enroll themselves, if they wish to do so. Such students are advised to get in touch with the Regional Director concerned.
10. **Obtaining Photocopy of Answer Scripts:** After the declaration of result, if the students are not satisfied with the marks awarded, they can request the University for Photocopy of Answer Scripts on payment of 100/- per course. The request for obtaining Photocopy of Answer Scripts by the student must be made within 45 days from the date of declaration of result to the Evaluation Centre concerned in the prescribed format along with the fee of 100/- per course in the form of Demand Draft in favour of IGNOU payable at the city where submitting the request for Photocopy. Format is available on the IGNOU website: [www.ignou.ac.in](http://www.ignou.ac.in)
11. **Early Declaration of Results:** In order to facilitate the students who have got offer of admission and or selected for employment etc. and are required to produce marks sheet/grade card by a specified given date may apply for early process of their answer-scripts and declaration of the results for this purpose. The students are required to apply in the specified format available on the University website with a fee of 1000/- per course through Bank Draft drawn in favour of IGNOU along with the attested photocopy of the offer of admission/employment offer. The students can submit their requests for early declaration before the commencement of the Term-end Examination i.e., before 1st June and 1<sup>st</sup> December respectively. The University in such cases will make arrangements for processing the answer-scripts and declare the results as a special case.
12. **Re-evaluation of Answer-script(s):** The University has replaced the scheme of rechecking with the re-evaluation whereby the answer-scripts will be re-evaluated by another Evaluator in case the students are not satisfied with the marks/grades secured by them in Term-end Examination. Such students can apply for re-evaluation within one month from the date declaration i.e. the date on which the results are made available on the University Website on payment of 750/- per course in the prescribed application form available on the University Website. The better of the two courses on original marks/grades and re-evaluated marks/grades will be considered and the revised marks/grades shall be incorporated in the students' record as applicable and the revised grade card/marks sheet will be sent to the students within one month from the receipt of application. **Re-evaluation is not permissible for Projects, Practical, Assignments and Seminars etc.**
13. **Improvement of Division/Class:** Keeping the interest of students who have completed their Bachelor's Degree and Master's Degree Programmes, but falling short of 2% marks for securing 1st Division/2nd Division the university has made a provision for allowing such students to improve their performance. The improvement is permissible only in theory papers and the students may apply for improvement of their performance on the prescribed application format along with a fee of Rs. 750/- per course through a Bank

Draft drawn in favour of IGNOU payable at Delhi and submit the application and fee to the Registrar, SRE Division, IGNOU, Maidan Garhi, New Delhi. The improvement is not permitted to those students who have completed their maximum duration of the programme. The students will be given only one opportunity to improve the marks/grades and they can apply for improvement a maximum of 25% of the credits for successful completion of the respective programme. However, the sealing for the number of courses in which the student can improve is five courses. **The better of the two examinations i.e., marks already awarded and the marks secured in the improvement examination will be considered.**

### 7.3 Laboratory Courses

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

### 7.4 Project Evaluation

If you opt for a course with a project component, you will need to submit a detailed report at the end of your project work. You will be graded on the basis of this report. This should be sent only to:

**Assistant Registrar (Project), Student Evaluation Division,  
Indira Gandhi National Open University,  
Maidan Garhi, New Delhi-110 068**

## 8 Important Information and Rules

### 8.1 Simultaneous Registration

As per the University policy, a student is allowed to pursue two academic programmes simultaneously through ODL / Online mode, as per the illustration given below.

|  |  |
|--|--|
| One Certificate Programme with any other Programme | Admission in both programmes can be taken in the same admission cycle                            |
| One UG + One PG Programme*                         | <b>Admission has to be taken in two different admission cycles</b>                               |
| Two UG Programmes*                                 | *Admission can be taken ONLY in specified Programmes. Details are available on the IGNOU website |
| Two UG Programmes*                                 |  |

Certain programmes are not allowed under the simultaneous registration. Students are advised to visit the following link for more details:

<http://www.ignou.ac.in/userfiles/Notification%20Simultaneous%20programs%20202-9-2022.pdf>

There will be no change in the counseling/assignment submission/examination schedule in case dates for the above clash in the programmes in which a student has taken admission.

### 8.2 Re-Registration

Learners are advised to submit the Re-Registration (RR) forms 'Online' only on the web portal [www.ignou.ac.in](http://www.ignou.ac.in). as per schedule being notified by the University from time to time. If the Re-Registration in any of the programme is not available online or for any other reason

as specified by the University, Learners should submit their RR forms at the respective Regional Centre ONLY and nowhere else. If any student submits the 'Offline' Re-Registration Form at any other Regional Centre than the allocated Regional Centre, and consequently misses the scheduled date and a semester/ year, he/she will have no claim on the University for regularization. International students of the University pursuing their programme from India are advised to submit re- registrations form Offline at respective Regional Centre or International Division, HQ.

### **8.3 Course-wise Registration and Certification Scheme (CRCS)**

The University offers a scheme of Course-wise Registration and Certification (CRCS). Under this scheme you can register for a single course or a limited number of courses, subject to a maximum of 16 credits. The rules of CRCS are as under:

1. The eligibility for registering for a course under the Scheme shall be same as the eligibility for admission to the Programme from where the course(s) are drawn.
2. The Scheme shall be offered in both Cycles of Admission, subject to the provision that the courses are on offer in the particular admission cycle.
3. Registration for all courses of all the academic programmes shall be open for registration under the Scheme except the courses offered under Research Degree Programmes and Awareness/Appreciation level Programmes.
4. Courses offered in combination shall have to be taken together by the student.
5. Course(s) once opted shall not be changed or withdrawn by the student.
6. The minimum and maximum period allowed for completion of the course(s) registered would be six months and two years, respectively.
7. There will be no separate counselling or lab-work schedule for students registered under the Scheme. The registered students under the Scheme shall be advised to be in touch with the Learner Support Centre allocated in order to know the schedule of theory/practical counselling sessions and participate in the sessions accordingly.
8. Candidates registering under the Scheme, for successfully completing the course(s) opted, shall be required to fulfill all the academic requirements as prescribed by the University from time to time.
9. Candidates successfully completing the course(s) opted shall be provided with a Certificate of Completion of Course indicating the score obtained in continuous/term.
10. The fee chargeable under the Scheme shall be as under:

| Credit weightage of each course | Course fee |
|---------------------------------|------------|
| Up to 4 credits                 | Rs. 1000   |
| Above 4 credits                 | Rs. 2000   |

The fee shall be calculated per course and not on the basis of total number of credits taken. The course fee shall be subject to revision and shall be linked with the revision of Programme fee. In addition to the course fee, Registration fee as decided by the University. Fee once paid shall be non-refundable or non-adjustable. Examination fee, as notified by the University from time to time, shall be charged over and above the course fee and registration fee. Application for CRCS can be made on the online on the Online Admission Portal of the University.

11. Candidates shall be allowed to seek transfer of credits earned under the Scheme by taking admission in a Programme of IGNOU subject to the following conditions:
  - a. Fulfillment of all the conditions as notified by the University from time to time for that particular academic programme.
  - b. A maximum of 50% of the credits earned under the Scheme shall be allowed at the time of taking admission in the relevant programme.
  - c. Credits earned for Project or Internship shall not be transferred.
  - d. Transfer of credits earned under the Scheme for an academic programme that falls under the purview of a Regulatory Authority shall be governed by the rules and regulations of the concerned Regulatory Authority.
  - e. Credit transfer of a course shall be permitted on application with requisite fee after taking admission in a programme.
  - f. Credit transfer shall be given only in the courses offered in that programme. In case the completed course under the Scheme is revised, credit transfer shall not be permitted.
  - g. Transfer of credits earned under the Scheme to an academic programme offered by the University in collaboration/under MoU with other Institutions, shall be governed by the terms of collaboration/MoU.
  - h. The UGC framework for Credit Transfer shall be applicable for transfer of credits.

#### **8.4 Refund of Fee**

Fee once paid will not be refunded under any circumstances except the provision of refund of admission fee as notified by the University. It is also not adjustable against any other programme of this University. However, in cases where University denies admission, the programme fee will be refunded after deduction of processing fee, if any, through online mode.

#### **8.5 Additional Chance in Differently-abled Students**

- a) Students with disability of 40% or more are given additional 2(two) years beyond the maximum duration prescribed for all academic programmes.
- b) Disabled students seeking benefit of the aforesaid facility should submit the 'Disability Certificate' issued by the competent authority at the Regional Centre concerned, which, in turn will verify it, make entry in the database and transmit the data to SRD for updating in the Master records.
- c) Re-admission facility to disabled students will be extended without charging any pro-rata fee, i.e. further extending the duration beyond the maximum duration by six months/ one year/ two year, as the case may be. However, disabled students are required to submit Re-admission Form, as per schedule, without any pro-rata fee.

#### **8.6 Reservation**

The University provides reservation of seats for Scheduled Castes, Scheduled Tribes, non-creamy layer of OBC, Economically Weaker Sections, War Widows, Kashmiri Migrants and Physically Handicapped learners, as per the Government of India rules, for admission to its various programmes. However, submission of forged certificate under any

category shall be liable for not only cancellation of admission but also to be legally implicated as per Government of India rules.

## **8.7 Scholarships and Reimbursement of Fee**

Reserved Categories, viz., Scheduled Castes, Scheduled Tribes and Physically Handicapped students etc. have to pay the fee 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 of IGNOU concerned. Similarly, SC/ST students have to submit their scholarship forms to the respective State Directorate of Social Welfare or Office of the Social Welfare Officer, through the Regional Director of IGNOU concerned for suitable reimbursement.

The Application for reimbursement of Programme Fee to SC/ST students can be downloaded from the link:

<http://ignou.ac.in/userfiles/Application%20form%20for%20Reimbursement%20of%20fee.pdf>

### **Fee Exemption for SC/ST Students under the SCSP and TSP Schemes:**

Detail information regarding this scheme may be obtained from the link:

<http://www.ignou.ac.in/userfiles/Joint%20Notification%20of%20SCSP%20TSP.pdf>

SC and ST students who are availing any kind of fellowship or fee exemption from other agencies are not eligible for fee exemption under SCSP/TSP scheme. The exemption of fee is confined to Programme Fee mentioned in this Admission Prospectus. The scheme will not exempt late fee, term-end-exam fee, convocation fee, etc. Eligible and interested students may contact the Regional Centre concerned. Details of the scheme and notification are uploaded on [www.ignou.ac.in](http://www.ignou.ac.in)

## **8.8 Waiver of IGNOU Programme Fee to Inmates lodged in Prisons**

Inmates lodged in Prisons in the country are exempted from payment of programme fee, including cost of Prospectus. The under-trial/short term prisoners are also eligible for the same benefit of FREESHIP as is extended to other prisoners with the condition that when they go out of jail, they will be treated as normal students and shall pay subsequent fees wherever applicable (examination fee, re-registration fee, registration fee for convocation etc.).

## **8.9 Study Material and Assignments**

The University has a provision to provide softcopy of the self-learning material in place of printed material. A student opting for the softcopy will be given a discount of 15% in the Programme Fee. The Option to this effect has to be indicated by the students while filling in the Online Admission Form. Such students will not be given printed self-learning material.

The University sends study materials by Registered post/ Speed Post/ Courier etc. and if a student does not receive the same for any reason, whatsoever, the University shall not be held responsible for that. You can check status of dispatch of study materials on the IGNOU website using the web link: [www.ignou.ac.in/ignou/aboutignou/division/mpdd/material](http://www.ignou.ac.in/ignou/aboutignou/division/mpdd/material), provided by MPDD.

**The assignments for each semester can be downloaded from the Student Zone of the University website-[www.ignou.ac.in](http://www.ignou.ac.in).** For non-receipt of study material, students are required to write to the Registrar, Material Production and Distribution Division, IGNOU, Maidan Garhi, New Delhi –110 067 or e-mail to [mpdd@ignou.ac.in](mailto:mpdd@ignou.ac.in).

## **8.10 Change of Programme/ Medium**

The students will not be allowed programme change from B.Sc. to BA and vice versa. However, students may get the admission to one programme cancelled and register for another programme. For FYUP Based Bachelor's Degree Programme, Change of medium will be allowed as per current practice on payment of applicable fee. Change of Medium is permitted within 30 days from the receipt of first set of course material in the first year ONLY, on payment of Rs.350/- plus Rs.350/- per 2/4 credit course and Rs.700/- per 6/8 credit course for undergraduate courses. For Master's Degree Programme it is Rs.350/- plus Rs.600/- per 2/4 credit course and Rs.1200/- per 6/8 credit course. Payment should be made by way of a Demand Draft drawn in favour of "IGNOU" payable at the place of concerned Regional Centre. All such requests for change of Medium should be addressed to the concerned Regional Centre only, as per schedule.

## **8.11 Change of Elective/Course**

For FYUP Based Bachelor's Degree Programme, change of course is permitted in the **first Year ONLY**.

## **8.12 Credit Transfer**

Students who want to avail of credit transfer shall get registered with IGNOU for the programmes they want to study. All the applications for this purpose should be addressed to The Registrar, Student Registration Division, IGNOU, Maidan Garhi, New Delhi-110068. Such cases of internal/external credit transfer will be examined on individual basis. The SRD may refer all such cases to the Schools concerned for a decision.

The Internal Credit Transfer Form and guidelines are available on the following link:

<http://www.ignou.ac.in/ignou/studentzone/download/InternalCredittransferscheme>

## **8.13 Counselling and Examination Centre**

All study centres, Programme study centres, special study centres are not Examination centres. Practical Examination need not necessarily be held at the centre where the learner has undergone counselling or practicals.

## **8.14 Correction of Address and Study Centre Change**

Students can initiate the request for change of address, Study Centre and regional centre online from their user account. The user account is to be created at <https://ignou.samarth.edu.in> by clicking 'New Registration'.

## **8.15 Change of Region**

When a learner wants transfer from one region to another, he/she has to write to that effect to the Regional Centre from where he/she is seeking a transfer marking copies to the Regional Centre where he/she would like to be transferred to. Further, he/she has to obtain a certificate from the Coordinator of the Study Centre from where he/she is seeking transfer regarding the number of assignments submitted. The Regional Director from where the learner is seeking

the transfer will transfer all records including details of fee payment to the new Regional Centre under intimation to the Registrar, Student Registration Division (SRD) and the learner as well. For change of Region in practical oriented Programmes like computer programmes, B.Sc. etc., 'No Objection Certificate' is to be obtained from the concerned Regional Centre/Study Centre where the learner wishes his/her transfer.

In case any learner is keen for transfer from Army/Navy/ Air Force Regional Centre to any other Regional Centre of the University during the cycle/session, he/she would have to pay the fee-share money to the Regional Centre. In case the learner seeks transfer at the beginning of the session/cycle, the required programme course fee for the session/cycle shall be deposited at the Regional Centre. However, the transfer shall be subject to availability of seats wherever applicable.

The learner can seek transfer to any other overseas study centre only after six months of Registration or submission of first year/semester assignments for the programme of one year or longer duration.

## **8.16 Official Transcripts**

The University provides the facility of official transcripts on request made by the learners on plain paper addressed to Registrar, Student Evaluation Division (SED), Block12, IGNOU, Maidan Garhi, and New Delhi–110068. The fee for official transcripts is as under:

### **For Indian Students:**

₹ 300/-for each transcript, if to be sent to the Student/Institute **within India**

₹ 500/- for each transcript, if to be sent to the Student/Institute **out of India**

### **For SAARC Countries Students:**

₹ 1200/- for each transcript, if to be sent to the Student/institute of **SAARC Countries**.

### **For Non-SAARC Countries Students:**

\$ 120 for each transcript, if to be sent to the Student/Institute of **Non-SAARC Countries**.

Format is available in the Programme Guide or IGNOU website: [www.ignou.ac.in](http://www.ignou.ac.in)

## **8.17 Correction/Change of Name/Surname of Learner**

Spelling mistakes, if any, committed at the time of data entry stage will be rectified at the Regional Centre and corrected data transmitted to Student Registration Division for updating in the database. However, Learners are expected to write their correct name (as indicated in the High School Certificate) in the Admission Form. In case any change in the name (other than the one mentioned in his/her High School Certificate), then it is mandatory for the prospective learners to furnish legal evidence of having changed his/her name/ surname while submitting the admission form.

For Change of Name/Surname, after confirmation of admission, the learners are required to submit the following documents at the Regional Centre, for onward transmission to Registrar, SRD:

- a) Original copy of Notification in a daily newspaper notifying the change of name;
- b) Affidavit, in original, on non-judicial Stamp Paper of the appropriate value sworn in before 1st Class Magistrate specifying the change in the name;
- c) MarriageCard/MarriageCertificateincaseofwomencandidatesforchangeinsurname;

- d) Gazette Notification, in original, reflecting the change of name/surname;
- e) Demand Draft of Rs. 500/- drawn in favour of IGNOU payable at New Delhi.

**Request for correction and/or change of Name / Surname will be entertained only before award of the Degree/Diploma/Certificate. For change/correction of name after completion of programme, but before award of degree please see the guidelines available at:**

**[http://www.ignou.ac.in/userfiles/Notification%20\(4\)\(3\).pdf](http://www.ignou.ac.in/userfiles/Notification%20(4)(3).pdf)**

### **8.18 Disputes on Admission and Other University Matters**

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

### **8.19 Recognition**

IGNOU Degrees/Diplomas/Certificates are recognized by all member universities of the Association of Indian Universities (AIU) and are at par with Degrees/Diplomas/ Certificates of all Indian Universities/Institutions, as per UGC Circular letter No. F.1-52/2000(CPP-II) dated 5<sup>th</sup> May, 2004, AIU Circular No. EV/11(449/94/176915- 177115 dated January 14, 1994, AICTE Circular No. AICTE/Academic/ MOU-DEC/2005 dated May 13, 2005 and UGC/DEB/2013 dated 14.10.2013.

### **8.20 Pre-admission Counselling of Persons with Disabilities**

Persons with disabilities before opting for a programmes for admission may please go through the category of perspective jobs for persons with disabilities and the physical requirements of jobs by visiting the link (<http://www.disabilityaffair.gov.in/content/page/rules-and-regulations.php#ipd2013>) of Department of Empowerment of Persons with Disabilities, Ministry of Social Justice and Empowerment, Government of India. After having made this informed decision, the person with disability seeking admission must give an undertaking in the prescribed proforma available on IGNOU Website.

### **8.21 Prevention of Malpractice/Notice for General Public**

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

1. Director, Research Unit (Tele: 29534336)
2. Director, SSC (Tele: 29535714)
3. Director, RSD (Tele: 2953 2118, 29572412)
4. Registrar, SED (Tele: 2953 5828, 29572204)
5. Registrar, SRD (Tele: 2953 2741,9571302)
6. Registrar, MPDD (Tele: 29534521,29572002)
7. Deputy Registrar, F&A (Tele: 29534934)
8. Registrar (SRD) (Tele: 29571302)

Alternatively, complaints may be faxed on 29532312.

**Email :** [ignouregistrar@ignou.ac.in](mailto:ignouregistrar@ignou.ac.in)

**Website:** <http://www.ignou.ac.in>

**Note :** Except the above mentioned complaints, no other queries will be entertained at the above phone numbers.

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

## **8.22 Placement Services**

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

## **8.23 Grievance Redressal: Whom to Contact**

IGNOU has a robust mechanism in place for redressal of student grievances. A Special Online Portal –IGNOU Grievance Redress and Management (iGRAM) has been developed for this purpose. Students can submit their grievances on iGRAM online and track the response. iGRAM can be accessed at,

<http://igram.ignou.ac.in/>

A dedicated Student Service Centre has been set up at the HQ to respond to the queries and grievances of the students. The Student Service Centre can be contacted at the contact details provided below.

| <b>Contact Details of Student Service Centre</b>   |   |
|--|---|
| General Enquiry (Student Support Services and Student Grievances, pre-admission Inquiry of various Programmes in IGNOU, etc) | Phone: 011-29572514, 29572513, 29572516   |
| Director, SSC, IGNOU, Maidan Garhi,<br>New Delhi – 110068  | Phone: 011-29572505<br>Email: <a href="mailto:directorssc@ignou.ac.in">directorssc@ignou.ac.in</a> , <a href="mailto:ssc@ignou.ac.in">ssc@ignou.ac.in</a> |

**For specific queries related to Admission, Study Material, Assignment, Examination, Counselling etc. the students may contact the following:**

| <b>Sl. No.</b> | <b>Issues</b>  | <b>Authority to be contacted</b>  |
|----------------|--|---|
| 1              | Identity Card, Fee Receipt, Bona fide Certificate, Migration, Certificate, Scholarship Forms, change of name, correction of name/address   | Concerned Regional Centre   |
| 2              | Non-receipt of study material  | Registrar (MPDD), IGNOU, Maidan Garhi, New Delhi-110068 Email: <a href="mailto:mpdd@ignou.ac.in">mpdd@ignou.ac.in</a> , Ph: 011-29572008, 29572012  |
| 3              | Change of Elective/Medium/opting of left over electives/ Deletion of excess credits  | Concerned Regional Centre   |
| 4              | Credit Transfer  | Student Registration Division, Block No. 1 & 3, IGNOU, Maidan Garhi, New Delhi-110068 Email: <a href="mailto:registrarsrd@ignou.ac.in">registrarsrd@ignou.ac.in</a>   |
| 5              | Purchase of Audio/Video CDs  | Marketing Unit, EMPC, IGNOU, Maidan Garhi, New Delhi-110068 Email: <a href="mailto:empcmktunit@ignou.ac.in">empcmktunit@ignou.ac.in</a>   |
| 6              | Academic Content   | Director of the School concerned ( <a href="http://www.ignou.ac.in">www.ignou.ac.in</a> )   |
| 7              | Approval of a Project Synopsis   | Project Co-ordinator in the Concerned School of Studies/ Regional Centres   |
| 8.             | International Students residing in India should contact  | Director, International Division, IGNOU, Block-15, Section K, Maidan Garhi, New Delhi. Tel. Nos. : 29533987; 29571681<br>E-mail : <a href="mailto:internationaldivision@ignou.ac.in">internationaldivision@ignou.ac.in</a>                                  |
| 9              | Issue of Degree/ Diploma Certificate/ Despatch of returned Degrees/ Verification of Degrees/Convocation  | Asstt. Registrar 011-29572224, 011-29572213, 011-29535438<br><a href="mailto:convocation@ignou.ac.in">convocation@ignou.ac.in</a>   |
| 10             | Issue of Hall Ticket/ Correction in the hall ticket for handicapped student s/ Non-receipt of hall tickets for term-end-examination & Entrance Test/Entrance, Test Results/Queries related to dispatch of attendance, list of examinees etc./ writer | Asstt. Registrar 011-29535064, 011-29572209, 011-29572202<br><a href="mailto:bhavna@ignou.ac.in">bhavna@ignou.ac.in</a><br><a href="mailto:ssbhandari@ignou.ac.in">ssbhandari@ignou.ac.in</a><br><a href="mailto:examiii@ignouac.in">examiii@ignouac.in</a> |
| 11             | Declaration of results of Masters & Bachelors degree level programme/ Issue of grade card and provisional certificate of Masters and Bachelors degree level prog./ Practical marks of all programmes   | Section Officer 011-29536103, 011-29572212<br><a href="mailto:mdresult@ignou.ac.in">mdresult@ignou.ac.in</a> <a href="mailto:bdresult@ignou.ac.in">bdresult@ignou.ac.in</a><br><a href="mailto:practicalsde@ignou.ac.in">practicalsde@ignou.ac.in</a>       |
| 12             | Declaration of results of Masters, Bachelor and Diploma programme/ Issue of grade card and provisional certificate of Masters, Bachelor and Diploma level programme  | Section Officer 011-29536743, 011-29572211<br><a href="mailto:bdresult@ignou.ac.in">bdresult@ignou.ac.in</a> <a href="mailto:dpresult@ignou.ac.in">dpresult@ignou.ac.in</a>   |
| 13             | Declaration of results of DPE and Certificate programme/ Issue of grade card and provisional certificate of DPE & Certificate level programme  | Section Officer 011-29536405, 011-29572208 Email: <a href="mailto:cpresult@ignou.ac.in">cpresult@ignou.ac.in</a>  |
| 14             | Verification of genuineness of provisional certificate and grade card/ Issue of Transcript   | Section Officer 011-29536405, 011-29572210 Email: <a href="mailto:gcverification@ignou.ac.in">gcverification@ignou.ac.in</a>  |
| 15             | Queries related to UFM cases   | Section Officer 011-29572208, 011-29576405 <a href="mailto:ufmgroup@ignou.ac.in">ufmgroup@ignou.ac.in</a>   |

|    |   |  |
|----|---|--|
| 16 | Status of Project Report of all Programmes/ Dissertation and Viva marks       | Asstt.Registrar 011-29532294, 011-29571324, 011-29571321<br>projects@ignou.ac.in   |
| 17 | Queries related to Assignment Marks   | Asstt.Registrar 011-29571313, 011-29571325, 011-29571319<br>assignment@ignou.ac.in   |
| 18 | Students general enquiries and grievances/ Issue of duplicate mark sheet      | Asstt. Registrar<br>011-29572218, 011-29571313<br>sedgrievance@ignou.ac.in   |
| 29 | Discrepancy in grade card, non updation of grade/marks in the grade card etc. | Dy. Director/ Asstt.Director,<br>011-29572208, 011-29572211, 011-29572212<br>mdresult@ignou.ac.in<br>bdresult@ignou.ac.in<br>bdpresult@ignou.ac.in<br>dpresult@ignou.ac.in<br>cpresult@ignou.ac.in |

**You are also advised to get in touch with the Coordinator of your study centre for timely information.**

## **9. Links to Forms and Enclosures**

In this section, we are enclosing the IGNOU website links to various forms, which are useful for you. Whenever you have to correspond with the university, please download the form from the Website and fill it carefully and send as per instructions therein. The detailed instructions for all these-forms are provided in form itself. Some of these links may change, in those cases please use search option to find the desired link.

### **1. Assignments related links**

<https://webservices.ignou.ac.in/assignments/>

### **2. Re-registration and Re-admission**

<https://onlinerr.ignou.ac.in/>

Last date of Re-Registration is announced on the IGNOU website. In general, the re-admission is to be done 2-3 months prior to the start of Session. For example, the last date of re-registration for session starting from July 2019 is 31 May 2019. Similarly, the last date for session starting January, 2020 may be 30 Nov, 2019. You must verify the cutoff dates and fee from the website prior to filling up this offline form.

### **3. Term End Examination and related links**

**Link to online Term End Examination form**

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

**Link to form for Early Declaration of Result**

<http://www.ignou.ac.in/userfiles/APPLICATION%20FORM%20FOR%20EARLY%20DECLARATION%20OF%20RESULT%20OF%20TERM-END%20EXAMINATION.pdf>

**Link to Application Form for Obtaining Photocopy of the Answer Script**

[http://www.ignou.ac.in/userfiles/Application%20form%20for%20Reevaluation%20of%20Answer%20Scripts\(1\).pdf](http://www.ignou.ac.in/userfiles/Application%20form%20for%20Reevaluation%20of%20Answer%20Scripts(1).pdf)

**Link to form for Re-evaluation of Answer script**

[http://www.ignou.ac.in/userfiles/Application%20form%20for%20Reevaluation%20of%20Answer%20Scripts\(1\).pdf](http://www.ignou.ac.in/userfiles/Application%20form%20for%20Reevaluation%20of%20Answer%20Scripts(1).pdf)

**Link to Application form for Improvement of Division/Class**

<http://www.ignou.ac.in/userfiles/Improvement%20form.pdf>

**Link to form for Duplicate Grade Card/Mark-sheet**

<http://www.ignou.ac.in/userfiles/Duplicate%20mark%20sheet%20form.pdf>

**Link to form for Issue of Official Transcript**

<http://www.ignou.ac.in/userfiles/Official%20Transcript%20form.pdf>

**Link to form for Issue of Migration Certificate**

<http://ignou.ac.in/userfiles/Migration%20Certificate.pdf>

**Link to form for Date sheet of all Programme**

[http://ignou.ac.in/userfiles/DATE%20SHEET\(1\).pdf](http://ignou.ac.in/userfiles/DATE%20SHEET(1).pdf)

#### **4. Other important links**

**Link for Old Question Papers**

<https://webservices.ignou.ac.in/Pre-Question/>

**Link for Checking Study Material Status**

[IGNOU - Material Production & Distribution Division \(MPDD\) - Study Material Status](http://www.ignou.ac.in/MPDD/)

In case the student does not receive the study material from the Regional Centre concerned, the student may approach ***Regional Director, IGNOU, Regional Centre where they stand enrolled/admitted*** through e-mail/fax/letters along with proof of depositing of fee for the course of study.

**Link for eGyankosh for Online Course Materials**

<http://egyankosh.ac.in/>

## **Forms**

*Note: You may download the Forms from the Website*

We are enclosing some samples of the following forms for your use.

1. Assignment Submission-cum-Acknowledgement form (Form No.1)
2. Request for Change of Programme/Medium /Course/Elective (Form No.2)

Whenever you have to correspond with the University for any of the above listed subjects, it is better to **retain the original form for reuse and get a photocopy of the relevant form**, fill it carefully and send as per instruction therein. The detailed instructions for all the above listed subjects are provided in the Programme Guide.

ASSIGNMENTS REMITTANCE -CUM-ACKNOWLEDGEMENT CARD

|  |   |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
|--|---|----------------|--|---------------------|--|-------------|--|------------------------|--|--------------------------|--|--|--|---|---|------------------|------------------------|-------------|---------------|--------------------|---------------------|-------|----------------|--|-------------|--|---------------------------------|--|-------------|--------------------------|--|-------------|--|-------------------------------|--|-------------|--|---|--|
| Enrol. No. _____<br>Programme Title: _____<br>Name: _____<br>Course Code: _____ Medium: _____<br><table border="1"> <tr> <td>S.No.</td> <td>Assignment No.</td> </tr> <tr> <td></td> <td>For Office Use Only</td> </tr> <tr> <td></td> <td>S.No. _____</td> </tr> <tr> <td></td> <td>Date of Receipt: _____</td> </tr> <tr> <td></td> <td>Name of Evaluator: _____</td> </tr> <tr> <td></td> <td>Date of despatch to the Evaluator: _____</td> </tr> <tr> <td></td> <td>Date of receipt from the Evaluator: _____</td> </tr> </table><br>Signature of the Student<br>Date: _____ | S.No.                                     | Assignment No. |  | For Office Use Only |  | S.No. _____ |  | Date of Receipt: _____ |  | Name of Evaluator: _____ |  | Date of despatch to the Evaluator: _____ |  | Date of receipt from the Evaluator: _____ | <br>INDIRA GANDHI NATIONAL OPEN UNIVERSITY<br>ASSIGNMENTS REMITTANCE -CUM-ACKNOWLEDGEMENT CARD<br><table border="1"> <tr> <td>Enrol. No. _____</td> <td>Programme Title: _____</td> </tr> <tr> <td>Name: _____</td> <td>Medium: _____</td> </tr> <tr> <td>Course Code: _____</td> <td>For Office Use Only</td> </tr> <tr> <td>S.No.</td> <td>Assignment No.</td> </tr> <tr> <td></td> <td>S.No. _____</td> </tr> <tr> <td></td> <td>Signature of the receiver _____</td> </tr> <tr> <td></td> <td>Date: _____</td> </tr> <tr> <td colspan="2">Signature of the Student</td> </tr> <tr> <td colspan="2">Name: _____</td> </tr> <tr> <td colspan="2">Address of the Student: _____</td> </tr> <tr> <td colspan="2">Date: _____</td> </tr> <tr> <td colspan="2">(Please write your complete address and affix adequate postal stamp on reverse)</td> </tr> </table> | Enrol. No. _____ | Programme Title: _____ | Name: _____ | Medium: _____ | Course Code: _____ | For Office Use Only | S.No. | Assignment No. |  | S.No. _____ |  | Signature of the receiver _____ |  | Date: _____ | Signature of the Student |  | Name: _____ |  | Address of the Student: _____ |  | Date: _____ |  | (Please write your complete address and affix adequate postal stamp on reverse) |  |
| S.No.  | Assignment No.                            |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
|  | For Office Use Only                       |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
|  | S.No. _____                               |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
|  | Date of Receipt: _____                    |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
|  | Name of Evaluator: _____                  |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
|  | Date of despatch to the Evaluator: _____  |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
|  | Date of receipt from the Evaluator: _____ |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
| Enrol. No. _____   | Programme Title: _____                    |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
| Name: _____  | Medium: _____                             |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
| Course Code: _____   | For Office Use Only                       |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
| S.No.  | Assignment No.                            |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
|  | S.No. _____                               |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
|  | Signature of the receiver _____           |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
|  | Date: _____                               |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
| Signature of the Student   |   |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
| Name: _____  |   |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
| Address of the Student: _____  |   |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
| Date: _____  |   |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |
| (Please write your complete address and affix adequate postal stamp on reverse)  |   |                |  |                     |  |             |  |                        |  |                          |  |  |  |   |   |                  |                        |             |               |                    |                     |       |                |  |             |  |                                 |  |             |                          |  |             |  |                               |  |             |  |   |  |

Affix  
Stamp  
Here

From:

To

The Coordinator  
Study Centre concerned

(ADDRESS OF THE STUDENT)

.....  
.....  
.....

**Form 2**

To

The Regional Director

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Change of Medium: Rs.300/- + Rs.500/- for per 2/4 credits and Rs.1000/- for per 6/8 credits course.  
Change of Courses: Rs.500/- for 2/4 credit per course Rs.1000/- for more than 4 credits per course.  
This is permitted within 30 days from receipt of first set of course material.

**Sub:**      **1. Change of Medium Study**  
                 **2. Change of Courses of Study**

Enrolment No.: 

|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|

1. Change of Medium: From \_\_\_\_\_ to \_\_\_\_\_
2. Change of courses of study as per following details:

| Title of the Course offered at the time of Registration | Medium | New Course to be offered | Medium |
|---|--------|--------------------------|--------|
|   |        |                          |        |
|   |        |                          |        |
|   |        |                          |        |
|   |        |                          |        |
|   |        |                          |        |
|   |        |                          |        |
|   |        |                          |        |

Fee Details: Demand draft is to be made in the name of IGNOU payable at the city of your Regional Centre.

Demand Draft No. \_\_\_\_\_ Dated \_\_\_\_\_

Amount Rs. \_\_\_\_\_ Drawn on \_\_\_\_\_

Signature: \_\_\_\_\_

Name: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Phone &amp; Email: \_\_\_\_\_

## 10. Syllabi of Courses

### 10.1 Details of Discipline Specific Core (DSC) Courses

#### 10.1.1 Botany

|                               |  |                  |
|-------------------------------|--|------------------|
| <b>Course Code: BBYCT-131</b> | <b>Course Title: Biodiversity (Microbes, Algae, Fungi and Archegoniates)</b> | <b>Credits:4</b> |
|-------------------------------|--|------------------|

Virus – General Account and Economic Importance: Discovery; General Structure; Economic Importance

Virus – Replication: Replication – General Account; Replication in DNA – Virus (T Phage); Lytic Cycle, Lysogenic Cycle; Replication in RNA Virus – TMV

Bacteria: General Account and Economic Importance: Discovery, General Characteristics, Cell Structure, Economic Importance

Bacteria: Reproduction: Reproduction – Vegetative and Asexual; Recombination, Conjugation, Transformation, Transduction

Algae : Introduction: General Characteristics, Ecology and Distribution

Algae: Organization, Reproduction and Classification: Range of organization; Reproduction in algae; Classification of algae

Algae: Morphology and Life Cycles: Morphology and Life Cycles; *Nostoc* (Structure, reproduction), *Chlamydomonas* (Structure, reproduction), *Oedogonium* (Structure, reproduction), *Vaucheria* (Structure, reproduction), *Fucus* (Structure, reproduction), *Polysiphonia* (Structure, reproduction)

Algae : Economic importance: Economic importance of algae

Fungi: Introduction: General Characteristics; Ecology and significance; Range of thallus organization; Cell wall composition; Nutrition; Reproduction and Classification

Fungi: True Fungi: General Characteristics; Ecology and significance; Life Cycles, *Rhizopus* (Zygomycota) *Penicillium*, *Alternaria* (Ascomycota), *Puccinia*, *Agaricus* (Basidiomycota)

Fungi: Lichens and Mycorrhiza: Lichens; General Account, Reproduction, Significance or Economic Importance; Mycorrhiza Ectomycorrhiza, Endomycorrhiza; Significance

Introduction to Archegoniates: Unifying features of Archegoniates; Transition to land habit; Alternation of generations

Bryophytes: An Introduction: General Characteristics; Adaptations to land habit; Classification (up to family)

Bryophytes: Type Studies: Range of Organisation in Bryophytes; *Marchantia*, Morphology, Anatomy, Reproduction; *Funaria*, Morphology, Anatomy, Reproduction

Bryophyta: Ecology, Economic Importance: Ecology ; Economic Importance (special mention of *Sphagnum*)

Pteridophytes: An Introduction: General Characteristics; Classification (up to family); Early land plants, *Cooksonia*, *Rhynia*

Unit Pteridophytes: Type Studies: Range of Organisation in Pteridophytes; *Selaginella*; Morphology, Anatomy, Reproduction; *Equisetum*; Morphology, Anatomy, Reproduction; *Pteris*, Morphology, Anatomy, Reproduction

Pteridophytes: Importance and Evolution: Heterospory and seed habit; Stelar Evolution; Ecological and economical importance of Pteridophytes

Gymnosperms: General Characteristics: General Characteristics; Classification (up to family):Gymnosperms: *Cycas* Morphology; Anatomy; Reproduction; Gymnosperms: *Pinus* Morphology; Anatomy; Reproduction; Gymnosperms : Importance Ecological Importance; Economic Importance

|                              |  |                  |
|------------------------------|--|------------------|
| <b>Course Code:BBYCL-132</b> | <b>Course Title: Biodiversity (Microbes, Algae, Fungi and Archegoniates): Laboratory</b> | <b>Credits:2</b> |
|------------------------------|--|------------------|

EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle.

Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.

Gram staining

Study of vegetative and reproductive structures of *Nostoc*, *Chlamydomonas* (electron micrographs), *Oedogonium*, *Vaucheria*, *Fucus\** and *Polysiphonia* through temporary preparations and permanent slides. (\* *Fucus* - Specimen and permanent slides)

*Rhizopus* and *Penicillium*: Asexual stage from temporary mounts and sexual structures through permanent slides.

*Alternaria*: Specimens/photographs and tease mounts.

*Puccinia*: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts.

*Agaricus*: Specimens of button stage and full grown mushroom; Sectioning of gills of *Agaricus*.

Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)

Mycorrhiza: ectomycorrhiza and endomycorrhiza (Photographs)

*Marchantia* - Morphology of thallus, W.M. rhizoids and scales, V.S. thallus through gemma cup, W.M. gemmae (all temporary slides), V.S. antheridiophore, archegoniophore, L.S. sporophyte (all permanent slides).

*Funaria* - Morphology, W.M. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, L.S. capsule and protonema.

*Selaginella* - Morphology, W.M. leaf with ligule, T.S. stem, W.M. strobilus, W.M. microsporophyll and megasporophyll (temporary slides), L.S. strobilus (permanent slide).

*Equisetum* - Morphology, T.S. internode, L.S. strobilus, T.S. strobilus, W.M. sporangiophore, W.M. spores (wet and dry)(temporary slides); T.S. rhizome (permanent slide).

*Pteris* - Morphology, T.S. rachis, V.S. sporophyll, W.M. sporangium, W.M. spores (temporary slides), T.S. rhizome, W.M. prothallus with sex organs and young sporophyte (permanent slide).

*Cycas* - Morphology (coralloid roots, bulbil, leaf), T.S. coralloid root, T.S. rachis, V.S. leaflet, V.S.. microsporophyll, W.M. spores (temporary slides), L.S. ovule, T.S. root (permanent slide).

*Pinus* - Morphology (long and dwarf shoots, W.M. dwarf shoot, male and female), W.M. dwarf shoot, T.S. needle, T.S. stem, L.S/T.S. male cone, W.M. microsporophyll, W.M. microspores (temporary slides), L.S. female cone, T.L.S. and R.L.S. stem (permanent slide).

|                              |   |                  |
|------------------------------|---|------------------|
| <b>Course Code:BBYCT-133</b> | <b>Course Title: Plant Ecology and Taxonomy</b> | <b>Credits:4</b> |
|------------------------------|---|------------------|

Introduction to Plant Ecology: What is Ecology? History of Ecology; Subdivisions of Ecology; Relationship of Ecology with other disciplines of Biology; Basic Terms of Ecology - Environment, Biosphere, Ecosystem, Population, Community.

Ecological Factors : Soil and Water: Soil - What is Soil? Origin and formation of Soil; Composition of Soil, Soil profile, Properties of Soil, Soil biota and fertility, Water - States of Water in Environment, Precipitation types, Global distribution of Water, Properties of Water, Water Cycle.

Ecological Factors: Light and Temperature: Light - Electromagnetic spectrum, Solar energy input, Periodic variations, Distribution, Temperature - Latitudinal and altitudinal variations, Global temperature distribution, Shelford Law of Tolerance.

Adaptations of hydrophytes and xerophytes: Hydrophytes - Free-floating plants, Rooted plants with floating leaves, Submerged floating plants, Rooted submerged plants, Rooted emerged plants; Xerophytes - Ephemeral annuals, Succulents, Non-succulent perennials.

Introduction to Plant Communities: What is community? Community gradients and boundaries; Community characters - Analytical characters, Synthetic characters.

Succession in Communities: What is succession? Processes in succession; Types of succession – Hydrarch, Xerarch.

Ecosystem Structure: Ecosystem – as a unit of nature; Structure – Abiotic, Biotic; Trophic organization.

Ecosystem Functioning: Ecological pyramids, Energy flow in ecosystem, Food chain, Food web.

Biogeochemical Cycling: Biogeochemical cycling, Cycling of carbon, Cycling of nitrogen, Cycling of phosphorus.

Phytogeography: Types of vegetation, Distribution of vegetation over the world, Phytogeographical zones of India, Endemism, Hotspots of India.

Introduction to Plant Taxonomy: What is Plant Taxonomy? History of Plant Taxonomy; Aims and Objectives of Taxonomy -Classification, Identification, Nomenclature.

Herbaria and Botanical Garden: Field Observations: Ecological – Phytosociological; Herbaria - Functions of Herbarium, Important Herbaria of World and India; Botanical Gardens of World and India - Role of a Botanic Garden, Role of Botanical Survey of India.

Taxonomy Documentation: General Taxonomic Indexes; Types of documentation– Floras, Monographs, Manuals, Revisions, Periodicals; Keys - What are Keys? Types of Keys, Construction of Keys, How to use a Key, How to prepare a Key, Punch Card, Single access and multi access.

Taxonomic Evidence: Alpha Taxonomy and Omega Taxonomy; Taxonomy Evidences from Palynology; Taxonomy Evidences from Cytology - Chromosomes Numbers, Chromosomes Structure, Chromosomes Behaviour; Evidence from Phytochemistry - Directly visible Chemical Characters, Primary Metabolites, Secondary Metabolites, Semantides; Evidence from Molecular Data.

Taxonomy Hierarchy: Concept of Taxa; Ranks; Categories and hierarchy; Taxonomy groups; Species concept.

Botanical Nomenclature: Development of Concept - International Code; Principal of Binomial Nomenclature; Important Rules of Nomenclature; Binomial System – Bauhin, Linnaeus.

Scientific Naming of Plants :Nomenclature: Common Name: it's problem; Nomenclature: The Code; Laws and Provisions; Rules - Ranks of Taxa, Typification, Principles of Priority and its limitations, Effective and valid publication, Author citation, Retention, Choice and rejection of names.

System of Classification: Types of Classifications – Artificial, Natural Classification, Phylogenetic Classification; Natural System of Classification; Bentham and Hooker's Classification - Outline and Basis of Classification, Merits, Demerits; Engler and Prantl's System of Classification; Outline and Basis of Classification; Merits; Demerits.

Biometrics, Numerical Taxonomy: Numerical Taxonomy; Characters; Principles of Numerical Taxonomy; Procedures adopted by Numerical Taxonomists - Choice of units to be studied, Character selection, Binary coding or two-state coding, Multi-state coding, Measurement of similarity, Cluster analysis.

Cladistics: Phenograms - Definition; Cladograms - Definition, Types of Clades, Building and interpretation of Cladograms.

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| <b>Course Code:BBYCL-134</b> | <b>Course Title: Plant Ecology and Taxonomy: Laboratory</b> | <b>Credits:2</b> |
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Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.

Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.

Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.

Study of morphological adaptations of hydrophytes and xerophytes (four each).

Study of biotic interactions of the following: Stem parasite (*Cuscuta*), Root parasite (*Orobanche*), Epiphytes, Predation (Insectivorous plants)

Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed)

Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law.

Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Brassicaceae - *Brassica, Alyssum / Iberis*; Asteraceae - *Sonchus/Launaea, Vernonia/Ageratum, Eclipta/Tridax*; Solanaceae – *Solanum nigrum, Withania*; Lamiaceae - *Salvia, Ocimum*; Liliaceae - *Asphodelus / Lilium / Allium*.

Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

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| <b>Course Code:BBYCT-135</b> | <b>Course Title: Plant Anatomy and Embryology</b> | <b>Credits:4</b> |
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**Tissues:** Types of tissues; Simple tissues (Parenchyma, Collenchyma, Sclerenchyma); Complex tissues (Xylem and Phloem); Meristematic tissues; Apical meristem; Lateral meristem (vascular cambium, cork cambium); Intercalary meristem; Theories of root apical organization - Apical cell theory, Histogen theory; Theories of zonation; Function of root cap and quiescent center; Theories of shoot apical organization- Apical cell theory, Histogen theory, Tunica-corpus theory, Tissue differentiation theory.

**Root:** Structure of root; Primary and secondary tissues in root (Ground, dermal and vascular tissues); Dicot root; Monocot root; Specialized root (Storage, aerial, pneumatophores, mycorrhizae).

**Stem:** Structure of stem; Primary and secondary tissues in stem (Ground, dermal and vascular tissues); Dicot stem; Monocot stem; Specialized stems (Rhizome, tuber, bulb, corm, runner, sucker, cladophyll).

**Leaf:** Structure of leaf; Primary and secondary tissues in stem (ground, dermal and vascular tissues); Structure and function of stomata; Dicot leaf; Monocot leaf; Specialised leaves (tendril, spines, thorns, storage leaves).

**Secondary growth (Vascular cambium):** Vascular cambium; Structure and development (Fusiform initials, Ray initials); Types (Storied and Non-storied); Function (Formation of annual rings and growth); Seasonal activity; Secondary Xylem; Wood (heartwood and sapwood); Secondary Phloem; Wood anatomy and climate studies (Dendrochronology).

**Secondary growth (Periderm):** Secondary growth in root; Secondary growth in stem; Formation of periderm; Phellem, Phellogen, Lenticels; Cork cambium; Anomalous secondary growth or cambial variants.

**Protective features in plants:** Protective features; Epidermis (specialized epidermal cells, cystoliths); Trichomes (glandular, non-glandular); Cuticle.

**Adaptive features in plants:** Adaptations in xerophytes; Adaptations in hydrophytes; Adaptive features - Change in size of plant organs (leaf, stem); Other adaptive features, Characteristic features of Mangroves.

**Structural organization of flower (I):** Various parts of flower; Complete and incomplete flowers; Development of flower; Structure of anther; Development of anther wall layers; Tissue organization (sporogenous tissue, tapetum); Microsporogenesis (formation of

microspores); Pollinia; Male gametophyte; Vegetative and generative cell; Structure of pollen; Development of pollen wall; Pollen sterility; Pollen and health (allergies and nutrition).

Structural organization of flower (II): Structure of Ovary; Ovules, Structure (integuments, nucellus, endothelium), Types (Anatropous, Orthotropous, Hemianatropous, Campylotropous, Circinotropous); Megasporogenesis; Structure and organization of mature embryo sac (*Polygonum* type), Structure (synergids, antipodal cells and egg cell), Types (Monosporic, Bisporic, Tetrasporic).

Pollination: Types of pollination; Self pollination and cross pollination; Dichogamy, Herkogamy, Dicliny; Pollination mechanisms, Anemophily, Hydrophily, Entomophily, Ornithophily, Cheiropterophily; Pollen - stigma interaction, Wet, Dry, open style and closed style.

Fertilization: Pollen tube structure and growth; Pollen tube germination; Syngamy and Triple fusion; Incompatibility (Interspecific and intraspecific); Self incompatibility, Sporophytic incompatibility, Gametophytic incompatibility, Recognition and Rejection reaction; Methods to overcome incompatibility; Significance of incompatibility.

Endosperm: Development of endosperm; Structure of endosperm; Types of endosperm, (Nuclear, Cellular, Helobial); Endosperm haustoria (Chalazal, Micropylar, Secondary, Lateral); Endosperm variants (Composite, Ruminate, Mosaic); Functions of endosperm.

Embryo: Development of embryo (globular, torpedo stage, heart stage); Differentiation of embryonal tissues (*Arabidopsis*); Structure of embryo, Dicot embryo, Monocot embryo.

Apomixis and Polyembryony: Apomixis; Types of Apomixis - Recurrent and Non-recurrent types ; Causes of Apomixis; Parthenogenesis; Polyembryony; Types of Polyembryony, Cleavage, Simple and Rosette; Significance and applications of Apomixis and Polyembryony.

Seeds and Fruit: Parts of seed; Development and structure of seed; Storage metabolites in seeds; Dispersal of seeds; Types of fruit; Fruit development and structure; Parthenocarpy

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| <b>Course Code:BBYCL-136</b> | <b>Course Title: Plant Anatomy and Embryology; Laboratory</b> | <b>Credits:2</b> |
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Study of meristems through permanent slides and photographs.

Tissues (parenchyma, collenchyma and sclerenchyma); Macerated xylary elements,

Phloem (Permanent slides, photographs)

Stem: Monocot: *Zea mays*; Dicot: *Helianthus*; Secondary: *Helianthus* (only Permanent slides).

Root: Monocot: *Zea mays*; Dicot: *Helianthus*; Secondary: *Helianthus* (only Permanent slides).

Leaf: Dicot and Monocot leaf (only Permanent slides).

Adaptive anatomy: Xerophyte (*Nerium* leaf); Hydrophyte (*Hydrilla* stem).

Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent slides).

Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/campylotropous.

Female gametophyte: *Polygonum* (monosporic) type of Embryo sac development (Permanent slides/photographs).

Ultrastructure of mature egg apparatus cells through electron micrographs.

Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle)(Photographs and specimens).

Dissection of embryo/endosperm from developing seeds.

Calculation of percentage of germinated pollen in a given medium.

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| <b>Course Code:BBYCT-137</b> | <b>Course Title: Plant Physiology and Metabolism</b> | <b>Credits:4</b> |
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Plant –Water Relations: Introduction; Characteristics of Water and Its Importance to Plants, Physical and Chemical Properties; Water Transport, Diffusion, Imbibitions, Pressure-driven bulk flow, Osmosis, Osmotic Pressure, Water Potential and its Components, Gradients of water potential; Absorption and Uptake of Water

Water Transport: Introduction; The Pathway of Transport of Water; Ascent of Sap; Transpiration and its Significance; Mechanism of Stomatal Opening; Factors Affecting Transpiration; Root Pressure and Guttation; Physiological Processes affected by Plant Water Status;

Mineral Nutrition: Introduction; Nutrient Elements of Plants, Plant Ash Analysis and Detection of Elements, Special Techniques used to study the role of Minerals – Importance in Agriculture and Crop Productivity; Classification of Elements/The Essential Nutrient Elements, Criteria of Essentiality, Macro-and Micronutrients; Functions of Essential Elements, Deficiency, Nutrient Toxicity; Nutrient Absorption, Soil and Colloidal Constituents, Uptake of Nutrients by Roots, Foliar Nutrition; Root-Microbe Interactions, Role of Mycorrhizal Association.

Nutrient Transport: Introduction; Transport of ions across cell membrane barriers/transport of Ions, Apparent free space, Simple Diffusion, Facilitated Diffusion and Active Transport, Membrane Transport Proteins, Selective Accumulation of Ions by roots, Plasma membrane ATPases; Ion Transport in Roots – Radial movement of ions in Roots; Long Distance Transport – Xylem loading and unloading.

Introduction to Photosynthesis: Introduction; Basic Concepts – Historical Background, Earlier investigations, Development of Concept – Formulation of Equation for photosynthesis; Chloroplast: Ultrastructure and Organization; Chlorophylls and Accessory Pigments, Synthesis of Chlorophyll, Action and Absorption spectra, **Non-Photosynthetic Pigments**, Anthocyanins, Flavonoids, Betacyanins, Other Photoreceptors; Role of Sunlight, Electromagnetic Spectrum, Light Absorption by Photons, Fate of Light (Photosynthetic Efficiency).

Photosynthesis Mechanism: Introduction; Evidence for the Light and Dark Reactions, Temperature Coefficient Experiments, Intermittent Light Experiments, Role of Light Reaction, CB Van Niel's work, Hill Reaction, Photophosphorylation and Production of Reducing Power (Photoreduction), Discovery of Two Light Reactions, Quantum Requirements of Photosynthesis, Red Drop and Emerson Effect; Photosystems I and II, Organization of

Photosynthetic apparatus in the chloroplast, Photosynthetic Unit and Light Harvesting Complexes, Non-Cyclic and Cyclic Photophosphorylation – Z- Scheme, Pseudocyclic Photophosphorylation; Chemiosmic Coupling and ATP generation, ATPase (Coupling Factor/CF<sub>0</sub>-CF<sub>1</sub>), Conformational Change Model; The Dark Reaction – Photosynthetic Carbon Reduction (C<sub>3</sub>) Cycle; Calvin – Benson Cycle, Rubisco--- Structure and some Modern Concepts, Regulation of Calvin – Benson Cycle;

C<sub>2</sub>, C<sub>4</sub> And Cam Plants: Introduction; The C<sub>2</sub>-Oxidative Photosynthetic Carbon Cycle (Photorespiration); C<sub>4</sub> Cycle – Inorganic Carbon Concentrating Mechanism, Variation among C<sub>4</sub> Cycle, NADP<sup>+</sup> - ME (Malic Enzyme) type, NAD<sup>+</sup> - ME (Malic Enzyme) type, PCK (PEP-Carboxylase) type, Relationship between C<sub>2</sub> and C<sub>3</sub> Cycle; Crassulacean Acid Metabolism (CAM), Ecological Significance; Bacterial Photosynthesis and Chemosynthesis, Chemosynthesis; Factors affecting Photosynthesis, The Principle of Limiting Factors, External Environmental Factors; Photosynthesis, Productivity and Human Welfare.

Translocation In Phloem: Introduction; Why is Transport Necessary?, Downward and Upward translocation; Pathways of Translocation, Conduction through phloem, Sieve elements and p-proteins, Companion cells, Transfer cells, The source and Sink Relationship, Sampling of phloem sap – Nature of metabolites; Ringing Experiment, Phloem Sap and its Composition, Use of radioactive tracers; Phloem loading and unloading, Short and Long Distance Transport, Loading via apoplast and symplast, Sink to source transition and phloem unloading , Polymer Trapping Model for Symplastic transport; Mechanism of Phloem Transport, Münch Mass Flow (Pressure Flow) Model, Electro – Osmotic Hypothesis, Protoplasmic Streaming Model, Protoosmotic Model.

Enzymes: Introduction; Discovery, Structure, Apozymes, coenzymes, co-factors and Holozyme; Classification and Nomenclature; Properties of Enzymes, Isozymes, Lysozymes, Ribozymes, Allosteric Enzymes; Mode of Enzyme Action—Mechanism of Enzyme Catalysis; Enzyme Inhibition; Competitive, Non-competitive, Uncompetitive; Regulation of Enzyme Activity; Factors affecting Enzyme Activity.

Respiration: Introduction; Respiration v/s Combustion; Mitochondria –ultra structure and Organisaton; Types of Respiration, Aerobic, Obligate aerobes and Facultative aerobes, Anaerobic, Obligate anaerobes and Facultative anaerobes, Floating and Protoplasmic Respiration, Respiratory Quotient (RQ); Mechanism: An Overview, Regulation of Glycolysis and Krebs Cycle.

Respiration Mechanism: Introduction; Glycolysis---EMP Pathway, Reactions, ATP Yield; Oxidative Decarboxylation of Pyruvate; Krebs Cycle (TCA Cycle);Electron Transfer Chain and Oxidative Phosphorylation; Substrate Level Phosphorylation; Shuttle Mechanisms, Glycerol-phosphate Shuttle, Malate-Aspartate Shuttle; Recent Findings on ATP energetics and net gain Fermentation Pentose Phosphate Pathway; Fatty Acid Breakdown—Glyoxylate; Factors Affecting Respiration.

Nitrogen Metabolism: Introduction; Nitrate Assimilation, Sources of nitrogen to plants, Biochemistry of nitrate assimilation, Conversion of nitrate to nitrite, Nitrate Reductase, Factors regulating nitrate reductase, Reduction of nitrite into ammonia; Ammonium Assimilation, Uptake of Ammonia, Biochemistry of Ammonium assimilation, Conversion of ammonium to amino acids, Glutamate synthase route, Glutamate dehydrogenase pathway, Regulation of ammonium assimilation.

Biological Nitrogen Fixation: Introduction; Biological Nitrogen Fixation, Nitrogen fixers in nature-Freeliving and Symbiotic, Conditions for nitrogen fixation, Symbiotic nitrogen fixation-

Nodule Formation-Leghaemoglobin, Biochemistry of nitrogen-Fixation, Nitrogenase Enzyme Complex, Gene Regulation of Nitrogen Fixation, Measurement of Nirogenase Activity; Genetic Control of nitrogen assimilation.

Plant Growth Regulators: Introduction; Plant Hormones, Auxins, Gibberellins, Cytokinins, Ethene, Abscisic Acid, Perception, signalling and Responses, New Class of Plant Hormones, *Brassinosteroids*, *Jasmonic acid*, *Polyamines*, *Strigolactones*, *Salicylic acid*; Synthetic Growth Hormones.

Plant Response to Light And Temperature: Introduction; Photoperiodism, Historical Perspective, Short Day and Long Day Plants, Day Neutral, Intermediate Day Length and Ambi-photoperiodic Plants; Perception of Light Stimulus, Role of Quality of Light in Flowering; Phytochrome, Discovery and Structure, Mechanism of Action, Phytochrome-mediated Responses and Signalling; Flowering Hormone; Plant responses to temperature; Plant Movements; Rythmic Changes.

Plant Stress: Introduction; What is stress?; Abiotic and Biotic Stress; Ways to Adapt to Stress, Biochemical Alterations, Changes in Plant Morphology and Behaviour, Alternate Mabolic Pathways; Plant Reponses to Specific Stress Conditions, Water and Osmotic Stress, Pollutant Stress, Temperature Stress, Stress by Infection and Wounding; Future Prospects.

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| <b>Course Code:BBYCL-138</b> | <b>Course Title: Plant Physiology and Metabolism: Laboratory</b> | <b>Credits:2</b> |
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### **List of Experiments**

1. To determine the osmotic potential of plant cell sap by plasmolytic method;
2. To study the effect of two environmental factors (light and wind) on transpiration by excised twig;
3. To calculate the stomatal index and stomatal frequency of a mesophyte and a xerophytes;
4. To demonstrate Hill reaction;
5. To demonstrate the activity of catalase and study the effect of pH and enzyme concentration;
6. To study the effect of light intensity and bicarbonate concentration on  $O_2$  evolution in photosynthesis;
7. To compare the rate of respiration in any two parts of a plant;
8. To separate the amino acids by paper chromatograph

### **Demonstration experiment (any four)**

1. Bolting
2. Effect of auxins on rooting
3. Suction due to transpiration
4. R.Q.

5. Respiration in roots

### 10.1.2 Chemistry

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| <b>Course Code: BCHCT-131</b> | <b>Course Title: Atomic Structure, Bonding, General Organic Chemistry and Aliphatic Hydrocarbons</b> | <b>Credits:4</b> |
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Bohr's Theory: Earlier Atomic Models; Dalton, Thomson and Rutherford Models; Bohr Atom Model: Calculation of Radius of Orbit, Energy of an Electron in an Orbit; Hydrogen Atom Spectrum and Bohr's Theory; Critical Analysis and Limitations of Bohr's Theory, Sommerfeld Modification.

Dual Behaviour of Radiation and Matter: The Nature of Radiation: Light as an Electromagnetic Wave, Particle Nature of Radiation; Nature of Matter: de-Broglie's Relation, Matter Waves, Davisson and Germer Experiment; Heisenberg Uncertainty Principle.

Quantum Mechanical Approach: Need for a New Approach to Atomic Structure; What is Quantum Mechanics?: Postulates of Quantum Mechanics, Observables and Operators, Eigenfunctions, Eigenvalues; Time-independent Schrödinger Equation; Significance of  $\psi$  and  $\psi^2$ . Applications of Schrödinger Equation: Energy States of the Hydrogen-like Atoms.

Hydrogen Atom: Schrödinger Equation for Hydrogen Atom, Significance of Quantum Numbers; Radial Distribution Functions, The Most Probable Distance; Angular Dependence of the Wave Function and Shapes of Atomic Orbitals; Radial and Angular Nodes and their Significance; Discovery of Spin, Spin Quantum Number (s), Magnetic Spin Quantum Number ( $m_s$ )

Electronic Configuration of Multi-Electron Atoms: Energy Levels for Multi-Electron Atoms; Rules for Filling of Electrons in Various Orbitals, Theaufbau Principle, Hund's Rule, Pauli Exclusion Principle; Electronic Configuration of Some Multi-Electron Atoms, Stability of Half-Filled and Completely Filled Orbitals, Concept of Exchange Energy, Anomalous Electronic Configurations.

Ionic Bond: Chemical Bonding: Basic Concepts, Effective Nuclear Charge, Ionisation Energy, Electron Affinity, Electronegativity; Ionic Bond, Characteristics of Ionic Compounds, Ionic Radii, Lattice Energy; Solubility and Solvation Energy; Polarising Power and Ploarisability of Ions, Fajan's Rules; The Bonding Continuum; Bond Polarity, Dipole Moments, Determination of Dipole Moment, Application of Dipole Moment Studies.

Covalent Bond: Classical Theory of Covalent Bond, Lewis Concept of Covalent Bond, Writing Lewis Structures, Formal Charge: Predicting Preferred Lewis Structure, Coordinate Covalent Bonds; Characteristics of Covalent Compounds, Covalent Bond Parameters; Molecular Geometry: Valence Shell Electron Pair Repulsion Theory, Central Atom having only Bond Pairs, Central Atom having Bond Pairs and Lone Pairs, Central Atom having Multiple Bonds.

Valence Bond Theory: The Origin of Valence Bond and Molecular Orbital Theories; Principles of Valence Bond Theory; Valence Bond Theory of Hydrogen Molecule; Resonance or Electron Delocalisation; Resonating Structures; Hybridisation of Orbitals.

Molecular Orbital Theory: Molecular Orbital Theory, LCAO method, Bonding and Antibonding Molecular Orbitals, Molecular Orbitals and their Characteristics, s-s combination of Atomic Orbitals, s-p combination of Atomic Orbitals, p-p combination of Atomic Orbitals, Non-

bonding combination of Atomic Orbitals; Rules for Linear Combination of Atomic Orbitals; Molecular Orbital treatment of Homonuclear Diatomic Molecules; Heteronuclear Diatomic Molecules; Comparison of Valence Bond and Molecular Orbital Theories.

Stereochemistry I: Geometrical and Optical Isomerisms: Isomerism; Geometrical Isomerism, *cis*–, *trans*–Nomenclature, *E/Z* Nomenclature, Cahn-Ingold-Prelog Rules; Characterisation of Geometrical Isomers; Optical Isomerism; Plane Polarised Light and Optical Activity, Origin of Optical Activity; Chirality, Enantiomers, Diastereomers, *Meso* Compounds.

Stereochemistry-II: Configurational Isomers: Configuration and Fischer Projection Formulae; Configurational Notations, *R/S* System, *Erythro* and *threo* Nomenclature; Racemic Mixtures and their Resolution.

Stereochemistry-III: Conformational Isomerism: Conformational Isomers: Newman and Sawhorse Representations; Conformations of Ethane; Conformations of Butane; Conformations of Cyclic Systems, Conformations of Cyclohexane.

Structure - Reactivity Relationships: What are Acids and Bases?; Strengths of Acids and Bases; Factors Affecting the Strengths of Acids and Bases, Inductive Effect, Resonance Effect, Hyperconjugation, Hydrogen Bonding, Steric Effect; Tautomerism.

Reactions and Reactive Intermediates: Cleavage of Bonds, Bond Heterolysis, Bond Homolysis; Types of Reagents, Nucleophiles, Electrophiles; Types of Reactions, Substitution Reactions, Addition Reactions, Elimination Reactions, Polymerisation Reactions; Reactive Intermediates, Carbocations, Carbanions, Free Radicals.

Alkanes: Petroleum: A Source of Alkanes, Composition of Petroleum; Physical Properties; Preparation of Alkanes and Cycloalkanes, Wurtz Reaction, Kolbe's Electrolytic Method, Hydrogenation of Unsaturated Hydrocarbons, Reduction of Alkyl Halides; Decarboxylation of the Carboxylic Acids, Preparation of Cycloalkanes; Reactions of Alkanes, Halogenation, Nitration, Isomerisation, Aromatisation, Pyrolysis, Reactions of Small Ring Compounds.

Alkenes-I: Alkenes and their Classification; Physical Properties; Preparation of Alkenes, Dehydrohalogenation of Alkyl Halides, Dehydration of Alcohols, Hydrogenation of Alkynes, Preparation of Dienes.

Alkenes-II: Reactions of Alkenes, Halogenation, Hydrohalogenation, Hydration, Oxymercuration-demercuration Reaction, Hydroboration, Ozonolysis, Hydroxylation.

Alkynes: Alkynes and their Types; Physical Properties and Uses; Preparation of Alkynes, Dehydrohalogenation of Dihalides, Dehalogenation of Tetrahalides, Alkylation of Ethyne; Reactions of Alkynes, Hydrogenation, Hydrohalogenation, Halogenation, Hydration, Ozonolysis, Hydroboration,

Aromaticity: Aromatic Compounds- an Introduction; Physical Properties; IUPAC Nomenclature of Aromatic Compounds, Nomenclature of Benzene and its Derivatives, Disubstituted Benzenes; Structure of Benzene; Resonance, Molecular orbital model of benzene, Representation of Benzene Ring; Aromaticity, Cyclobutadiene, Cyclopentadiene, Benzene, Cyclooctatetraene.

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| <b>Course Code: BCHCL-132</b> | <b>Course Title: Chemistry Lab I: Atomic Structure, Bonding, General Organic Chemistry and Aliphatic Hydrocarbons</b> | <b>Credits:2</b> |
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Titrimetry: An Introduction: Introduction: Apparatus Commonly Used, How to Use a Pipette, How to Use a Burette, How to Use a Volumetric Flask, How to Use an Analytical Balance;

Expression of Concentration; Standard Solution; Titration, Types of Indicators, Types of Titrations; Instrumental Determination of Equivalence Point; Safety Measures in the Laboratory.

**List of Experiments:**

Experiment 1: Determination of Sodium Carbonate and Sodium Hydrogen Carbonate in a Mixture by indicator method

Experiment 2: Estimation of Oxalic Acid by Redox Titration

Experiment 3: Estimation of Water of Crystallisation in Mohr's Salt

Experiment 4: Estimation of Copper ions by Chromatometry using internal indicator

Experiment 5: Estimation of Copper Iodometrically

Experiment 6: Detection of Extra Elements (N, S, X) in the Organic Compounds

Experiment 7: Separation and Identification the Components of a given Mixture of Amino Acids by Paper Chromatography

Experiment 8: Separation and Identification the Sugars present in the given Mixture by Paper Chromatography.

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| <b>Course Code: BCHCT-133</b> | <b>Course Title: Chemical Energetics, Equilibria and Functional Group Organic Chemistry I</b> | <b>Credits:4</b> |
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Chemical Energetics: Thermodynamics and its Importance; Thermodynamic Terminology; Thermodynamic Processes, Work, Heat and Heat Capacity; Thermodynamic reversibility; The Zeroth Law of Thermodynamics.

The First Law of Thermodynamics: Heat Changes Under Constant Volume;

Internal Energy; Work of Expansion; Heat Changes Under Constant Pressure; Enthalpy and Enthalpy Changes.

Thermochemistry: Energy Changes in Chemical Reactions; Calorimetry, Thermochemical Equations, Standard Enthalpy Changes, Relationship between  $\Delta_rU$  and  $\Delta_rH$ ; Standard enthalpy of formation and its determination; Enthalpy Changes in Different types of Reactions; Kirchhoff's Equation; Bond Enthalpies, Bond Dissociation Enthalpy, Estimation of Enthalpies of Reaction and Formation.

Second and Third Laws of Thermodynamics: Spontaneous Processes, Enthalpy and Spontaneity, Entropy, Entropy and Spontaneity, Statements of the Second Law of Thermodynamics, The Third Law of Thermodynamics, Determination of Absolute Entropy, Concept of Residual Entropy.

Chemical Equilibrium I: Reversible and Irreversible Reactions, Gibb's Energy Change in a Chemical Reaction, Distinction between  $\Delta G$  and  $\Delta G^0$ Chemical Equilibrium in Ideal Gas Mixtures, Thermodynamic Derivation of Law of Chemical Equilibrium, Equilibrium constants and relationship between  $K_p$ ,  $K_x$ ,  $K_c$ .

Chemical Equilibrium II: Application of Equilibrium Studies, Le-Chatelier Principle, Effect of Change in Concentration, Pressure and Temperature, effect of addition of Inert Gas / Catalyst.

Ionic Equilibrium I: Electrolytes and Non-Electrolytes, Strong and Weak Electrolytes, Degree of Ionization and Factors Affecting Degree of Ionization, Ionization Constant and Ostwald's Dilution Law, Review of Theories of Acids and Bases, Ionic Product of Water,  $K_w$ , pH Scale and Calculation of pH.

Ionic Equilibrium II: Ionisation Constants of Weak Acids and Bases, Ionisation of Diprotic and Polyprotic Acids; Strength of Acids and Bases, Common Ion Effect, Buffer Solutions, Buffer Action.

Ionic Equilibrium III: Salt Hydrolysis, Hydrolysis Constant and Degree of Hydrolysis, Acidic, Basic and Neutral Salts, pH of Salt Solutions, Solubility and Solubility Product of Sparingly Soluble Salts, Applications of Solubility Product Principle.

Preparation of Aromatic Compounds: Aromatic Hydrocarbons: An Introduction; Nomenclature: A Recall; Structure of Benzene: A Recall; Physical Properties, Isolation of Benzene; Preparations of Benzene, From Phenol, By Decarboxylation, From Acetylene, From Benzene Sulphonic Acid.

Reactions of Aromatic Hydrocarbons-I: Electrophilic Substitution; General Mechanism of Electrophilic Substitution Reactions; Reactions of Benzene, Nitration, Halogenation, Sulphonation, Friedel-Craft's Alkylation and its Limitations; Friedel-Craft's Acylation.

Reactions of Aromatic Hydrocarbons-II: Effect of Substituents on Reactivity; Activators and Deactivators; Effect of Substituents on Orientation, Ortho and Para-Directing Activator, Meta-Directing Deactivator, Ortho and Para-Directing Deactivator; Reactions of Side-Chain of Benzene, Oxidation of Side-Chain.

Alkyl Halides: Classification of Halogen Derivatives; Preparation of Alkyl Halides; Structure and Properties of Halogen Derivatives, Structure of Halogen Derivatives, Physical Properties of Halogen Derivatives, Chemical Properties of Alkyl Halides; Uses of Alkyl Halides; Lab Detection.

Aryl Halides: Structure and Reactivity; Preparation of Aryl Halides, From Aromatic Hydrocarbon, From Aromatic Amide; Reaction of Aryl Halides, Nucleophilic Substitution by Addition-Elimination, Nucleophilic Substitution via a Benzene Intermediate, Electrophilic Substitution Reactions, Reactions due to C–X bond; Reactivity and Relative Strength of C–X Bond in Halogen Derivatives.

Alcohols: Classification of Alcohols; Structure of Alcohols; Preparation of Alcohols, General Methods of the Preparation of Alcohols, Commercial Preparations of Alcohols; Physical Properties; Chemical Properties, Acidity and Basicity of Alcohols, Reaction of the O–H Bond, Reaction of the C–O Bond; Oxidation of Alcohols; Diols; Lab Detection.

Phenols: Structure and Reactivity; Physical Properties; Preparation of Phenol; Chemical Properties, Acidity and Basicity of Alcohols and Phenol, Reactions of Phenols, Reactions due to Hydroxyl Group, Reactions due to Aromatic Ring, Oxidation of Phenols, Condensation Reaction, Coupling Reaction, Libermann's Nitroso reaction.

Ethers: Classification; Preparation of Ethers, Preparation of Open Chain Ethers, Preparation of Epoxides; Properties of Ethers, Physical Properties, Reactions of Open Chain Ethers, Reactions of Epoxides; Crown Ethers and Kryptands (as good hosts); Industrial Uses.

Aldehydes And Ketones: Structure and Physical and Properties, Structure of the Carbonyl Group, Physical Properties; Preparation, General Methods of Preparation, Industrial Methods

of Preparation of Aldehydes and Ketones; Reactions of Aldehydes and Ketones, Addition Reactions, Reactions Involving  $\alpha$ -Hydrogen, Oxidation, Reduction, Condensation, Specific Reactions of Aldehydes and Ketones; Industrial Uses.

Aromatic Aldehydes And Ketones: Preparation of Bezaldehyde and Phenylethanone; Structure and Properties of Aryl aldehydes and ketones.

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| <b>Course Code: BCHCL-134</b> | <b>Course Title: Chemistry Lab II: Chemical Energetics, Equilibria and Functional Group Organic Chemistry I</b> | <b>Credits:2</b> |
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Thermochemistry and Determination of Enthalpy of Neutralisation: Some Fundamental Concepts; The First Law of Thermodynamics; The Enthalpy of a Reaction; The Enthalpy of Neutralisation

#### **List of Experiments:**

Experiment 1a: Determination of the Heat Capacity of the Colorimeter, Heat Exchange Method

Experiment 1b: Determination of the Enthalpy of Neutralisation of, Hydrochloric Acid with Sodium Hydroxide

Experiment 2: Determination of the Enthalpies of Neutralisation and Ionisation of Acetic Acid

#### **The Enthalpy of Solution:**

Experiment 3: Determination of the Integral Enthalpy of Solution of Ammonium Chloride

Experiment 4: Determination of enthalpy of hydration of copper sulphate.

Experiment 5: Study of the solubility of benzoic acid in water and determination of  $\Delta H$ .

Experiment 6: Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps using pH-meter.

Experiment 7: Preparation of buffer solutions:(i) Sodium acetate-acetic acid(ii) Ammonium chloride-ammonium hydroxide.

Experiment 8: Purification of organic compounds by crystallization (from water and alcohol) and distillation.

Experiment 9: Criteria of Purity: Determination of melting and boiling points.

Experiment 10: Bromination of Phenol/Aniline

Experiment 11: Benzoylation of amines/phenols Experiment 12: Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone

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| <b>Course Code: BCHCT-135</b> | <b>Course Title: Solutions, Phase Equilibrium, Conductance, Electrochemistry and Functional Group Organic Chemistry-II</b> | <b>Credits:4</b> |
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Solutions-I: Types of Solutions; Different Modes of Expressing Concentration of Solution; Solutions of Solids in Liquids; Solutions of Gases in Liquids; Ideal Solutions, Raoult's Law, Raoult's Law curves, Thermodynamics of Ideal Solutions; Non-ideal Solutions, Raoult's Law Curves; Vapour Pressure Variation with Liquid and Vapour Composition (for Ideal and Non-ideal Solutions); Boiling Point Diagrams – Temperature - Composition Curves (for Ideal and Non-ideal Solutions), Distillation of Ideal Solutions, Lever Rule, Distillation of Solutions exhibiting Positive and Negative Deviations- Azeotropes.

Solutions-II: Partially Miscible Liquid Systems, Critical Solution Temperatures, Effect of Impurity on Partial Miscibility of Liquids; Immiscible Liquid Pairs, Principle of Steam Distillation; Nernst Distribution Law and its Applications, Nernst Distribution Law, Dissociation of A Solute in one of the Solvents, Association of a Solute in one of the Solvents, Solvent Extraction.

Phase Equilibrium-I: Definition of the Terms; Phases, Components, Degrees of Freedom of a System; Criteria for Phase Equilibrium; Gibbs Phase Rule and its Thermodynamic Derivation; Derivation of Clausius-Clapeyron Equation and its Importance in Phase Equilibria.

Phase Equilibrium-II: Application of Phase Rule to One Component Systems, Phase Diagram of Water, Phase Diagram of Sulphur; Application of Phase Rule to Two Component Systems, Phase Rule for Two Component Systems, Simple Eutectic System,(Pb-Ag system), System involving Congruent Melting Point, ( $\text{FeCl}_3 - \text{H}_2\text{O}$  system), System involving Incongruent Melting Point (Na-K system).

Conductance-I: Electrolytic Conductance; Molar Conductivity; Molar Conductance at Infinite Dilution, (Variation with Dilution for Strong and Weak Electrolytes); Molar Conductance for Strong electrolytes, Kohlrausch Law of Independent Migration of Ions.

Conductance-II: Ionic Mobilities and Transference Number; Determination of Transference Number, Hittorf Method, Moving Boundary Method; Application of Conductivity Measurements, Determination of Degree of Ionisation of Weak Electrolytes, Determination of Solubility and Solubility Products of Sparingly Soluble Salts, Determination of Ionic Product of Water, Determination of Hydrolysis Constant of a Salt, Conductometric Titrations (Acid - base).

Electrochemistry-I: Reversible and Irreversible Cells; Concept of EMF of a Cell, Experimental Measurement of EMF; Standard Electrode Potential, Electrochemical Series; Electrochemical Cell Representation and Cell Reaction; Types of electrodes, Metal-Metal Ion Electrodes, Gas Electrodes, Amalgam Electrode, Metal-Insoluble Salt Electrode, Membrane Electrode, Redox Electrode; Nernst Equation and its Importance; Thermodynamics of a Reversible Cell, Calculation of Thermodynamic Properties:  $\Delta G$ ,  $\Delta H$  and  $\Delta S$  from EMF data; Calculation of Equilibrium Constant from EMF Data.

Electrochemistry-II: Types of Galvanic Cells, Chemical Cells and Concentration Cells ; Concentration Cells With Transference and Without Transference; Liquid Junction Potential and Salt Bridge; Applications of EMF Measurements, pH Determination, using Hydrogen Electrode, using Quinhydrone Electrode, Potentiometric Titrations-Qualitative treatment, (Acid-base and Oxidation-reduction only); Electrolytic Cells, Faraday's Law of Electrolysis; Applications of Electrolysis.

Carboxylic Acids: Structure and Reactivity; Physical Properties; Preparation of Carboxylic Acids; Reactions of Carboxylic Acids, Conversion to Alkanoyl Halides, Esterification, Conversion to Amides, Hell-Vohlard-Zelinsky Reaction, Reduction, Decarboxylation.

Carboxylic Acid Derivatives: Structure and Reactivity of Carboxylic Acid Derivatives; Physical Properties of Carboxylic Acid Derivatives; Carboxylic Acid Halides, Preparation of Carboxylic Acid Halides, Reactions of Carboxylic Acid Halides; Carboxylic Acid Anhydrides, Preparation of Carboxylic Acid Anhydrides, Reactions of Carboxylic Acid Anhydrides; Carboxylic Acid Esters, Preparation of Carboxylic Acid esters, Reactions of Carboxylic Acid esters, Reformatsky Reaction; Amides, Preparation of Amides, Reactions of Amides.

Amines: Structure and Reactivity of Amines; Physical Properties of Amines; Preparation of Amines; from Alkyl Halides, from Gabriel's Phthalimide Synthesis, from Hofmann Bromamide Degradation; Reactions of Amines, Hofmann elimination, Schotten-Baumann Reaction; Reaction of aliphatic amine with  $\text{HNO}_2$ ; Electrophilic Substitution (of Aniline), Nitration, Bromination, Sulphonation; Laboratory Detection of Amines, Carbylamine Test, Hinsberg Test.

Diazonium Salts: Preparation from Aromatic Amines; Reactions of Diazonium Salts, Conversion to, Benzene, Phenol, Sandmeyer Reaction, Dyes.

Amino Acids and Peptides; Structure and Physical Properties Amino Acids, Zwitter Ion, Isoelectric Point and Electrophoresis (+optical activity in brief); Synthesis of 2-Amino Acids: Gabriel's Phthalimide Synthesis, Strecker Synthesis; Structure of Peptides; Synthesis of Peptides, Synthesis by N-protection, *t*-Butyloxycarbonyl (Boc) Group, Phthaloyl Group, Synthesis by C-Activating Groups; Merrifield Solid-Phase Synthesis; Lab Detection of Amino Acids, Complexation with  $\text{Cu}^{2+}$ , Ninhydrin Test.

Structure of Peptides and Proteins: Overview of Primary, Secondary, Tertiary and Quaternary Structures of Proteins; Determination of Primary Structure of Peptides and Proteins, Partial Hydrolysis, End Group Analysis, N-terminal Identification by, Degradation (i) Sanger Method (ii) Edman degradation, C-terminal Identification (with Carboxypeptidase Enzyme).

Carbohydrates-I: Monosaccharides: Classification of Carbohydrates; General Properties; Structure of Glucose and Fructose; Configuration of Monosaccharides, Absolute Configuration of Glucose and Fructose, Mutarotation; Ascending and Descending of Chains in Monosaccharides.

Carbohydrates-II: Disaccharides and Polysaccharides: Structure of Disaccharides, Sucrose, Cellobiose, Maltose, Lactose; Structure of Polysaccharides, Starch, Cellulose, (Excluding their Structure Elucidation).

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| <b>Course Code: BCHCL-136</b> | <b>Course Title: Chemistry Lab 3: Solutions, Phase Equilibrium, Conductance, Electrochemistry and Functional Group Organic Chemistry-II</b> | <b>Credits:2</b> |
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#### **List of Experiments:**

Experiment 1 Study of the equilibrium of one of the following reactions by the distribution method:



Experiment 2 Construction of the phase diagram of a binary system (simple eutectic) using cooling curves.

Experiment 3 Study of the variation of mutual solubility temperature with concentration for the phenol water system and determination of the critical solubility temperature

Experiment 4 Study of the effect of impurities on CST of phenol – water system

Experiment 5 Determination of dissociation constant of a weak acid.

Experiment 6 Conductometric titrations of the following:

- a) Strong acid vs. strong base
- b) Weak acid vs. strong base

Experiment 7 Potentiometric titrations of the following:

- a) Strong acid vs. strong base
- b) Weak acid vs. strong base

Experiment 8 Systematic qualitative organic analysis of organic compounds possessing functional groups: carboxylic acid, phenol, aldehydes and ketones, amide, nitro and aromatic amines preparation of their derivatives

Experiment 9 Systematic qualitative organic analysis of organic compounds possessing unknown functional group and its derivative (Five to six samples)

Experiment 10 Differentiation between a reducing and a nonreducing sugars

Experiment 11 Separation of amino acids/sugars by Paper Chromatography/ Thin Layer Chromatography (Optional)

Experiment 12 Determination of the concentration of glycine solution by formylation method.

Experiment 13 Action of salivary amylase on starch and effect of temperature on the action of salivary amylase on starch

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| <b>Course Code: BCHCT-137</b> | <b>Course Title: Coordination Chemistry, States of Matter &amp; Chemical Kinetics</b> | <b>Credits:4</b> |
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Transition Elements-I: Electronic Configuration ; General Characteristics; Periodic Trends in Properties, Atomic Radii, Atomic Volume and Density, Melting and Boiling Points, Ionisation Energy, Electronegativity, Electrode Potential, Oxidation States, Stability of various Oxidation States for Mn, Fe and Cu, Latimer diagrams.

Transition Elements-II: Formation of Complexes; Colour of Transition Metal Compounds; Magnetic Properties; Catalytic Properties.

Inner-Transition Elements: General Characteristics, Electronic Configuration and Position in Periodic Table, Lanthanide Contraction, Atomic Radii, Oxidation States, Colour of Ions, Electrode Potentials, Magnetic Properties; Separation of Lanthanides, Ion-Exchange Method.

Coordination Chemistry-I: Coordination Chemistry, Werner's Coordination Theory; Some Basic Definitions, Complex, Ligands, Coordination Number; Nomenclature, IUPAC System.

Coordination Chemistry –II : Isomerism in Coordination Compound, Structural Isomerism (Coordination Numbers 4 and 6), Stereoisomerism (Coordination Numbers 4 and 6);

Theories of Bonding as applied to Complexes, Valence Bond Theory, Inner and Outer Orbital Complexes of Cr, Fe, Co, Ni and Cu.

Crystal Field Theory-I : Crystal Field Theory, Crystal Field Splitting in Octahedral Complexes, Crystal Field Stabilization Energy (CFSE); Crystal Field Effects , Weak and Strong Fields; Factors affecting the Magnitude of Crystal Field Splitting Energy, Spectrochemical Series.

Crystal Field Theory-II: Crystal Field Splitting in Tetrahedral Complexes; Comparison of CFSE for  $O_h$  and  $T_d$  Complexes; Crystal Field Splitting in Square Planar Complexes, Tetragonal Distortion of Octahedral Geometry, Jahn-Teller Distortion, Square Planar Coordination; Some common applications of Complexes.

Kinetic Theory of Gases : Recapitulation of the Gas Laws; Equation of State of Ideal Gases; Kinetic Theory of Gases, Postulates of Kinetic Theory; Kinetic Gas Equation; Maxwell Boltzmann Distribution, Molecular Velocities, Molecular Energies, Temperature Dependence of these Distributions; Principle of Equipartition of Energy; Intermolecular Collisions; Mean Free Path.

Real Gases and their Liquefaction: Deviation of Real Gases from Ideal Behavior, Compressibility Factor, Causes of Deviation; Van der Waals Equation, Boyle Temperature; Critical Phenomenon, Andrews Isotherms of  $CO_2$ , Critical Constants and van der Waals Constants, Determination of Critical Constants; Viscosity of Gases, Effect of Temperature and Pressure.

Liquids: Comparison of Liquids with Gases and Solid; Structure of Liquids; Surface Tension, Determination Surface Tension; Viscosity of a Liquid, Determination of Coefficient of Viscosity; Effect of temperature on surface tension and coefficient of viscosity of a liquid.

Solids - I: Amorphous and Crystalline Solids; Symmetry Elements; Crystal Lattice, Unit Cell; Bravais Lattices and Crystal Systems, Bravais Lattice, Cubic System Geometry; Laws of Crystallography, Law of Constancy of Interfacial Angles, Law of Rational Indices; Crystal Planes and Miller Indices.

Solids -II: X-rays Diffraction, Bragg's Law; Structures of  $NaCl$ ,  $KCl$  and  $CsCl$ ; Defects in Crystals; Glasses and Liquid Crystals.

Chemical Kinetics – I: Rate of a Reaction, Experimental Determination, Factors affecting Rate of a Reaction; Rate Law and Rate Constant, Order and Molecularity; Integrated Rate Laws, Zero Order Reactions, First Order Reactions, Second Order Reactions

Chemical Kinetics – II: Determining the Order of a Reaction, Initial Rate Method, Integral Method, Graphical Method, Half-life Method, Isolation Method; Theories of Reaction Rates, Collision theory, Activated Complex Theory of Bimolecular Reactions, Collision Theory and Arrhenius Theory – a Comparison.

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| <b>Course Code: BCHCL-138</b> | <b>Course Title:Chemistry Lab IV: Coordination Chemistry, States of Matter &amp; Chemical Kinetics</b> | <b>Credits:2</b> |
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**List of Experiments:**

1. Qualitative Inorganic Analysis of 6 known and 6 unknown samples (semi-micro qualitative analysis using  $H_2S$  of mixtures – not more than four ionic species, two anions and two cations and excluding insoluble salts)

[Cations:  $\text{NH}_4^+$ ,  $\text{Pb}^{2+}$ ,  $\text{Bi}^{3+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Cd}^{2+}$ ,  $\text{Sb}^{3+}$ ,  $\text{Sb}^{5+}$ ,  $\text{Sn}^{4+}$ ,  $\text{Al}^{3+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$

Anions: Sulphide, Sulphite, Thiosulphate, Nitrite, Acetate, Oxalate, Chloride, Bromide, Iodide, Fluoride, Nitrate, Sulphate, Phosphate, Borate Ions].

2. To determine Nickel gravimetrically as the dimethylglyoximate or  
To determine Aluminium gravimetrically as Aluminium 8-hydroxyquinolinate.
3. To estimate Magnesium or Zinc Ions in a mixture by complexometry or  
To estimate total hardness of a given sample of water by complexometric titration.
4. To draw calibration curve (absorbance at  $\lambda_{\text{max}}$  vs. concentration) for various concentrations of a given coloured compound ( $\text{KMnO}_4$ /  $\text{CoSO}_4$ ) and estimate the concentration of the same in a given solution. (demonstation/optional).
5. To determine the composition of the  $\text{Fe}^{3+}$ -salicylic acid complex solution by Job's method. (demonstation/optional)
6. To determine the Surface Tension of a liquid or a dilute solution using a stalagmometer.
7. To Study the Variation of Surface Tension with the Concentration of a Detergent solution.
8. To determine the Coefficient of Viscosity of a liquid or a dilute Solution by Ostwald Viscometer or To study the variation of Viscosity of an aqueous solution with concentration of solute.
9. To study the Kinetics of Reaction between Peroxydisulphate and Iodide Ions by Initial rate method (Iodine Clock Method)
10. To study the Kinetics of Acid Catalysed Hydrolysis of Ester – Titrimetry or To study the Kinetics of Saponification of Ester – Titrimetry.
11. To Compare the strengths of  $\text{HCl}$  and  $\text{H}_2\text{SO}_4$  by studying the kinetics of hydrolysis of methyl acetate.

### 10.1.3 Geology

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| <b>Course Code: BGYCT-131</b> | <b>Course Title: Physical and Structural Geology</b> | <b>Credits: 4</b> |
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General Geology: Introduction to Geology and its relation to Earth science; Its scope and sub disciplines; Geology and its relation with other branches of science; Earth and solar system; Asteroids and meteorites; Theories regarding origin and age of the Earth; Radioactivity and its application in determining age of the Earth; Shape and structure of the Earth; Internal constitution of the Earth; Convections in the Earth's mantle; Magnetic field; Earthquakes - causes, geological effects, nature of seismic waves, their intensity and magnitude, seismic zones of India, distribution of seismic belts; Tsunami; Volcanoes - types, causes, landforms, products and geological effects, distribution of volcanic belts; Relationship of earthquakes with volcanic belts.

Earth Surface Processes: Significance of geological processes; Weathering (physical, chemical and biological) and its products; Factors and processes of soil formation, soil profile and classification of soil; Mass wasting; Geological work of river - river erosion; sediment

transport; erosional and depositional landforms of rivers; Geological work of wind and underground water - wind as a transport agent; erosional and depositional landforms of wind and underground water; Erosional, transportational and depositional landforms of glaciers and oceans.

**Structural Geology:** Contours, topographic and geological maps; Elementary idea of bed, dip and strike; Outcrop; Representation of altitude; Clinometer compass and its use; Classification of structures; Types of deformation; Folds - parts, classification, criteria of their recognition in field; Faults - parts, geometrical and genetic classification, criteria of their recognition in field; Joints and Unconformity – types and significance; Basics of Field Geology, planning for field work, field equipments, fieldwork and field safety measures; Recognition of Lithology; Measurement of structures; Systematic documentation of field observations.

**Mountain Building and Plate Tectonics:** Classification of mountains; Mountain building and its causes; Evidences of mountain building processes; Continental drift and sea floor spreading; Principles of mountain building; Plate tectonics, Lithospheric plates, plate boundaries and margin; Principles of Plate tectonics; Origin of Himalaya;

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| <b>Course Code:</b> BGYCL-132 | <b>Course Title:</b> Physical and Structural Geology: Laboratory | <b>Credits:</b> 2 |
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**List of Experiments:**

Experiment 1: Preparation of diagram showing layered structure of Earth's interior.

Experiment 2: Preparation of seismic zonation map of India.

Experiment 3: Reading topographical maps of the Survey of India.

Experiment 4: Identification of geomorphic features from block models.

Experiment 5: Use of Clinometer compass.

Experiment 6: Identification of folds from block models.

Experiment 7: Identification of faults from block models.

Experiment 8: Identification of unconformities from block models.

Experiment 9: Laboratory exercises on structural problems of dip and strike.

Experiment 10: Drawing geological cross section profile and interpretation of geological maps.

Experiment 11: Geological field work and preparation of field report.

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| <b>Course Code:</b> BGYCT-133 | <b>Course Title:</b> Crystallography, Mineralogy and Economic Geology | <b>Credits:</b> 4 |
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**Basic Concepts of Crystallography:** Crystals and their characters; Parts of crystal-face, edge, solid angle, zone and zone axis; Interfacial angle and their measurements; Crystal forms; Crystal Parameters; Axial ratios; Weiss and Miller system of notations; Laws of crystallography; Crystallographic axes and angles; Centre, plane and axis of symmetry;

Symmetry elements and description of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic crystal systems.

Mineralogy: Definition and characters of minerals and their physical properties; Chemical classification of Minerals; Structural classification of silicates; Chemical composition and diagnostic physical properties of minerals such as Olivine, Garnet, Augite, Hypersthene, Hornblende, Muscovite, Biotite, Orthoclase, Plagioclase, Microcline, Quartz, Nepheline, Chlorite, Epidote, Kyanite; Calcite.

Optical Mineralogy: Polarizing microscope - its parts and functioning; Ordinary and polarised lights; Optical properties under ordinary, polarised light and crossed nicols; Optical properties of rock forming minerals such as Quartz, Orthoclase, Plagioclase, Microcline, Olivine, Augite, Hypersthene, Hornblende, Muscovite, Biotite, Garnet, Calcite.

Economic Geology: Ore and ore deposits, ore minerals and gangue minerals; Tenor of ores; Metallic and non-metallic ore minerals; Strategic, critical and essential minerals; Processes of ore formation - magmatic, hydrothermal, contact metamorphic and sedimentary; Study of important metallic (Cu, Pb, Zn, Mn, Fe, Au, Al), Industrial (gypsum, magnesite, mica) and building materials; Origin, occurrence and distribution of coal and petroleum in India.

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| <b>Course Code: BGYCL-134</b> | <b>Course Title: Crystallography, Mineralogy and Economic Geology: Laboratory</b> | <b>Credits: 2</b> |
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#### **List of Experiments:**

Experiment 1: Study of symmetry elements of normal class of Isometric and Tetragonal systems.

Experiment 2: Study of symmetry elements of normal class of Hexagonal, Trigonal and Triclinic systems.

Experiment 3: Study of symmetry elements of normal class of Orthorhombic and Monoclinic systems.

Experiment 4: Use of polarising microscope.

Experiments 5-6: Study of physical properties of common rock forming minerals.

Experiments 7-8: Study of optical properties of common rock forming minerals

Experiment 9: Study of ore and economic minerals in hand specimen.

Experiment 10: Preparation of maps showing distribution of important metallic and non-metallic deposits

Experiment 11: Preparation of maps showing important coal and oil fields of India.

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| <b>Course Code: BGYCT-135</b> | <b>Course Title: Petrology</b> | <b>Credits: 4</b> |
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Igneous Petrology: Introduction, classification of rocks; Rocks and rock cycle; Rocks and their uses; Extraterrestrial rocks; Textures, structures and forms of igneous rocks; Mineralogical and chemical classification of igneous rocks; Magma, its composition, types and origin; Bowen's Reaction Series; Magmatic differentiation and assimilation;

Crystallisation of magma - unicomponent and bicomponent (mix-crystals); solid solution and eutectic; Detailed megascopic and petrographic description of Granite, Granodiorite, Rhyolite, Syenite, Phonolite, Diorite, Basalt, Gabbro, Dolerite and Peridotite.

**Sedimentary Petrology:** Sediment and Sedimentary Rocks; Processes of formation of sedimentary rocks (from weathering to lithification and diagenesis); Textures of Sedimentary rocks- Grain size and particle morphology: Primary and secondary sedimentary structures; Description of siliciclastic and non-siliciclastic rocks; Megascopic and petrographic details of important siliciclastic and carbonate rocks such as - conglomerate, breccia, sandstone, shale and limestone.

**Metamorphic Petrology:** Process and products of metamorphism; Types, factors, zones and grade of metamorphism; Textures and structures of metamorphic rocks; Factors affecting textures; Classification of metamorphic rocks; Megascopic and petrographic details of some important metamorphic rocks such as slate, phyllite, schist, gneiss, quartzite and marble.

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| <b>Course Code:</b> BGYCL-136 | <b>Course Title:</b> Petrology: Laboratory | <b>Credits:</b> 2 |
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#### **List of Experiments:**

- Experiment 1: Megascopic study of the common felsic igneous rocks.
- Experiment 2: Megascopic study of the common intermediate igneous rocks.
- Experiment 3: Megascopic study of the common mafic igneous rocks.
- Experiment 4: Megascopic study of the common ultramafic igneous rocks.
- Experiment 5: Microscopic study of the important felsic and intermediate igneous rocks.
- Experiment 6: Microscopic study of the important mafic and ultramafic igneous rocks.
- Experiment 7: Megascopic study of important sedimentary rocks
- Experiment 8: Microscopic study of important sedimentary rocks.
- Experiment 9: Megascopic study of important metamorphic rocks.
- Experiment 10: Microscopic study of important metamorphic rocks.
- Experiment 11: Geological field work and preparation of field report.

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| <b>Course Code:</b> BGYCT-137 | <b>Course Title:</b> Stratigraphy and Palaeontology | <b>Credits:</b> 4 |
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**Fundamentals of Stratigraphy:** Definition, basic principles of stratigraphy, stratigraphic contacts and unconformities; Collection of stratigraphic data; Importance of stratigraphy and geological time scale; Lithostratigraphic, biostratigraphic and chronostratigraphic classification; stratigraphic correlation; Physical and structural subdivisions of Indian subcontinent, elementary idea of stratigraphic successions of India.

**Stratigraphy of India:** Dharwar, Cuddapah, Vindhyan and Delhi Supergroups; Palaeozoic successions of northwestern Himalaya; Triassic of Spiti; Mesozoic of Kutch and Rajasthan; Cretaceous of Tiruchirapalli; Gondwana supergroup and Deccan Traps of peninsular India; Cenozoic of Himalaya - Palaeogene-Neogene sequences of northwest Himalaya and Assam.

Introduction to Palaeontology: Definition, fossils, characters, taxonomy, mode of preservation and significance of fossils; Micropalaeontology and microfossils, principal microfossil groups and techniques of microfossils; Evolutionary stages of horse, role of climate in the evolution of horse; Plant fossils and their classification; Morphology, distribution and significance of Gondwana flora - *Glossopteris*, *Gangamopteris*, *Vertebraria*, *Thinnfeldia*, *Sigillaria*, *Nilsonia*, *Williamsonia* and *Ptilophyllum*.

Invertebrate Palaeontology: Morphology and geological distribution of brachiopods, corals, bivalves, gastropods, nautiloid, ammonoids, trilobites, echinoids and crinoids.

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| <b>Course Code: BGYCL-138</b> | <b>Course Title: Stratigraphy and Palaeontology: Laboratory</b> | <b>Credits: 2</b> |
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#### **List of Experiments:**

Experiment 1: Morphological characters, systematic position and age of fossil genera pertaining to brachiopods.

Experiment 2: Morphological characters, systematic position and age of fossil genera pertaining to pelecypods.

Experiment 3: Morphological characters, systematic position and age of fossil genera pertaining to cephalopods.

Experiment 4: Morphological characters, systematic position and age of fossil genera pertaining to trilobites.

Experiment 5: Morphological characters, systematic position and age of fossil genera pertaining to echinoids.

Experiment 6: Preparation of physiographic map of India.

Experiment 7: Preparation of lithostratigraphic map showing distribution of main geological formations of India.

Experiment 8: Preparation of stratigraphic column.

#### **10.1.4 Geography**

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| <b>Course Code: BGGCT 131</b> | <b>Course Title: Physical Geography</b> | <b>Credits: 6</b> |
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Physical geography is one of the two major branches of systematic geography. It consists of the four main spheres of the earth i.e., lithosphere, atmosphere, hydrosphere, and biosphere. Physical geographers study the nature of natural phenomena and processes operating in these spheres. This course would enable the learners to observe spatial variations and similarities in natural phenomenon and reasons for these, and the consequences thereof, in relation to human beings.

Section 1: Geo-Tectonics: Origin of Earth, Earth- A Living Planet, The Interior of the Earth: Structure and Composition, Concept of Isostasy.

Section 2: Lithosphere: Materials of the Earth's Crust: Rocks and Minerals, Continental Drift, Mountain Building and Plate Tectonics, Endogenetic Forces and Exogenetic Processes.

Section 3: Atmosphere: Composition and Structure of the Atmosphere, Insolation and Atmospheric Temperature, Global Distribution of Surface Pressure Systems and Winds, Humidity and Precipitation, Climatic Classification of Koeppen.

Section 4: Hydrosphere: Introduction to Hydrosphere, Ocean Floor and Relief Features, Distribution of Temperature and Salinity in the Oceans, Tides and Currents, Ocean Deposits.

Tutorials (1 Credit): Students are required to do tutorials equivalent to 1 Credit provided in the Self Learning Material.

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| <b>Course Code: BGGCT 132</b> | <b>Course Title: Human Geography</b> | <b>Credits: 6</b> |
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Human geography is one of the two main branches of geography. Physical geography is the other main branch. The basic philosophy of introducing human geography is to make learners aware about spatial differentiation and organization of human activities and interrelationship with earth and its environment.

Section 1: Human Geography Fundamentals: Nature and Scope of Human Geography, Concepts in Human Geography, Perspectives on Human-Environment Relationships, Human Adaptation to the Environment.

Section 2: Space and Society: Peopling and Racial Elements, Religion and Beliefs, Languages, Cultural Regions.

Section 3: Population: Population Distribution and Growth, Population Composition, Human Migration, Population and Resources.

Section 4: Human Settlements: Human Settlements, Rural Settlements, Urban Settlements, Urbanisation.

Tutorials (1 Credit): Students are required to do tutorials equivalent to 1 Credit provided in the Self Learning Material.

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| <b>Course Code: BGGCT 133</b> | <b>Course Title: General Cartography (Theory)</b> | <b>Credits: 4</b> |
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Cartography is the art and science of making maps. Till recently, maps were being made manually which was both time consuming and tedious. However, with the advancement of technology, cartographic techniques have continuously been changing in order to meet the demands of new generation of mapmakers and map users. This course deals with the introduction to cartography, map projections, sources of data, map reading and interpretation, and representation of data with an aim to train the learners in cartographic tools and techniques for geographical studies.

Section 1: Introduction to Cartography: Basic Concepts, Maps, Map Scale.

Section 2: Map Projections: Introduction, Cylindrical Projections, Conical Projections, Zenithal Projections.

Section 3: Sources of Data: Sources, Census and Sample Surveys, Remotely Sensed Data.

Section 4: Map Reading and Interpretation: Topographical Maps, Representation of Climatic Data, Weather Maps.

Section 5: Representation of Data: Graphs and Diagrams, Maps.

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| <b>Course Code: BGGCL134</b> | <b>Course Title: General Cartography (Laboratory)</b> | <b>Credits: 2</b> |
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**Exercises:**

The course includes 12 exercises and evaluation of practical records and viva voce.

Exercise 1: Construct Map Scales: Graphical, Comparative and Diagonal

Exercise 2: Construction of Cylindrical Projection

Exercise 3: Construction of Conical Projection

Exercise 4: Construction of Zenithal Projection

Exercise 5: Prepare Statistical Diagram from a given data

Exercise 6: Make a Choropleth and Isopleth Map from the given data

Exercise 7: Draw prominent relief features and Interpret major physical and cultural features from a given Toposheet

Exercise 8: Calculation of Slope Gradient by Wentworth's method from a given Toposheet

Exercise 9: Prepare Climograph and Hythergraph from a given data

Exercise 10: Prepare Wind Rose and Star Diagram from the given data

Exercise 11: Interpretation of Indian Daily Weather Map

Exercise 12: Prepare Simple Thematic Maps from the given data

**Preparation of Record:** A practical file consisting of performed exercises needs to be submitted for evaluation.

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| <b>Course Code: BGGCT135</b> | <b>Course Title: Environmental Geography</b> | <b>Credits: 6</b> |
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This course is designed to develop a broad understanding of natural environment and human-nature interrelationship that are very important today within environmental geography. This course is set out in the form of different blocks such as introduction to environmental geography, human-environment relationship, environmental problems and management, conservation of environment, and environmental issues programmes and policies. This course will help to identify some of the significant adverse environmental effects caused by human activities and facilitate to address these consequences through proper management policies and legislation from global to local perspective. This course will provide an opportunity to think about various environmental problems in a wider context.

Section 1: Introduction to Environmental Geography: Concepts and Scope of Environmental Geography, Ecology and Ecosystems, Biogeography.

Section 2: Human-Environment Relationship: Human-Environment Relationships in Equatorial Regions, Desert Regions, Mountain Regions, Coastal Regions.

Section 3: Environmental Problems and Management: Understanding Pollution, Air Pollution, Solid and Liquid Waste, Biodiversity Loss.

Section 4: Conservation of Environment: Environmental Conservation and Management, Environmental Impact Assessment: Methods and Techniques, Environmental Standards and Monitoring.

Section 5: Environmental Issues, Programmes and Policies: Environmental Issues, United Nations and the Environment, Environmental Policies with Special Reference to India.

Tutorials (1 Credit): Students are required to do tutorials equivalent to 1 Credit provided in the Self Learning Material.

#### 10.1.5 Mathematics

Mathematics is deeply rooted in the activities of our daily life. At the same time, it is also known as an abstract discipline. Indeed, mathematics has two aspects – functional and philosophical. It has wide applications in various areas of the sciences, social sciences, humanities, engineering, technology, commerce and agriculture. It is also a philosophy with intrinsic beauty and logical validity. In view of this mathematics is being introduced as a discipline in the Bachelor's Degree programme. We are offering the following mathematics courses as part of this programme. The pre-requisite for any of these courses is knowledge of mathematics that is imparted at the senior secondary (+2) level or an equivalent level.

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| <b>Course Code:BMTC-131</b> | <b>Course Title: CALCULUS</b> | <b>Credits:6</b> |
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This is a first level course, consisting of five blocks, and is intended as a short introduction to calculus. Calculus is increasingly being recognised, and accepted, as a powerful tool in the exact sciences and social sciences. Its power stems from two sources – the derivative and the integral. In this course, we shall acquaint you with the basic techniques of differential and integral calculus. We shall also briefly trace the historical development of calculus.

We shall begin the course with essential preliminary concepts, in the first block. You will be introduced the concepts of 'limit', 'continuity' and 'derivative' in the second and third block. We shall discuss the geometrical significance and application of the derivative in the fourth block. The fifth block focuses on the other important concept of calculus, namely, integral.

Definition and examples of sets and subsets, Venn diagrams, Complementation, Intersection, Union, Distributive laws, De Morgan's laws, Cartesian Product, Relations and Functions, Composition of Functions and Binary Operation, Operations (inverse, composite). Cartesian system, Graphs of functions, Equation of a line, Symmetry, change of axis, polar coordinates. Definition and examples of complex numbers, Geometric representation and polar representation, algebraic operations, De Moivre's theorem, trigonometric identities,  $n^{\text{th}}$  roots of a complex number. Basic Theory of Equations: Relations between roots and coefficients; Descartes rule of signs, Solution of equations up to bi-quadratic equations.

Real number line, Supremum and Infimum, Absolute value, Interval and some special types of functions (even, odd, monotonic, periodic). Definition of Limits, Algebra of limits, One-sided limits, The concept of infinite limits (infinite limits as the independent variable  $x \rightarrow a \in \mathbb{R}$ , one-sided infinite limits, limits as the independent variable tends to  $\infty$  or  $-\infty$ ). Continuity, algebra of continuous functions, Types of discontinuity.

Derivatives of some simple functions, algebra of derivatives, the chain rule, continuity versus derivability. Derivatives of the various trigonometric functions, derivative of inverse of a function. The inverse function theorem, derivatives of inverse trigonometric functions, use of transformations. Derivative of exponential function, logarithmic functions, hyperbolic functions, inverse hyperbolic functions, methods of differentiation (derivative of  $x^r$ , logarithmic

differentiation, derivatives of functions defined in terms of a parameter, derivatives of implicit functions).

Higher order derivatives: Second and third order derivatives, nth order derivatives, Leibnitz Theorem, Taylor Polynomials. Indeterminate forms: L'Hopital's rule for 0/0 form, L'Hopital's rule for  $\infty/\infty$  form, other types of indeterminate forms (indeterminate forms of the type  $\infty-\infty$ , indeterminate forms of the type  $0 \cdot \infty$ , indeterminate forms of the type  $0^0, \infty^0, 1^\infty$ ). Ups and Downs: Rolle's Theorem, Lagrange's mean value theorem, Maxima-minima of functions (Definitions and examples, a necessary condition for the existence of extreme points, Sufficient conditions for the existence of extreme points, first derivative test, second derivative test), Monotonicity, Curvature, Tangents and Normals, Angles of intersection of two curves, Concavity / Convexity, points of inflection. Classifying singular points, Asymptotes (Parallel to the axes, Oblique asymptotes), Tracing of curve.

Introduction to Integration: UPF, LPF, Definite integral, properties, Fundamental theorem of calculus (without proof.), Standard integrals, Algebra of integrals. Methods of Integration, Reduction Formula. Applications of Integration: Area under a curve, area bounded by a closed curve, length of a plane curve, Volume and Surface area of a solid generated by revolution.

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| <b>Course Code:BMTC-132</b> | <b>Course Title: Differential Equations</b> | <b>Credits:6</b> |
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This course of Differential Equation assumes the knowledge of the course BMTC-131 on Calculus. The studies in this course are divided into four blocks.

Block-1 deals with functions of two and three real variables. The purpose of this block is to provide the basis for studying the remaining blocks of the course. We have given a brief discussion on 3D-coordinate system and discussed the algebraic and geometrical structure of  $\mathbf{R}^2$  and  $\mathbf{R}^3$ . The notions of limit, continuity and differentiability are extended for functions of 2 and 3 variables. This block also covers chain rule and homogeneous functions.

We have started Block-2 with the essentials and the basic definitions related to the study of differential equations. After discussing various methods of solving first order ordinary differential equations (ODEs) we have formulated some of the problems of physical and engineering interest in terms of first order linear differential equations. In Block-3 we have laid specific stress on the applications of second order ODEs.

In Block-4 we have discussed simultaneous, total and partial differential equations (PDEs). Here we have classified the first order PDEs into linear, semi-linear, quasi-linear and non-linear PDEs and discussed the various types of solutions/integrals of these PDEs.

All the concepts discussed are followed by a lot of examples as well as exercises. These will help you get a better grasp of the techniques discussed in this course.

3D-Cartesian Coordinate System, Spherical Coordinate System and Cylindrical Coordinate System, Cartesian products, Properties of  $\mathbf{R}^n$ . (Linear Space Properties), Distance in  $\mathbf{R}^2$  and  $\mathbf{R}^3$ , Functions from  $\mathbf{R}^n$  to  $\mathbf{R}$  ( $n = 2, 3$ ), Limit of functions from  $\mathbf{R}^2 \rightarrow \mathbf{R}$  and from  $\mathbf{R}^3 \rightarrow \mathbf{R}$ , Repeated Limits, Properties of Limits, Continuity of functions from  $\mathbf{R}^2 \rightarrow \mathbf{R}$  and from  $\mathbf{R}^3 \rightarrow \mathbf{R}$ , Algebra of continuous functions. First Order Partial Derivatives, Geometrical Meaning, Continuity and Partial Derivatives, Differentiability of functions from  $\mathbf{R}^2 \rightarrow \mathbf{R}$ . Differentiability of functions from  $\mathbf{R}^3 \rightarrow \mathbf{R}$ , Higher Order Partial Derivatives, Equality of Mixed Partial Derivatives (Euler's, Schwarz's and Young's Theorem without proof), Chain rule for finding partial

derivatives of composit functions, Total Derivative, Homogeneous functions and Euler's theorem.

Basic concepts in the theory of differential equations, Family of curves and differential equations, Differential Equations arising from physical situations. Separation of Variables, Homogeneous equations, Exact equations, Integrating factors. Classification of first order differential equations (DE), General solutions of linear non-homogeneous equation, Method of Undetermined coefficient, Method of Variation of Parameters, Equations reducible to linear form, Applications of linear DEs. Equations which can be factorized, Equations which cannot be factorized (solvable for  $x$ ,  $y$ , independent or dependent variable is absent, homogeneous in  $x$  and  $y$ , Clairaut's and Riccati's equations).

General form of linear ordinary differential equation, Condition for the existence of unique solution, linear dependence and independence of the solution of DEs, Method of solving homogeneous equation with constant coefficients; Method of undetermined coefficients – Types of non-homogeneous terms for which the method is applicable (polynomial, exponential, sinusoidal etc.), Observations and Constraints of the method. Variation of parameters, Reduction of order, Euler's equations. Differential operators, General method of finding Particular Integral (PI), Short method of finding PI, Applications – Mechanical Vibrations, Electric Circuits.

Curves and surfaces in space, Formation of simultaneous DEs, Methods of solution – Method of Multipliers, One Variable absent, Applications – Particle motion in phase-space, Electric Circuits. Total Differential Equations – Definition and examples, Integrability condition (only statement and illustration), Methods of Integration (By Inspection, Variable separable, One variable separable, Homogeneous equation). Origin, Classification (order, degree, linear, semi-linear, non-linear) of linear first order PDEs, Formation of Linear Equations of the First Order and types of their solutions, Lagranges Method, Solutions of non-linear PDEs – The Complete integral, Compatible system of first order equations, Charpits method, Standard forms.

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| <b>Course Code:BMTC-133</b> | <b>Course Title: REALANALYSIS</b> | <b>Credits:6</b> |
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This course is mainly designed assuming that you have a working knowledge of the concepts covered in our first level calculus course. As the name suggests, real analysis is one of the core branches of mathematics which gives a more rigorous and abstract treatment to concepts such as limit, continuity, differentiability and integrability. These concepts are widely applied in several fields such as the sciences, engineering and economics. The aim of this course is also to acquaint you with the language of mathematics, which is required for a clear presentation of various arguments in mathematics. The whole material is divided into six booklets called blocks.

The first block initiates you into the world of analysis. Sequences and series are introduced and discussed in Blocks 2 and 3. In Block 4 a formal study of limits, continuity and differentiability is laid out. Block 5 introduces you to the concepts of Riemann integrability, and discusses some properties of a Riemann integrable functions. In the last block, Block 6, the sequences and series of functions and their point wise convergence and uniform convergence are discussed.

Mathematical Statements and Symbols, Terms (necessary, sufficient, converse, negation, if, only if, if and only if, there exists, for all), Mathematical reasoning, Methods of Proof (Contrapositive, Counter example, Contradiction), Field Structure, Ordered Field,

Boundedness, Supremum and Infimum, Order Completeness, Archimedean property, Countable and uncountable subsets of  $\mathbb{R}$ , Neighbourhood, Limit Point, Open and Closed sets, Bolzano Weierstrass Theorem.

Real Sequences, Bounded Sequences, Monotonic Sequences, Subsequences, Convergent Sequences, Cauchy Sequences, Criteria for the convergence of Sequences, Algebra of Convergent Sequences, Cauchy's First Theorem on limits, Cauchy's Second Theorem on Limits, Squeeze Theorem, Monotone Convergence Theorem.

Infinite Series, Convergence criteria, Cauchy Convergence criteria, Comparison test, Cauchy Root Test, D'Alembert's ratio test, Integral Test, Raabe's test, Gauss's test, Alternating Series, Leibniz test, Absolute and Conditional Convergence, tests for convergence (Abel test and Dirichlet Test), rearrangement of terms.

Concept of limit, Continuous functions, Algebra of Continuous functions, Types of discontinuity, Uniform Continuity, Existence of Derivative, Differentiability versus Continuity, Inverse function theorem, Algebra of derivatives, Darboux's Theorem, Intermediate Value Theorem for Derivatives, Rolle's theorem, Mean Value Theorems (Lagrange, Cauchy and Generalized Mean Value Theorems) Increasing and Decreasing Functions and Sign of the Derivative, Taylor's Theorem, Maxima and Minima (necessary and sufficient conditions for maxima and minima).

Integral as a Limit of Riemann Sums, Necessary and sufficient conditions for Riemann integrability, Algebra of Integrable functions, Special class of integrable functions (monotone functions and continuous functions), The Fundamental Theorem of Calculus, Mean Value theorems.

Sequences of functions, Point-wise Convergence, Uniform Convergence, Series of functions, Point-wise Convergence, Uniform Convergence, Term by term Integration, Term by term differentiation, Power series, radius of convergence.

| <b>Course Code: BMTC-134</b> | <b>Course Title: Algebra</b> | <b>Credits: 6</b> |
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This course comprises 4 blocks. Through this course you will be familiarised with several algebraic systems, namely, groups, rings and fields. The first two blocks focus on group theory, and in the next two blocks you will study rings and fields.

As you go through the course, you will get acquainted with various methods of algebra. You will also see how several different algebraic objects can actually be studied in one go by using these methods. This study will, of course, help you develop your abilities to think mathematically and to appreciate the beauty of mathematics.

Given below is the outline of the matter covered in the course:

Integers, divisibility, well ordering principle, division algorithm, Fundamental Theorem of Arithmetic, Principle of induction, binary operation, equivalence relations, partitions, examples (including  $\mathbb{Z}_n$ ); Introduction to operations on Matrices and symmetries; Definition and examples of groups; properties of groups; Subgroups, centre, centralizer as examples, different characterisations of subgroups, intersection, union, sum, product of subgroups; condition for products of subgroups to be a subgroup; Order of an element, order of  $a^k$  vis-a-vis  $o(a)$ , 'a and  $gag^{-1}$  have the same order'; Cyclic groups, 'Subgroup of a cyclic group is cyclic.', 'Order of a subgroup divides the order of a finite cyclic group.', 'For each divisor  $d$  of

the order  $n$  of a finite cyclic group, there is a unique subgroup with that order.', number of elements of a particular order in a finite cyclic group; number of generators for finite and infinite cyclic groups.

Left and right cosets, Lagrange's theorem, converse is true for cyclic groups, not true in general, applications of Lagrange's theorem (Fermat's little theorem, etc.); normal subgroups, properties and characterisation of normal subgroups, Simple groups, 'Simple subgroups of abelian groups are cyclic of prime order.'; quotient groups; group homomorphism and isomorphism, automorphism, Fundamental Theorem of Homomorphism, correspondence between subgroups of  $G/H$  and subgroups of  $G$  that contain  $H$ , three isomorphism theorems.

Permutation groups, cycle decomposition, alternating group, Cayley's theorem.

(Optional: Direct product, Sylow theorems (without proof), classifying groups of orders 1 to 10.)

Rings, elementary properties,  $Z_n$ , polynomial rings, matrix rings over  $\mathbb{R}$ ,  $C$ ,  $Z_n$ , rings of the form  $\{a + b\sqrt{n} \mid a, b \text{ are integers and } n \text{ is not a square}\}$ , ring of continuous functions, ring of differentiable functions, Cartesian product of rings is again a ring. Commutative and non-commutative rings; subrings, examples of subrings in matrix rings, polynomial rings, characterisation, properties, algebra of subrings (Intersection, direct product are rings, etc.); ideals, properties of ideals (sum, product, intersection), prime ideal, maximal ideal; quotient rings; Ring homomorphism and isomorphism, properties, isomorphism theorems.

Zero divisors, integral domain, definition of a field, 'Every finite integral domain is a field.', characteristic of an integral domain, field of quotients of an integral domain; Ring of Polynomials, properties of  $R[x]$  (the polynomial ring over a ring  $R$ ), the division algorithm in  $F[X]$ ,  $F$  a field; roots of polynomials, statement of the Fundamental Theorem of Algebra, field of rational functions.

(Optional: Euclidean Domains, Gaussian Integers, primes, factorisation into primes; principal ideal domains, units, irreducible and prime elements, associates, unique factorisation domains, Eisenstein's criterion for irreducibility of polynomials over  $\mathbb{Q}$ .)

### 10.1.6 Physics

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| <b>Course Code: BPHCT-131</b> | <b>Course Title: Mechanics</b> | <b>4 Credits</b> |
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**Mathematical Preliminaries:** Geometrical and algebraic representation of vectors, vector algebra, scalar and vector products, derivatives of a vector with respect to a scalar. First order homogeneous ordinary differential equations, separable and linear first order ordinary differential equations. Second order homogeneous ordinary differential equations with constant coefficients.

**Basic Concepts of Mechanics:** Newton's laws of motion, frames of reference, straight line motion, motion in a plane, uniform circular motion, 3-d motion. Applications of Newton's law of motion, friction, tension, gravitation, spring-mass system – Hooke's law. Satellite in circular orbit and applications, geosynchronous orbits, basic idea of global positioning system (GPS). Weight and weightlessness. Linear momentum, conservation of linear momentum, impulse, impulse-momentum theorem, motion of rockets. Work and energy, conservation of energy. Kinematics of angular motion, angular displacement, angular velocity and angular acceleration, general angular motion. Dynamics of rotational motion, torque, rotational

inertia, kinetic energy of rotation, angular momentum, conservation of angular momentum and its applications. Motion of a particle in a central force field, motion in a plane, conservation of angular momentum, constancy of areal velocity, Kepler's laws (statement only).

Many Particle Systems: centre of mass, determination of the centre of mass of discrete mass distributions, centre of mass of a rigid body (qualitative), dynamics of a system of particles, linear momentum, angular momentum and energy conservation laws for many particle systems. Head-on and 2-d collisions.

Harmonic Oscillations: Simple harmonic motion, differential equation of SHM and its solutions, kinetic energy, potential energy, and total energy of SHM and their time averages. Superposition of harmonic oscillations, linearity and superposition principle, superposition of collinear oscillations having equal frequencies and having different frequencies (beats), superposition of orthogonal oscillations with equal and unequal frequency, Lissajous figures and their uses. Damped oscillations, equation of motion of damped oscillations and its solution (without derivation), qualitative description of the solution for heavy, critical and weak damping, characterising damped oscillations, logarithmic decrement, relaxation time and quality factor. Wave motion, qualitative description, wave formation and propagation, describing wave motion, frequency, wavelength and velocity of wave, mathematical description of wave motion.

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| <b>Course Code:BPHCL-132</b> | <b>Course Title: Mechanics Laboratory</b> | <b>2 Credits</b> |
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Unit I: Measurements and error analysis.

Unit II: Graphing.

### **List of Experiments**

1. Length measurement.
2. Determination of moment of inertia of a fly wheel about its axis of rotation.
3. Determination of Young's modulus by bending of beams.
4. Determination of the modulus of rigidity of a wire using Maxwell's needle.
5. Determination of elastic constants of a wire by Searle's method.
6. Determination of acceleration due to gravity using bar pendulum.
7. Determination of acceleration due to gravity by Kater's pendulum.
8. Study of the motion of a spring-mass system: determination of spring constant and value of acceleration due to gravity.
9. Determination of frequency of tuning fork using sonometer.
10. Study of Lissajous figures using a cathode ray oscilloscope.

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| <b>Course Code:BPHCT-133</b> | <b>Course Title: Electricity and Magnetism</b> | <b>4 Credits</b> |
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**Vector Analysis:** Brief review of vector algebra (scalar and vector products). Scalar fields and their gradient and its significance. Vector fields, divergence and curl of vector field and their significance. Vector integration, line and surface integrals of vector fields, volume integrals. Vector integral theorems, divergence theorem and Stoke's theorem (statement only).

**Electrostatics:** Electrostatic force and electric field, electric flux, Gauss's law of electrostatics. Applications of Gauss's law - electric field due to point charge, uniformly charged spherical shell and solid sphere, infinite line of charge, plane charged sheet, charged conductor. Electric potential, electric potential as line integral of electric field, potential due to a point charge, potential due to a system of charges, calculation of electric field from potential, electric field and potential due to electric dipole, electric dipole in an electric field. Electric potential due to continuous charge distributions, line charge, uniformly charged spherical shell and uniformly charged non-conducting solid sphere, equipotential surfaces, electrostatic potential energy.

**Electrostatics in Medium and Magnetism:** Dielectric medium, dielectric in electric field, polarisation, displacement vector, Gauss's law in dielectrics. Capacitors, capacitance of an isolated spherical conductor, parallel plate, spherical and cylindrical capacitors, parallel plate capacitor completely filled with dielectric, energy per unit volume in electrostatic field. Magnetic field, electric current and magnetism, current density, continuity equation, source of magnetic field, Gauss's law for magnetism, Biot-Savart law and its applications –long straight wire carrying current and circular coil, force between two parallel conductors – definition of Ampere. Ampere's law, applications of Ampere's law – long straight current carrying wire and current carrying solenoid, differential form of Ampere's law, divergence and curl of magnetic field, magnetic vector potential. Magnetic properties of materials, magnetic induction, magnetic intensity, permeability, magnetic susceptibility, brief introduction of diamagnetic, paramagnetic and ferromagnetic materials.

**Electromagnetic Induction:** Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, self-inductance of single coil, mutual inductance of two coils. Energy stored in magnetic field. Equation of continuity for current, displacement current, Maxwell's equations, electromagnetic waves, transverse nature of electromagnetic waves. Electromagnetic wave propagation through vacuum and isotropic dielectric medium, Poynting vector, energy density in electromagnetic field.

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| <b>Course Code:BPHCL-134</b> | <b>Course Title: Electricity and Magnetism: Laboratory</b> | <b>2 Credits</b> |
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### **List of Experiments**

1. Measurements with a multimeter.
2. Study of magnetisation intensity in a magnetic material.
3. Study of a series *RC* circuit.
4. Study of a series *LCR* circuit.
5. Study a parallel *LCR* circuit.
6. Determination of low resistance by Carey Foster's bridge.

7. Verification of Thevenin and Norton theorems.
8. Verification of superposition and maximum power transfer theorems.
9.  $I-V$  characteristics of a  $p-n$  junction diode.
10. Study of half-wave/full-wave rectifiers and filter circuits.

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| <b>Course Code: BPHCT-135</b> | <b>Course Title: Thermal Physics and Statistical Mechanics</b> | <b>4 Credits</b> |
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**Kinetic Theory of Gases:** Expression for pressure (no derivation), kinetic interpretation of temperature and derivation of gas laws, real gases (van der Waals equation, qualitative discussion). Derivation of Maxwell's law of distribution of velocities and its experimental verification, expression for average speed ( $\bar{v}$ ), most probable speed ( $v_p$ ), and root mean square ( $v_{rms}$ ), law of equipartition of energy (no derivation) and its applications to specific heat of gases, monoatomic and diatomic gases. Mean free path (zeroth order). Transport phenomena, viscosity, conduction and diffusion (discussion of physical implications only, no derivation). Brownian motion (no derivation) and its significance, sedimentation, Perrin's experiment.

**The Zeroth Law and The First Law of Thermodynamics:** Boundaries, variables, processes (reversible and irreversible), graphical description. Statement of zeroth law, introduction of concept of temperature, applications of the zeroth law. Compressibility and expansion coefficient. First law of thermodynamics, statement, parametric form, mathematical form (integral and differential), relation between  $c_p$  and  $c_v$ , work done during isothermal and adiabatic processes, velocity of sound.

**The Second and Third Law of Thermodynamics:** Heat engines, conversion of heat into work, Carnot cycle, efficiency of a Carnot engine, Carnot theorem, Kelvin-Planck and Clausius statements of second law of thermodynamics, equivalence of Kelvin-Planck and Clausius statements. Entropy, second law and entropy, entropy changes in reversible and irreversible processes, entropy-temperature diagram, statement and consequences of the third law of thermodynamics (unattainability of absolute zero temperature, etc.). Thermodynamic potentials, enthalpy, Gibbs, Helmholtz and internal energy functions, Maxwell's relations and their applications, Clausius-Clapeyron equation, Joule Thomson effect,  $TdS$  equations. Black body radiation, spectral distribution, concept of energy density, derivation of Planck's law, deduction of laws of radiation (Wien's distribution law, Rayleigh-Jeans law, Stefan Boltzmann law and Wien's displacement law).

**Statistical Mechanics:** Phase space, macrostate and microstate, entropy and thermodynamics probability, distribution function. Maxwell-Boltzmann law, partition function of a monoatomic gas and deduction of thermodynamic functions. Need for quantum statistics, Bose-Einstein distribution function, Bose-Einstein photon gas, Fermi-Dirac distribution function, strongly degenerate Fermi system, Fermi energy, electronic heat capacity, comparison of the three statistics.

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| <b>Course Code: BPHCL-136</b> | <b>Course Title: Thermal Physics and Statistical Mechanics: Laboratory</b> | <b>2 Credits</b> |
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### **List of Experiments**

1. Measurement of Planck's constant using black body radiation.
2. Determination of Stefan's constant using black body radiation.
3. Determination of the coefficient of thermal conductivity of copper by Searle's apparatus.
4. Determination of the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.
5. Study of variation of thermo-emf with temperature.
6. Determination of specific heat capacity of liquid using the method of cooling.
7. Study of temperature variation of surface tension of a liquid.
8. Study of phase transitions and interpretation of cooling curves.
9. Determination of specific heat of a liquid using a calorimeter.
10. Determination of the temperature coefficient of resistance by platinum resistance thermometer.

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| <b>Course Code: BPHCT-137</b> | <b>Course Title: Waves and Optics</b> | <b>4 Credits</b> |
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**Waves:** Transverse waves on a string, wave formation and propagation, relation between wavelength and frequency, wave velocity, mathematical description of wave motion, types of waves – plane waves and spherical waves (*qualitative description only*), energy carried by waves, intensity of waves. Superposition principle for waves, travelling and standing waves on a string, normal modes of a string, group velocity, phase velocity. Acoustic waves, production of sound waves – forced vibrations and resonance, intensity and loudness of sound, decibels, intensity levels, musical notes, musical scale, acoustics of buildings. Electromagnetic waves, wave equation for electromagnetic waves, electromagnetic nature of light, definition and properties of wave front, Huygens principle. Polarisation, transverse nature of light waves, production and analysis plane polarised light, Malus' law, Brewster's law, double refraction, Nicol prism, wave plates, circular and elliptical polarisation.

**Interference:** Interference by division of wave front, Young's double slit experiment, white light fringes, displacement of fringes, Lloyd's mirror and Fresnel's biprism. Interference by division of amplitude, phase change on reflection – Stokes' treatment, interference in thin films, qualitative description of Fringes of equal inclination (Haidinger fringes) and fringes of equal thickness (Fizeau fringes), interference in wedge-shaped films, Newton's rings – measurement of wavelength and refractive index. Michelson's interferometer, qualitative idea of the form of fringes, determination of wavelength, wavelength difference, refractive index and visibility of fringes.

**Diffraction:** Fresnel diffraction, Fresnel construction, half-period element, the zone plate, diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. Fraunhofer diffraction, evolution from Fresnel to Fraunhofer diffraction, diffraction from a single slit - observed pattern, intensity distribution; diffraction from a double slit – observed pattern, intensity distribution. Diffraction grating, Fraunhofer diffraction from multiple slits,

intensity distribution, principal maxima, minima and secondary maxima, angular half-width of principal maxima.

**Lasers and Optical Fibre:** Basic principles of lasers, emission and absorption of light, spontaneous and stimulated emission, Einstein's relations (general idea only), population inversion, optical pumping, pumping mechanisms, three and four level pumping schemes, feedback mechanism, optical resonant cavity. Types of lasers and their applications, solid state, liquid and gas lasers, Helium-Neon laser, applications of lasers in communication, medicine, industry and photography. Optical fibre, core and cladding materials and their refractive indices, propagation of light through optical fibre - total internal reflection, types of fibres – step index and gradient index fibres, refractive index profiles, optical communication through fibres, qualitative idea of pulse dispersion and its reduction, material dispersion and power loss.

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| <b>Course Code:</b> BPHCL-138 | <b>Course Title:</b> Waves and Optics: Laboratory | <b>2 Credits</b> |
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**List of Experiments:**

1. Refractive index of the material of a given prism.
2. Investigations with polarised light using polarimeter.
3. Determination of the value of Cauchy constant of the material of a prism using mercury light.
4. Determination of wavelength of sodium light using Fresnel biprism.
5. Determination of wavelength of sodium light using Newton's rings.
6. Determination of wavelength of sodium/ mercury light using plane diffraction grating.
7. Determination of dispersive power of the material of a given prism using mercury light.
8. Determination of resolving power of a prism.
9. Determination of wavelength of laser light using diffraction from a thin wire.
10. Study of the intensity of single slit diffraction pattern of a laser using photo sensor.

#### **10.1.7 Zoology**

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| <b>Course Code:</b> BZYCT-131 | <b>Course Title:</b> Animal Diversity | <b>Credits:</b> 4 |
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**Animal Like Protists:** Protozoans: General Characters; Classification: Super Group Excavata, Super Group 'SAR' Clade, Super Group Unikonta; Structural Organisation and Function: Body Form, Nutrition, Osmoregulation and Excretion, Respiration, Mechanism for Response, Reproduction; Locomotion in Protozoans: Structure and Function Cilia and Flagella.

**Animal Classification and Architecture:** Classification of Living Organisms: Binomial Naming of Organisms, Concept of Species, Classifying Organisms, Modern Classification System; Organisation and Body Plan: Symmetry and Cephalisation, Germ Layers and Body Cavity, Developmental Patterns, Segmentation; Origin and Diversification of Metazoa: Origin of Multicellularity, Diversification and Phylogeny of Animals.

**Phylum Porifera:** Porifera (Sponges): Characteristic Features, Classification; Canal System: Asconoid Type, Syconoid Type, Leuconoid Type.

Phylum Cnidaraia: Characteristic Features of Phylum Cnidaria; Classification of Phylum Cnidaria; Polymorphism in Cnidaria: Polymorphism in Hydrozoa.

Phylum Platyhelminthes: Platyhelminthes: Characteristic Features, Classification; Life Cycle of *Taenia Solium*.

Phylum Nematoda: Nematoda: Characteristic Features, Classification of Nematoda; Life Cycle of *Ascaris Lumbricoides*; Parasitic Adaptations in *Ascaris Lumbricoides*.

Phylum Annelida: Coelomata – Eucoelomata – Phylum Annelida: The Coelom, Metamerism (Segmentation); Characteristic Features of Phylum Annelida; Classification of Phylum Annelida.

Phylum Arthropoda: General Characters of Arthropoda; Characteristic Features of Arthropoda; Classification of Phylum Arthropoda, Subphylum Trilobitomorpha, Subphylum Chelicerata, Subphylum Crustacea, Subphylum Uniramia; Vision in Arthropods, Metamorphosis in Insects.

Phylum Mollusca: Characteristics of Mollusca; A Generalised Mollusc; Classification of Phylum Mollusca: Monoplacophora, Polyplacophora, Aplacophora, Gastropoda, Bivalvia, Scaphopoda, Cephalopoda.

Echinodermata and Hemichordata: Characteristic Features of Phylum Echinodermata; Classification of Phylum Echinodermata: Class Asteroidea, Class Ophiuroidea, Class Echinoidea, Class Holothuroidea, Class Crinoidea; Phylum Hemichordata: Class Enteropneusta, Class Pterobranchia, Basic Adaptive Features, Affinities.

Protochordates: Phylogenetic Position and Classification of Chordates; Five Chordate Hallmarks; Ancestry and Evolution; Classification of Phylum Chordata: Subphylum Urochordata (Tunicata), Subphylum Cephalochordata, Subphylum Vertebrata (Craniata).

Agnatha-Jawless Fishes: Living Jawless Fishes: General Characters, Classification.

Pisces: General Characters and Classification; Cartilaginous Fish-Chondrichthyes: Subclass Elasmobranchii, Subclass Holocephali; Bony Fish-Osteichthyes: Class Actinopterygii, Class Sarcopterygii; Osmoregulation in Fish.

Amphibia: Class Amphibia: Salient Features of Amphibia, General Organisation of Amphibia; Classification of Amphibia: Order Anura (Salientia), Order Gymnophiona (Apoda), Order Caudata (Urodea); Parental Care in Amphibia: Parental Care in Organisms of Urodea, Parental Care in Anura.

Reptiles: Evolution of Amniotes: Morphological Features for Identification of Amniote Skull Types, Types of Skulls in Amniotes, Division of Reptile and Bird for a Terrestrial Life Style, Main Adaptation in Amniotes for a Terrestrial Life Style; Characteristic Features of Reptiles; Classification of Reptiles, Cladistic Classification of Reptiles, Traditional Classification of Reptiles, The Four Extant Reptilian Orders; Order Testudines; Order Sphenodontia; Order Squamata: Characteristics of Suborder Serpentes (Snakes), Kinetic Skull of Snakes: Mechanism of Biting and Eating, Identification of Venomous and Non-Venomous Snakes, Characteristics of Suborder Lacertilia (Lizards); Order Crocodilia.

Aves: Ancestry and Evolution of Birds: *Archaeopteryx*: a link between Reptiles and Birds, Affinity of Reptiles, Aves and Mammals, Evolution of Birds; Characteristic Features of Birds; Classification of Living Birds of Class Aves: Superorder Paleognathae, Superorder

neognath; Adaptations for Flight: Form and Function: Body Shape and Size, Endothermy, Skeleton, Muscular System, Skin, Bird Feather, Nervous and Sensory Systems, Food, Feeding and Digestion, Circulatory System, Respiratory System, Excretory System, Respiratory System, Excretory System, Reproductive System; Bird Flight: Drag and thrust, Weight and Life, Mechanism of Flight.

Mammals: Salient Features of Mammals; Form and Function of Mammals: Body Form, Integument, Integumentary Glands, Exoskeleton, Endoskeleton, Dentition and Digestive System, Respiratory System, Muscular System, Circulatory System, Endothermy and Temperature Regulation Excretory System, Sexual Dimorphism and Reproductive system, Reproductive Cycle, Viviparity and Modes of Development.

Evolutions and Classification of Mammals: Origin and Evolution of Mammals: The Diversification of Synapsids, Origin and Diversification of Mesozoic Mammals, Features of Early Mammals; Classification of Mammals; Class Mammalia; Subclass Prototheria: Characteristic Features of Subclass Prototheria, Infraclass Ornithodelphia (^nee-tho-del-fee); Subclass Theria: Characteristic Features of Subclass Theria, Infraclass Metatheria (^Meta-thee-ree-aa), Orders of Infraclass Metatheria, Infraclass Eutheria.

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| <b>Course Code:BZYCL-132</b> | <b>Course Title: Animal Diversity: Laboratory</b> | <b>Credits:2</b> |
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#### **List of Experiments:**

Exercise 1: Protists: Observation and Classification of Specimens.

Exercise 2: Porifera: Observation and Classification of Specimens.

Exercise 3: Cnidaria: Observation and Classification of Specimens.

Exercise 4: Platyhelminthes and Nemathelminthes – Classification of Specimens and Microscopic Study of Their Sections.

Exercise 5: Annelida: Observation and Classification of Specimens.

Exercise 6: Arthropoda: Observation and Classification of Specimens.

Exercise 7: Mollusca: Observation and Classification of Specimens.

Exercise 8: Echinodermata: Observation and Classification of Specimens.

Exercise 9: Protochordata: Observation and Classifications of Specimens *Balanoglossus*, *Herdmania* and *Branchiostoma* (*Amphioxus*).

Exercise 10: Agnatha: Observation and Classification of Specimens.

Exercise 11: Chondrichtyes and Osteichthyes: Observation and Classification of Specimens.

Exercise 12: Amphibia: Observation and Classification of Specimens.

Exercise 13: Reptilia: Observation and Classification of Specimens.

Exercise 14: Aves: Observation and Classification of Specimens.

Exercise 15: Mammals: Observation and Classification of Specimens.

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| <b>Course Code:BZYCT-133</b> | <b>Course Title: Comparative Anatomy and Developmental Biology of Vertebrates</b> | <b>Credits:4</b> |
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**Integumentary System:** General feature of vertebrate integument; integument of fishes and tetrapods; specialised derivatives.

**Skeletal System** Cartilage and bone; classification-axial and appendicular skeleton; skull, jaw suspensorium; vertebral column and types of vertebrae (comparison of frog and rabbit).

**Digestive System** Give tabular form for dentition; digestive system in non-mammalian and mammalian vertebrates; digestive glands in mammals.

**Respiratory System** Respiratory system in aquatic, terrestrial vertebrates; (gills, swim bladder, lungs and air sacs).

**Circulatory System** Evolution of heart in chordates; evolution of aortic arches in vertebrates; venous system in vertebrates (mammal).

**Urinogenital System** Succession of kidneys; structure of mammalian kidney; evolution of urinogenital ducts; male and female genital system in chordates.

**Nervous system** Comparative account of brain; nervous tissue, central and peripheral nervous system.

**Sense organs** Types of receptors; eye, ear, olfactory organs, specialised sense organs.

**of Development** Historical background; difference between embryology and developmental biology; Some questions in developmental biology; approaches adopted; some models in development (sea urchin, drosophila, amphibians); fate maps; cell differentiation; patterns of development (mosaic, regulative and syncytium); specification, determination and differentiation of organism; gene activation and regulation (differential gene expression, genomic equivalence, King's experiment).

**Cell-to-Cell Communication** -Morphogenetic processes; cell movements, cell-to cell communication, cell adhesion, cell signalling (paracrine, exo, endocrine); cell to cell interaction; pattern formation example development of eye; cell death (autophagy, necrosis and apoptosis).

**Beginning of a New Organism** -Gametogenesis; spermatogenesis; oogenesis; vitellogenesis in birds; mechanism of fertilisation in frog and humans; polyspermy- slow block , fast block;

**Cleavage and Gastrulation** Types of eggs, cleavage - planes of cleavage, patterns of cleavage; movements involved in gastrulation (invagination, involution, ingression, epiboly and delamination).

**Development of Frog/ (Development in Amphibians)** Blastula formation; gastrula, neurulation; life cycle of frog with reference to metamorphosis; hormonal regulation in metamorphosis; neotany.

**Development of Chick** -Blastula formation; gastrulation; comparison between frog and chick development.

**Early Development in Humans** -Female reproductive tract and fertilisation; blastocyst formation; potencies, implantation; extra embryonic membranes, their structures and functions; flaws in development; different types of placentae in mammals (given in a tabular form with figures); growth and aging.

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| <b>Course Code:BZYCL-134</b> | <b>Course Title: Comparative Anatomy and Developmental Biology of Vertebrates: Laboratory</b> | <b>Credits:2</b> |
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### **List of Experiments**

Exercise1: Osteology of Frog;

Exercise 2: Osteology of rabbit;

Exercise 3: Comparative study of skull of a herbivore and a carnivore;

Exercise-4: Study of shell of a turtle;

Exercise 5: Studies of the developmental stages of frog, using permanent slides;

Exercise 6: Study of sperm and ova of rat;

Exercise7: Studies of developmental stages of frog using permanent slides;

Exercise8: Comparative study of different types of placenta of mammals through permanent slides/ photomicrographs;

Exercise 9: Studies of placental development in humans by ultrasound scans.

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| <b>Course Code:BZYCT-135</b> | <b>Course Title: Physiology and Biochemistry</b> | <b>Credits:4</b> |
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**Nerve-** Structure of a neuron, Resting membrane potential, Graded potential, Origin of Action potential and its Propagation of action potential in myelinated and non-myelinated nerve fibres **Synapse.**

**Muscle** -Types of muscles, Ultra-structure of skeletal muscle, Mechanism of muscle contraction, Molecular and chemical basis of skeletal muscle contraction, Initiation of muscle contraction, Energetics of muscle contraction.

**Digestion**-General structure of the digestive tract of vertebrates, Gastrointestinal hormones, Digestive enzymes, Protein digestion, Carbohydrate digestion, Lipid digestion, Maintenance of gut lining, Coordination of digestion, Absorption of proteins ,carbohydrates and lipids, Energy metabolism.

**Respiration** -Vital properties of respiratory gases, Structure of Mammalian lung, Pulmonary ventilation, Exchange of gases in alveoli, Transport of oxygen and carbon dioxide in blood, Regulation of respiration, Respiratory volumes and capacities.

**Excretion** -Modes of excretion, Functional principles of osmolarity and membrane permeability, Structure of mammalian kidney, Mechanism of Urine formation, Counter-current Mechanism, Regulation of kidney function.

**Cardiovascular system**-Composition of blood, Homeostasis, Structure of Heart, Origin and conduction of the cardiac impulse, Cardiac cycle.

**Reproduction** -Physiology of male reproduction, hormonal control of spermatogenesis; Physiology of female reproduction: hormonal control of menstrual cycle.

Endocrine Glands-Structure and function of pituitary, thyroid, Parathyroid, pancreas and adrenal.

Biomolecules- Structure and function of biomolecules: Protein, Carbohydrate, Lipids.

Carbohydrate Metabolism Glycolysis, Fate of pyruvate, Citric acid cycle, Gluconeogenesis, Pentose phosphate pathway, Glycogen metabolism: Glycogenesis & Glycogenolysis, Electron transport chain.

Lipid Metabolism- $\beta$  Oxidation of fatty acids:  $\beta$  oxidation Regulation, Ketone body formation, Fatty acid biosynthesis.

Protein Metabolism-Metabolic fates of amino groups, Nitrogen Economy and Protein Turnover, Amino acid Degradation, Transamination, Deamination, Transport of Ammonia to Liver, Urea Cycle, MR: Linkage between TCA and Urea cycle, MR: Urea Cycle and Genetic Defects, Biosynthesis of amino acids.

Enzyme -Nature of enzymes, Cofactor and prosthetic group, Apoenzyme, Holoenzyme, IUBMB classification of enzymes, Mechanism of action of enzymes-proximity, orientation, acid-base catalysis, Relationship between initial velocity and substrate concentration, Steady state kinetics, Equilibrium constant - monosubstrate reactions, Michaelis-Menten equation, Line weaver-Burk plot, Km and Vmax, turnover number. Regulation of enzymes, Reversible and irreversible inhibition.

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| <b>Course Code:BZYCL-136</b> | <b>Course Title: Physiology and Biochemistry: Laboratory</b> | <b>Credits:2</b> |
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#### **List of Experiments**

Experiment 1: Preparation of haemin and haemochromogen crystals

Experiment 2: To study the permanent histological sections of mammalian endocrine glands: pituitary, thyroid, pancreas, adrenals

Experiment 3: To study the permanent histological sections of mammalian tissues: spinal cord, duodenum, liver, lung, kidney, bone and cartilage

Experiment 4: To identify by qualitative tests the functional groups of carbohydrates in given solutions

Experiment 5: To estimate the total protein present in a given solutions by Lowry's method  
the;

Experiment 6: To observe the activity of salivary amylase under optimum conditions.

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| <b>Course Code: BZYCT-137</b> | <b>Course Title: Genetics and Evolutionary Biology</b> | <b>Credits: 4</b> |
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Introduction to Genetics: Development of Genetics – A Historical Perspective; Basic Genetic Terminology; Mendel's Classical Experiments: Transmission of Traits, Confirmation of the Law of Segregation: The use of Test Crosses, Dihybrid Crosses and Mendel's Law of Independent Assortment, Trihybrid Crosses.

Extension and Modifications of Mendelian Genetic Analysis-I: Dominance (Complete Dominance, Incomplete Dominance, Codominance); Multiple Alleles (ABO Blood Type

Alleles in Humans, Rh Factor Alleles in Humans, Incompatibility in Plants); Gene Interactions and Modified Mendelian Ratios (Complementary Gene Interaction, Epistasis).

Extension and Modifications of Mendelian Genetic Analysis-II: Lethal Alleles; Pleiotropy; Sex linked Inheritance (X-linked Inheritance, Y-linked Inheritance); Pedigree Analysis (Family Tree, Significance); Degree of Gene Expression (Penetrance, Expressivity).

Linkage, Crossing Over and Recombination: Linkage; Crossing Over (Cytological Basis of Crossing Over, Molecular Mechanism of Crossing Over); Recombination (Recombination frequency).

Chromosome Mapping: Genetic Mapping (Three-Point Crosses, Interference and Coincidence, Linkage Analysis in Haploid Eukaryotes); Somatic Cell Genetics (An alternative approach to Gene Mapping); Extra-nuclear (Cytoplasmic) Inheritance; Maternal vs Extra-nuclear Inheritance; Systems and Characteristics of Extra-nuclear Genome and Inheritance (Chloroplasts, Mitochondria).

Structural Abnormalities in Chromosomes and their Effects: Deletion; Duplication; Inversion; Translocation; Ring Chromosomes; Isochromosomes.

Numerical Abnormalities in Chromosomes and Their Effects: Euploidy (Monoploidy, Polyploidy); Aneuploidy.

Sex Determination: Genetic Basis of Sex Determination (Genic Type, Chromosomal Type); Chromosomal Sex Determination (XX-XY System, A variation: The ZZ-ZW System, XX-XO System, Sex Determination by Ploidy level, Compound Chromosome System; Dosage Compensation of X-linked genes.

The Nature and Structure of Genetic Material: Nature of Genetic Material ( Nuclein, Proteins, Amounts of DNA and Protein, DNA as the Genetic Material, RNA as Genetic Material); Structure and Chemical Composition of DNA and RNA; Conformational Flexibility of DNA Molecules.

Mutations and Mutagenesis: What is Mutation?; Somatic and Genetic Mutations (Spontaneous and Induced Mutations, Back and Suppressor Mutations); Molecular Basis of Mutation (Base Pair Substitution, Frame Shift Mutation, Tautomerization, Deamination and Depurination, Base Analogues); Transposable Genetic Elements; Mutagenesis; DNA repair Mechanism; Significance of Mutations.

Major Events in History of Life: Origin of Solar System (Big Bang Theory); Origin of Life (Biogenesis and Biochemical Origin of Life); Biological Evolution (Convergent and Divergent Evolution, Homology and Analogy).

Introduction to Evolutionary Theories: Lamarckism and Neo Lamarckism; Darwinism (Darwinism: The Basic Tenets, The Significance of Darwin's Contribution); Challenges to Darwinism; Neo-Darwinism (Mendelism and Darwinism, The Chromosome Theory of Heredity).

Evolutionary Evidences: Fossil Records (Type of Fossils, Geological Time Scale, Dating of Fossils); Comparative Anatomy; Embryological Evidences; Vestigial Organs; Biochemical Evidences (Recent Trends in Phenotypic Relationship); Evolution of the Horse; Evolution of Man.

Evolutionary Change: Natural Selection: The Basis for Natural Selection (Prodigality of Nature, Factors that Limit Reproductive Potential, Variability in Populations); Types of

Natural Selection (Stabilising Selection, Directional Selection, Disruptive Selection); Artificial Selection.

Evolutionary Change: Species Concept: Mechanisms of Speciation (Sympatric Speciation, Allopatric Speciation); Species Concept (Biological Species Concept, Morphological Species Concept).

Processes of Evolutionary Change: Genetic Repatterning during Isolation; Isolation Mechanisms, Pre-mating Isolating Mechanisms (Geographical Isolation, Ecological Isolation, Ethological Isolation, Mechanical Isolation); Genetic Drift Post-mating Isolating Mechanisms, (Interspecific Sterility, Hybrid Sterility, Cytoplasmic Incompatibility).

Macro-evolution: Characteristics of Macroevolution; Pattern of Macroevolution (Stasis, Changes in Lineages, Speciation, Extinction); Examples of Macroevolution (Macroevolution (Adaptive Radiations) in Darwin Finches, Macroevolution (Adaptive Radiations) in Marsupials (Metatherians)); Differences between Macroevolution and Megaevolution.

Species Extinction: Causes of Extinction; Mass Extinction and Speciation; Big Five Mass Extinctions; Sixth Extinction; Role of Extinction in Evolution.

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| <b>Course Code: BZYCL-138</b> | <b>Course Title: Genetics and Evolutionary Biology: Laboratory</b> | <b>Credits: 2</b> |
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### **List of Experiments**

Exercise 1: Study of Mendelian Inheritance and Gene Interaction (Non-Mendelian Inheritance) Using Suitable Examples and Verifying the Results Using Chi-Square Analysis (Monohybrid Mendelian Ratio-I).

Exercise 2: Study of Mendelian Inheritance and Gene Interaction (Non-Mendelian Inheritance) Using Suitable Examples and Verifying the Results Using Chi-Square Analysis (Dihybrid Mendelian Ratio-II).

Experiment 3: Linkage, Recombination and Gene Mapping.

Experiment 4: Study of Human Karyotypes (Normal and Abnormal).

Experiment 5: Study of Pedigree Chart.

Experiment 6: Application of Probability to Problems in Genetics.

Experiment 7: Study of Fossil Evidences.

Experiment 8: Study of Homology and Analogy.

Experiment 9: To Study the Phylogeny of Horse with Diagrams/Cutouts of Limbs and Teeth of Horse Ancestors.

Experiment 10: Study of Darwin's Finches with Diagrams/Cutouts Beats of Different Species.

Experiment 11: Field trip for Identification and Observation of Animals in a National Park / Sanctuary / Reserve / Breeding Park / Aaquaarium / Natural History / Museum / Zoological Park.

Experiment 12: To Demonstrate the Role of Natural Selection in Evolving Adaptations.

Experiment 13: To Demonstrate the Role of Natural Selection in Fixing Favoured Adaptations and Eliminating Maladaptations.

Experiment 14: To Illustrate the Concept of Genetic Drift.

## **10.2 Skill Enhancement Course Offered by School of Sciences**

### **BCHS 183: LABORATORY MANAGEMENT SKILLS (4 Credits)**

#### **Expected Learning Outcomes**

After studying the course, 'Laboratory Management Skills', the learner will be able to:

- list the various types of laboratories available in the disciplines of sciences and social sciences;
- recognise the components and describe the features of laboratories;
- compare the requirements of different types of science and social laboratories;
- state the process of lab purchase and maintenance of stock, files and records pertaining to laboratories;
- practice the ways of communications as per the requirement of laboratory related work;
- explain the role of computers in the management of laboratories;
- recognise and classify the possible hazards of laboratories;
- demonstrate the handling of apparatus, equipment and materials in the laboratories;
- appraise the safety aspects and apply first aid procedures in case of accident in the laboratories; and
- choose the laws and regulations for a specific situation pertaining to the safety in laboratories.

**Introduction to a Science Laboratory:** Your Role in Laboratory; What is Science?, Science as a Process of Inquiry, Features of Science; Science as a Way of Life; Approach to Your Work as a Laboratory Staff.

**Design and Components of a Laboratory:** Lab Design and Space, Fixed Design Laboratories, Flexible Design Laboratories, Fume Cupboards; Benching, Work Benches, Storage and Furniture, Benching, Work Benches, Storage, Furniture; Services and Drainage, Services, Drainage; Ventilation and Lighting, Ventilation, Heating, Lighting; Access to and Fro from the Laboratories; Security and Safety.

**Preparation Room and Store of a Laboratory:** Importance of a Preparation Room; Components of a Preparation Room, Wet Bench, Dry Bench, Work Area, Storage, Proper Lighting and other Services; Access to the Preparation Room; Work Flow in the Preparation Room; Microbiological Preparation Room, Access to microbial Preparation, Room for Bacteria and Fungi, Sterilizing Equipment, Preparation Area; Store and the Flow of Materials; Arrangement of Stores, Environmental Considerations, Physical Considerations; Flexibility of Store Design; Safety Provisions; Labels- A Cautionary Note; Metal Chest Solvent Stores.

**Communication in a Laboratory:** What is communication?; Oral communication; Written communication, Information received, Information sent; Memoranda; Letters, Official and

personal communication; Reports, Informal reports, Formal reports; The computer; Channels of communication.

**Routine Management of a Laboratory:** Organisation of Practical Work, Day-to-day Organisation, Day-to-day Cleaning up, Sterilisation, Disposal of Wastes; Routine Inspection and Maintenance of Laboratory; Maintenance of Equipment, Apparatus and Furniture, Prevention of Dust, Reduction of Vibration, Prevention of Corrosion and Rust, Protection of Equipment from Excess Heating, Correct Usage of Instruction Manual, Servicing of Equipment, Servicing of Furniture; Cleaning of laboratories and Preparation Rooms; Colour Coding of Services; Emergencies with Services, Emergency Procedure, Flooding, Gas Leaks; Security and Vandalism, Security of Premises and Immediate Working Area, Protection from Vandalism.

**Stock Management:** Arranging Stock, Locating and Referencing, Shelf Arrangement of Stock by Nomenclature; Stock Control, The Two Bin System, The Constant Cycle System; Record Keeping, Bin Cards, Order Books, Inventory, Service Register; Ordering Procedure, Preparation of List of Requirements, Mode of Procurements, Customs Duty on Imported Goods, Integrated Goods and Service Tax, Factors Deciding Purchases, Placing an Order, Discounts and Bargaining, Goods on Approval; Receipt of Goods, Taking Delivery, Sale of Goods Act 1930, Processing of Bills; Accounting : Records of Expenditure, Petty Cash/Imprest Money.

**Files and Records:** Sources of Information, Secondary and Tertiary Information Sources, Sources of Information in the Laboratory; Filing Systems, Aims of Filing Systems, Classification of Files; Filing Methods, Filing System for Equipments and chemicals, Filing of Printed and Written Material; Special Files, Safety File, Technician's File; Records, Stock Records; Location; Recording Loans; Recording Stock Used and Misused; Information about Equipment ,Serial Numbers, Maintenance Record, Electrical Checks; Miscellaneous Records.

**Role of Computers in Laboratory Management:** Components of a Computer, Central Processing Unit, Memory, Input and Output Devices, What Goes on inside a computer?; Overall Functions, Data Input, Data Processing, Data Output; Application Software, MS Word, MS Excel, MS Power Point, Internet or World Wide Web; Forms of Data Output.

**Fire Hazards:** Fire Hazards in the Laboratory, The Fire Triangle, Causes of Fires, Classification of Fires; Precautions for Fire Prevention; Fire Alarms, Fire Escapes, Fire Barriers; Extinguishing a Fire, Fire Extinguishers, Use of Fire Extinguishers.

**Electricity and Gas Hazards:** Electricity Hazards in the Laboratory, Wiring a Plug, Selection of Proper Fuse, Selection of Proper Flex, Safe Conduct, Earthing, Other Dangers Associated with Electrical Equipment; Gas Hazards in the Laboratory, How to make LPG Safer in Laboratory, Detection and Handling of Gas Leakage, Health Hazards of Gases.

**Chemical and Biological Hazards:** Chemical Hazards, Classification of Hazardous Chemicals, Handling of Chemicals, Storage of Chemicals, Transport of Bulk Chemicals, Transfer from Large Containers; Hygiene; Hazards in the Biology Laboratory; Laboratory Animals, Supply, Handling, Disposal, Sharps; Microorganisms, Handling, Sterilisation of Apparatus, Disposal; Plant Materials.

**Safety Measures in a Laboratory:** Role of the Teachers and the Head of the Institution; Code of Behaviour for the Laboratory Staff, Code of Practice in a Laboratory, Personal Protective Devices; Disposal of Waste Materials; Disposal of Unserviceable and Obsolete Items; Disposal of Chemical Wastes; Opening and Closing the Laboratory; Shifting Heavy Objects.

**First Aid in a Laboratory:** Accident Reporting, The Need for Reporting Accidents, Accident Reporting Procedure; First Aid Box, What is First Aid?, Placement of First Aid Box, Contents of First Aid Box; General Features of First Aid, Scope of First Aid, Sequence of Actions; First Aid Procedure for Electric Shock; First Aid Procedure for Unconscious Causalities; First Aid Procedure for Chemical Accidents; Controlling Bleeding; First Aid treatment for Shock; First Aid Treatment of Localised Injuries, Burns, Fractures, Eye Injuries.

**Laws and Regulations:** Need for Safety and Health Regulations; Construction Standards Set by Bureau of Indian Standards, National Building Code of India, Laboratory Safety Codes; Regulations Concerning Safety and Health of Workers in Industrial Laboratories; Regulations Regarding Electricity; Regulations Regarding Fire; Regulations Regarding Alcohol Purchase and Storage; Regulations Regarding Hazardous Substances; Regulations Regarding Experiments on Animals; Legal Liability for Laboratory Accidents in Educational Institutions.

**Note:** Syllabi of other skill enactment courses are provided either Programme guides of BAG or BCOMG programmes.

### 10.3 Ability Enhancement Courses

| Course Code: BEVAE-181 | Course Title Environment Studies | Credits: 4 |
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Earth is the only known planet in the solar system that supports life. Despite the vastness of the earth, life exists only in a very thin layer enveloping the earth called biosphere. Sun is the only source of energy which enables continuous interaction among various life forms. For a long period of time, there has been a symbiotic relationship between human being and nature. Due to excessive human interference and unsustainable practices, millions of people's life and livelihoods and other living organisms on the earth are at risk. These environmental issues have now become common problems and shared responsibility of each individual on the earth to act judiciously to reverse these negative impacts. Therefore, there has been a growing need to create awareness amongst all the stakeholders. Keeping this in view, Environmental Study is being introduced as a compulsory course for all the learners at under-Graduate level.

Our Environment: Concept of environment; Different components of environment and their relationship; Human-environment relationship: concept of Sustainability and Sustainable development; Multidisciplinary nature of the environmental studies, its scope and importance.

Ecosystems: What is an ecosystem? (Concept of ecosystem, Components of ecosystem producer consumers, decomposers); Structure and function of ecosystem; Energy flow in ecosystem: trophic levels, food chains, food web, and ecological pyramid; Ecological succession.

Major Ecosystems: Forest, grassland, desert and aquatic ecosystems: Case studies.

Land and Water: Renewable and non-renewable resources; Land as a resource; Land-use change; Land degradation; Soil erosion and desertification; Conservation and management of land resources: Case studies. Water as a resource; Over-exploitation of surface and ground water; Floods and droughts; International and inter-state conflict over water; Conservation and Management of water resource: Case studies.

Forest Resources: Forest as a resource; Deforestation and its Causes; Impact of mining and dam building on environment, forest, biodiversity and tribal populations; Conservation and management of forest resources: Case studies.

Biodiversity: Value And Services: Levels of biodiversity: genetic, species and ecosystem diversity; Bio-geographic zones of India; Biodiversity patterns and global biodiversity hot spots; India as a mega-biodiversity nation; Endangered and endemic species of India; Ecosystem and biodiversity services: ecological, economic, social ethical, aesthetic informational value.

Energy Resources: Renewable and non-renewable energy sources; uses of alternate energy sources; growing energy needs; conservation and management of energy resources: Case studies.

Unit 8: Biodiversity: Threats and Conservation: Threats to biodiversity: habitat loss, poaching of wildlife, Human-wildlife conflicts in Indian context, biological invasions; Conservation of biodiversity: In situ and Ex-situ conservation of biodiversity.

Environmental Pollution and Hazard: Definitions; Types, causes, effects and controls of: air, water, soil and noise pollution; Nuclear Hazard. Hazard and Pollution Case Studies (human health risks).

Waste Management: Solid waste management: Control measures of urban and industrial waste. Case Studies.

Global Environmental Issues: Global warming, climate change, ozone layer depletion, acid rain and their impact.

Environmental Legislation: Environment Protection Act; Air (Prevention & control of Pollution) Act; Water (Prevention and Control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act, International Agreements: Montreal protocols and conventional on Biological Diversity (CBD).

Human Communities and Environment: Human population growth: Impacts on environment, human health and welfare; Resettlement and rehabilitation of project affected person case studies. Disaster Management; Natural Disasters: Floods, earthquake, cyclones and landslides.

Environmental Ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies. TMA-Based on Field Work- Report of be submitted – 5 hours Visit to an area to document environmental assets: river/forest/ flora/ fauna etc.

- Visit to a local polluted site- Urban/ Rural / Industrial/ Agricultural
- Study of common plants, insects, birds and basic principles of identification

- Study of simple ecosystems-pond, river, Delhi Ridge, etc.

**Course Code: BHDAE 182 Course Title: fgUnh Hkk"kk vkSj laizs'k.k Credits: 4**

bl ikB~;Øe esa fganh Hkk'kk vkSj laizs'k.k ls lacaf/kr fcanqvksa dk v/;u djk;k tk,xkA ;g ikB~;Øe 4 ØsfMV dk gSA bl ikB~;Øe eas fganh Hkk'kk vkSj lizs'k.k ls lacaf/kr fuEufyf[kr fcanqvksa dks "kkfey fd;k x;k gS % fgUnh Hkk'kk dk fodkl] Hkk'kk dh ifjHkk'kk] izd'fr ,oa fofok :i( fganh Hkk'kk dh fo'ks'krk,i % fØ;k] foHkfDr] loZuke] fo'ys'k.k ,oa vO;; laca/khA fganh dh o.kZ&O;oLFkk % Loj ,oa O;atuA Loj ds izdkj&âLo] nh?kZ rFkk la;qDrA O;atu ds izdkj&Li'kZ] vUrLFk] Å'e] vYiizk.k] egkizk.k] ?kks'k rFkk v?kks'kA oxksZa dk mPpj.k LFkku% d.B~;] rkyO;] ew)ZU;] nUR;] vks'B~; rFkk nUrks'B~;A cyk?kkr] laxe] vuqrku rFkk laf/kA Hkk'kk laizs'k.k ds pj.k % Jo.k] vfHkO;fDr] okpu rFkk ys[kuA fgUnh okD; jpu] okD; vkSj miokD;A okD; HksnA okD; dk :ikUrjA HkkokFkZ vkSj O;k[;k] vk'k; ys[ku] fofok izdkj ds i= ys[kuA

**Course Code: BEGAE 182. Title: English Communication Skills Credits: 4** English Communication Skills is of 4 credits and has 3 Blocks and 11 Units. Communication involves both verbal and non-verbal communication. In this Course we give you an understanding of the communication process, the barriers to it, the skills involved in communication i.e. listening, speaking, reading and writing in both formal and informal contexts. We discuss the differences between spoken and written forms of the language and make you sensitive to conversational skills which include to a large extent body language. Note: Detail Syllabi of some courses are not added at this stage as these are in the process of finalization. Syllabi of skill enactment courses are provided either Programme guides of BAG or BCOMG programmes.

## 11. ADDRESS AND CODES OF REGIONAL CENTRES

| SL.<br>NO. | REGIONAL<br>CENTRE, NAME<br>AND CODE NO.<br>OF LEARNER<br>SUPPORT<br>CENTRES | ADDRESS OF THE REGIONAL<br>CENTRE TEL., FAX & E-MAIL   | JURISDICTION   |
|------------|--|--|--|
| 1.         | AGARTALA RC<br>CODE :26  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE M.B.B. COLLEGE<br>COMPOUND P.O. AGARTALA<br>COLLEGE AGARTALA – 799004,<br>TRIPURA PH.OFF : 0381-<br>2519391/2516714<br>FAX :0381-2516266<br>E-MAIL : <a href="mailto:rcaagartala@ignou.ac.in">rcaagartala@ignou.ac.in</a>   | STATE OF TRIPURA (DISTRICT: DHALAI, NORTH<br>TRIPURA,SOUTH TRIPURA, WEST TRIPURA,<br>GOMATI, KHOWAL, SEPAHIJALA, UNOKOTI)  |
| 2.         | AHMEDABAD RC<br>CODE : 09  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE OPP. NIRMA<br>UNIVERSITY SARKHEJ GANDHINAGAR<br>HIGHWAY CHHARODI AHMEDABAD -<br>382481, GUJARAT<br>PH.OFF : 02717-242976 FAX :<br>E-MAIL : <a href="mailto:rcahmmedabad@ignou.ac.in">rcahmmedabad@ignou.ac.in</a>   | STATE OF GUJARAT (DISTRICT: AHMEDABAD,<br>ANAND, BANASHKA NTHA, BHARUCH, DAHOD,<br>GANDHI NAGAR, MESHANA, PATAN,<br>SABARKANTHA, SURAT, VADODARA, VALSAD,<br>DANG, KHEDA, NARMADA, NAVSARI,<br>PANCHMAHAL, TAPI ARAVALLI), DAMAN &<br>DADRA NAGAR HAVELI (U.T) |
| 3.         | AIZWAL RC<br>CODE : 19   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE HOUSE NO. YC-<br>10, ROPIRA BUILDING, CHALTLANG<br>DAWRKAWN, AIZAWL - 796012,<br>MIZORAM PH.OFF : 0389-<br>2391692/2390669<br>E-MAIL : <a href="mailto:rcaizwal@ignou.ac.in">rcaizwal@ignou.ac.in</a>   | STATE OF MIZORAM (DISTRICT : AIZWAL,<br>LUNGLEI, KOLASIB, MAMIT, SERCHHIP, SAIHA,<br>CHAMPHAI, LAWNGTLAI,SAITUAL,HNAHTHIAL)  |
| 4.         | ALIGARH RC<br>CODE : 47  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE SRI TIKA RAM<br>KANYA MAHAVIDYALAYA, RAMGHAT<br>ROAD, ALIGARH-202001,<br>UTTAR PRADESH PH.OFF : 0571-<br>2700120,2701365 FAX :0571-2402147<br>E-MAIL : <a href="mailto:rcaligarh@ignou.ac.in">rcaligarh@ignou.ac.in</a>   | STATE OF UTTAR PRADESH (DISTRICT:<br>ALIGARH, BUDAUN, ETAH, ETAWAH,<br>FIROZABAD, KASGANJ (KASHIRAM NAGAR),<br>HATHRAS (MAHAMAYA NAGAR), MAINPURI  |
| 5.         | ANGUL R CODE:<br>89  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE ANGUL PLOT<br>NO.758-759, SIMILIPADA CHOWK<br>ANGUL 759122 ODISHA<br>PH.OFF: 06764 - 230016/17<br>(FOR STUDENTS SUPPORT<br>SERVICES) 230018 (RC OFFICE:<br>ADMINISTRATION & FINANCE) 230019<br>(RD OFFICE) E- MAIL:<br><a href="mailto:rcangul.ignou.ac.in">rcangul.ignou.ac.in</a>                             | STATE OF ODISHA (DISTRICT : SAMBALPUR,<br>JHARSUGUDA, SUNDARGARH, BARGARH,<br>DEBAGARH, SUBARNAPUR, BOUDH AND ANGUL)   |
| 5.         | BANGALORE RC<br>CODE: 13   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE BMTC OLD<br>DIVISIONAL OFFICE (SOUTH)<br>NO. 70-46-30/11 WARD NO.117,<br>BEHIND BMTC BUS STAND,<br>SHANTHINAGAR, BA NGALORE-<br>560027, KARNATAKA<br>PH.OFF :080-29607272/29601235,<br>MOB.NO. 9449337272<br>FAX :080-26644848<br>E-MAIL : <a href="mailto:rcbangalore@ignou.ac.in">rcbangalore@ignou.ac.in</a> | STATE OF KARNATAKA ( DISTRICT:<br>BANGALORE, BANGALORE RURAL,<br>CHIKBALLAPUR, CHITRADURGA, DAVANAGERE,<br>KOLAR, SHIMOGA, TUMKUR, RAMANAGARA,<br>CHAMARAJANAGAR, CHIKMAGALUR DAKSHINA<br>KANNADA, HASSAN, KODAGU, MANDYA,<br>MYSORE, UDUPI)                   |

| Sl.<br>No. | Regional Centre,<br>Name And Code<br>No. Of Learner<br>Support Centres | Address Of The Regional Centre Tel.,<br>Fax & E-Mail  | Jurisdiction   |
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| 6.         | BHAGALPUR RC<br>CODE: 82   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE ROOM NO.305,<br>INSTITUTIONAL AREA MITHAPUR,<br>PATNA-800001, BIHAR PH. NO. 0641-<br>2610055 E-MAIL :<br><a href="mailto:rcbhagalpur@ignou.ac.in">rcbhagalpur@ignou.ac.in</a>  | STATE OF BIHAR ( DISTRICT: BHAGALPUR,<br>BANKA & MUNGER)   |
| 7.         | BHOPAL RC<br>CODE: 15  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE 12, ARERA HILLS,<br>BHOPA L-462 011<br>MADHYA PRADESH<br>PH.OFF : 0755-2578455/ 2578452/<br>2762524 FAX :0755-2578454<br>E-MAIL : <a href="mailto:rcbhopal@ignou.ac.in">rcbhopal@ignou.ac.in</a>   | STATE OF MADHYA PRADESH (DISTRICT:<br>ALIRAJPUR, BHIND, DATIA, HARDA, KHANDWA,<br>MANDSAUR, NEEMUCH, RAJGARH, SHAJAPUR,<br>BAWANI, BHOPAL, DEWAS, GUNA,<br>HOSHANGABAD, JHABUA, KHARGONE, MORENA,<br>RATLAM, SHEOPUR, VIDISHA, ASHOK NAGAR,<br>BETUAL, BURHANPUR, DHAR, GWALIOR,<br>INDORE, RAISEN, REWA, SEHORE, SHIVPURI,<br>UJJAIN) |
| 8.         | BHUBANESHWAR RC<br>CODE: 21  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE C - 1,<br>INSTITUTIONAL AREA<br>BHUBANESHWAR-751 013<br>ORISSA<br>PH. OFF : 0674-2301348/<br>2301250/2301352<br>FAX :0674-2300349<br>E-MAIL : <a href="mailto:rcbhubaneswar@ignou.ac.in">rcbhubaneswar@ignou.ac.in</a>   | STATE OF ORISSA : BHA DRAK, BALASORE,<br>CUTTACK, DHENKANAL, GANJAM, GAJAPATI,<br>JAJPUR, JAGATSINGHPUR, KHORDHA,<br>KEONJHAR, KANDHAMAL, KENDRAPARA,<br>MAYURBHANJ,NAYAGARH, PURI, SRC-<br>KANDHMAL   |
| 9.         | BIJAPUR RC<br>CODE: 85   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE 1ST FLOOR,<br>PLAZA II, TOURISM DEPARTMENT<br>BUILDING<br>(OPPOSITE TO DR. B.R.A MBEDKAR<br>STADIUM) INDI ROAD VIJAYAPURA-<br>586101 KARNATAKA<br>PH.OFF : 08352-252006<br>FAX : 08352-256005<br>E-MAIL : <a href="mailto:rcbijapur@ignou.ac.in">rcbijapur@ignou.ac.in</a> | STATE OF KARNATAKA COVERING (DISTRICTS<br>BAGA LKOTE, BIJAPUR, BIDAR, GULBARGA,<br>KOPPAL RAICHUR, YADGIR, HAVERI, GADAG,<br>BELLA RY, BELGAUM AND DHARWAD) STATE OF<br>MAHARASHTRA (DISTRICTS SOLAPUR,LATUR)  |
| 10.        | Chandigarh Rc<br>Code: 06  | Regional Director Ignou Regional Centre<br>Chaudhry Devi Lal Memorial Centre For<br>Learning (Ccdl)<br>Plot No 5 Madhya Marg<br>Sector-28 Chandigarh-160002<br>E-Mail: Rccchandigarh@ignou.Ac.In<br>E-Mail : <a href="mailto:rcchandigarh@ignou.ac.in">rcchandigarh@ignou.ac.in</a>                                   | State Of Punjab (District: Patiala, Mohali, Rup Nagar,<br>Fatehgarh Saheb), State Of Haryana (District:<br>Ambala, Panchkula), Chandigarh (U.T.)   |
| 11.        | CHENNAI RC<br>CODE: 25   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE PERIYAR THIDAL,<br># 84/1,EVK SAMPATH SALAI VEPERY,<br>CHENNAI-600007, TAMILNADU<br>PH.OFF : 044-26618040,26618489<br>FAX :044-24312799<br>E-MAIL : <a href="mailto:rcchennai@ignou.ac.in">rcchennai@ignou.ac.in</a>   | STATE OF TAMIL NADU ( DISTRICT: CHENNAI,<br>CHENGALPATTU,THIRUVALLUR, KANCHIPURAM,<br>VELLORE,<br>RANIPET,TIRUPATTUR,THIRUVANNAMALAI,<br>KRISHNAGIRI, DHARMAPURI, SALEM,<br>NAMAKKAL, KALLAKURICHI, VILLUPURAM,<br>CUDDALORE,MAYILADUTHURAI, PERAMBALUR,<br>NAGAPATTINAM, PUDUCHERRY (U.T.)  |
| 12.        | COCHIN RC<br>CODE: 14  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE KALOOR<br>COCHIN - 682 017, KERALA<br>PH.OFF : 0484-2340203 FAX :NA<br>E-MAIL : <a href="mailto:rccohin@ignou.ac.in">rccohin@ignou.ac.in</a>   | STATE OF KERALA (DISTRICT: ALAPPUZHA,<br>ERNAKULAM, IDUKKI, KOTTAYAM, PALAKKAD,<br>THIRUSSUR, LAKSHADWEEP(U.T.)  |

| Sl.<br>No. | Regional Centre,<br>Name And Code<br>No. Of Learner<br>Support Centres | Address Of The Regional Centre Tel.,<br>Fax & E-Mail   | Jurisdiction  |
|------------|--|--|---|
| 13.        | DARBHANGA RC   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE LALIT NARAYAN<br>MITHLA UNIVERSITY CAMPUS,<br>KAMESHWAR NAGAR,<br>NEAR CENTRAL BANK,<br>DARBHANGA -846004,<br>BIHAR<br>PH.OFF : 06272-251833,251862 RC<br>WEBSITE : <a href="http://www.rcdarbhanga.ignou.ac.in">www.rcdarbhanga.ignou.ac.in</a><br>E-MAIL : <a href="mailto:rcdarbhanga@ignou.ac.in">rcdarbhanga@ignou.ac.in</a> | STATE OF BIHAR ( DISTRICT: BEGUSARAI,<br>DARBHANGA, EAST CHAMPARAN, GOPALGANJ,<br>SHEOHAR, SITAMARHI, SAMISTIPUR, MADUBANI,<br>MUZAFFARPUR & WEST CHAMPARAN)  |
| 14.        | DEHRADUN RC  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE NANOOR KHERA,<br>TAPOVAN,<br>RAIPUR ROAD DEHRADUN - 248 008<br>UTTRAKHAND<br>PH.OFF : 0135-2789200/2789205<br>E-MAIL : <a href="mailto:rcdehradun@ignou.ac.in">rcdehradun@ignou.ac.in</a>   | STATE OF UTTARAKHAND ( DISTRICT:<br>DEHRADUN, PAURI, CHAMOLI, TEHRI,<br>UTTARAKASHI, RUDRAPRAYAG, HARIDWAR,<br>NAINITAL, ALMORA, PITHORAGARH, US NAGAR,<br>CHAMPAWAT, BAGESHWAR)  |
| 15.        | DELHI 1 RC   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE PLOT NO J-2-1<br>BLOCK- B 1, MOHAN COOPERATIVE<br>INDUSTRIAL ESTATE, ATHURAROAD,<br>NEW DELHI - 110 044<br>PH.OFF : 011-26990085, 26990089 FAX<br>:011-26990084<br>E-MAIL : <a href="mailto:rcdelhi1@ignou.ac.in">rcdelhi1@ignou.ac.in</a>  | STATE OF DELHI (COVERING AREAS OF<br>MEHRAULI, CHANAKYAPURI, LODHI COLONY,<br>SOUTHEXTENSION, R.K. PURAM, VASANT KUNJ,<br>SAKET, GREEN PARK, LAJPAT NAGAR, G.K.,<br>MALVIYA NAGAR, BHOGAL, ASHRAM, HAUZ<br>KHAS, MUNIRIKA, OKHLA, SANGAM VIHAR,<br>FRIENDS COLONY, BADA RPUR) STATE OF<br>HARYANA (DISTRICT: FARIDABAD, PALWAL)   |
| 16.        | DELHI 2 RC   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE C/O IAEA HOUSE,<br>17-B, INDRAAPRASTHA ESTATE,<br>MAHATMA GANDHI MARG,<br>NEW DELHI - 110 002<br>PH.OFF : 011-23392374/ 23392376,<br>23392737 FAX :011-23392375<br>E-MAIL : <a href="mailto:rcdelhi2@ignou.ac.in">rcdelhi2@ignou.ac.in</a>  | STATE OF DELHI (COVERING AREAS OF KARALA,<br>PRAHLADPUR, BANAGAR, LIBASPUR, RAMA<br>VIHAR, RANI BAGH, SULTAN PURI, BUD VIHAR,<br>MANGOLPURI, PITAMPURA, JAHANGIR PURI,<br>JHARODA MAJA, BURARI, DR. MUKHERJEE<br>NAGAR, MODEL TOWN, SHAKURPUR COLONY,<br>GTB NAGAR,ASHOK VIHAR, SHASTRI NAGAR,<br>CIVIL LINES, YAMUNA VIHAR, NAND NAGRI BHR)  |
| 17.        | DELHI 3 RC   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE DELHI LIBRARY<br>ASSOCIATION BUILDING,<br>RANGANATHAN BHAWAN NEAR, _C'<br>BLOCK, COMMUNITY CENTRE,<br>NARAINA VIHAR,<br>NEW DELHI - 110 028<br>PH.OFF : 011-25774255/25774256<br>E-MAIL : <a href="mailto:rcdelhi3@ignou.ac.in">rcdelhi3@ignou.ac.in</a>  | STATE OF DELHI (COVERING AREAS OF<br>MUNDKA, NANGLOI JAT, PEERAGARHI, PUNJABI<br>BA GH, BAKA RWALA, MEERA BAGH, MOTI<br>NAGAR, TILAK NAGAR, TILANGPUR, KOTLA,<br>VIKASPURI, SUBHASH NAGAR, UTTAM NAGAR,<br>JANAKPURI, NAZAFGARH, MAHAVIR ENC.,<br>SAGARPUR, DWARKA, PALAM, PALAM FARMS,<br>KAPASERA, DHAULA KUAN, NARAINA,<br>MAHIPALPUR, MANSAROVAR GARDEN) STATE<br>OF HARYANA (DISTRICT: GURGAON, MEWAT) |
| 18.        | DEOGHAR RC   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE MANDAKINI<br>SADAN BASUWA DIH,<br>ROHINI ROAD,<br>DEOGHAR,<br>JASIDIH,<br>JHARKHAND- 814142<br>PH.OFF : 06432-34448<br>E-MAIL : <a href="mailto:rcdeoghbar@ignou.ac.in">rcdeoghbar@ignou.ac.in</a>  | STATE OF JHARKHAND COVERING (DISTRICTS<br>DEOGHAR, GODDA, SAHIBGANJ, PAKUR, DUMKA,<br>JAMTARA, & GIRIDIH)   |

| Sl. No. | Regional Centre, Name And Code<br>No. Of Learner Support Centres | Address Of The Regional Centre Tel., Fax & E-Mail   | Jurisdiction   |
|---------|--|---|--|
| 19.     | GANGTOK RC<br>CODE: 24   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE 5TH MILE<br>TADONG, NH-10,<br>BELOW CENTRAL REFERAL<br>HOSPITAL, GANGTOK - 737102<br>SIKKIM PH.OFF :03592-231102<br>FAX : 03592-231103<br>E-MAIL : <a href="mailto:rcgangtok@ignou.ac.in">rcgangtok@ignou.ac.in</a>  | STATE OF SIKKIM<br>(DISTRICT:GANGTOK,PAKYONG,GYALSHING,SOR ENG,MANGAN,NAMCHI)  |
| 20.     | GUWAHATI RC<br>CODE:04   | REGIONAL DIRECTOR IGNOU<br>REGIONALCENTRE HOUSE NO 71,<br>GMCH ROAD, CHRISTIAN BASTI<br>GUWAHATI-781005, ASSAM<br>PH.OFF : 0361-2343771/ 2343785<br>FAX :0361-2343784<br>E-MAIL : <a href="mailto:rcguwahati@ignou.ac.in">rcguwahati@ignou.ac.in</a>  | STATE OF ASSAM ( DISTRICT: KARBIANGLONG, MARIGAON, DARRANG, KAMRUP, NALBARI, BARPETA, BONGAIGAON, GOALPARA, KOKRAJHAR, DHUBRI, NORTH CACHAR HILLS, CACHAR, HAILAKANDI,KARIMGANJ, KAMRUP METROPOLITAN, BAKSA, UDALGURI, CHIRANG,BAJALI)   |
| 21.     | HYDERABAD RC<br>CODE: 01   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE First Floor, M-5 Block, Manoranjan Complex, Telangana State Housing Board Complex, (Adjacent To Gandhi Bhavan Metro Station, M J Road Nampally, HYDERABAD - 500001,Telangana PH.OFF : 040-23117550, Mob.No.9492451812 FAX :NA<br>E-MAIL : <a href="mailto:rchyderabad@ignou.ac.in">rchyderabad@ignou.ac.in</a> | STATE OF TELENGANA ( DISTRICT: ADILABAD,BHADRADRI-KOTHAGUDEM, HYDERABAD, JAGTIAL,JANGAON,JYAYASHANKAR BHOOPALPALLY,JOGULAMBA-GADWAL,KARIM NAGAR, KAMAREDDY,KOMARAM BHEEM ASIFABAD,KHAMMAM, MEDAK, MAHABUB NAGAR, MAHABUBABAD,MANCHERIAL, MEDCHAL,MEDAK, NALGONDA, NAGARKURNOOL, NIZAMABAD,NIRMAL,PEDDAPALLE,RAJANNA SIRCILLA, RANGA REDDY,SANGAREDDY,SIDDIPET,SURYAPET,VIKA RABAD,WANAPARTHY,WARANGAL (RURAL), WARANGAL (URBAN),YADADRI-BHUVANAGIRI, MULUGU,NARAYANPET |
| 22.     | IMPHAL RC<br>CODE: 17  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE ASHA JINA COMPLEX, NORTH AOC IMPHAL-795001MANIPUR PH.OFF : 0385-2421190/2421191 FAX :0385-2421192<br>E-MAIL : <a href="mailto:rcimphal@ignou.ac.in">rcimphal@ignou.ac.in</a> , <a href="mailto:ignouimp@gmail.com">ignouimp@gmail.com</a>  | STATE OF MANIPUR (DISTRICT: BISHNUPUR, CHURACHANDPUR, CHANDEL, IMPHAL EAST, IMPHAL WEST, SENAPATI, TAMENGLONG, THOUBAL, UKHRUL)  |
| 23.     | ITANAGAR RC<br>CODE: 03  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE HORNBILL COMPLEX, ' C' SECTOR (NEAR CENTRAL SCH.) NAHARLAGUN ITANAGAR -791110, ARUNACHAL PRADESH PH.OFF : 0360-2247536, 0360-2351705 FAX :0360-2350990<br>E-MAIL : <a href="mailto:rcitanagar@ignou.ac.in">rcitanagar@ignou.ac.in</a>  | STATE OF ARUNACHAL PRADESH (DISTRICT: ANJAW, CHANGLANG, EAST KAMENG, EAST SIANG, KURUNG KUMEY, LOHIT, LOWER DIBA NG VALLEY, LOWER SUBANSIRI, PAPUM PARE, TAWANG, TIRAP, UPPER DIBANG, UPPER SUBANSIRI, UPPER SIANG, WEST KAMENG, WEST SIANG)   |
| 24.     | JABALPUR RC<br>CODE: 41  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE 2ND FLOOR, RAJSHEKHAR BHA VAN, RANI DURGAVATI VISHVAVIDYALAYA CAMPUS, PACHPEDHI, JABALPUR - 482001 PH.OFF : 0761-2600411/2609896 / 2600219 FAX :0761-2609919<br>E-MAIL : <a href="mailto:rcjabalpur@ignou.ac.in">rcjabalpur@ignou.ac.in</a>  | STATE OF MADHYA PRADESH (DISTRICT: ANNUPUR BALAGHAT, CHHINDWARA, DINDORI, JABALPUR, KATNI, MANDLA, NARSINGAPUR, SEONI, SHAHDOL, SIDDHI, SINGRAULI, UMARIA, DAMOH, PANNA, SAGAR, CHHATARPUR, REWA , SATNA,TIKAMGARH)  |

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| 25.                | JAIPUR RC<br>CODE: 23  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE 70/ 79, SECTOR-7, PATEL MARG, MANSAROVAR, JAIPUR - 302 020 RAJASTHAN<br>PH.OFF : 0141-2785730 FAX :<br>E-MAIL : <a href="mailto:rcjaipur@ignou.ac.in">rcjaipur@ignou.ac.in</a>  | STATE OF RAJASTHAN ( DISTRICT: AJMER, ALWAR, BARAN, BHARATPUR, BHILWARA, BUNDI, CHITTORGARH, CHURU, DAUSA, DHOLPUR, HANUMANGARH, JAIPUR, JHALAWAR, JHUNJHUNU, KARAULI, KOTA, SAWAI MADHOPUR, SIKAR, SRI GANGANAGAR & TONK)                          |
| 26.                | JAMMU RC<br>CODE: 12   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE SPMR COLLEGE OF COMMERCE, PREMISES AUROBINDO BLOCK, 1ST FLOOR,CANAL ROAD, JAMMU - 180 001, JAMMU & KASHMIR PH.OFF : 0191-2546529 FAX :0191-2585154<br>E-MAIL : <a href="mailto:rcjammu@ignou.ac.in">rcjammu@ignou.ac.in</a>       | STATE OF JAMMU & KASHMIR (JAMMU REGION – DISTRICT: DODA, JAMMU, KATHUA, KISHTWAR, POONCH, RAJOURI, RAMBAN, REASI, SAMBA, UDHAMPUR)  |
| 27.                | JODHPUR RC<br>CODE:88  | REGIONAL DIRECTOR IGNOU<br>REGIONALCENTRE,<br>PLOT NO. 439, OPP. PAL LINK ROAD, KAMLA NAGAR HOSPITAL, JODHPUR-342008<br>RAJASTHAN PH.OFF : 0291-2012987<br>E-MAIL : <a href="mailto:rcjodhpur@ignou.ac.in">rcjodhpur@ignou.ac.in</a>   | STATE OF RAJASTHAN COVERING DISTRICTS JODHPUR, BARMER, JAISALMER, RAJASMAND, UDAIPUR, BIKANER, JALORE, SIROHI, NAGOUR, DUNGARPUR, PALI, PRATAPGARH,BANSWARA   |
| 28.                | JORHAT RC<br>CODE: 37  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE P.O.<br>KOROKATOLY,BALIGAON,<br>JORHAT-785015,<br>ASSAM<br>PH.OFF : 0376-2951116, 2951114<br>E-MAIL : <a href="mailto:rcjorhat@ignou.ac.in">rcjorhat@ignou.ac.in</a>  | STATE OF ASSAM ( DISTRICT: NAGAON, GOLAGHAT, JORHAT, SHIVASAGAR, DIBRUGARH, TINSUKIA, LAKHIMPUR, DHEMAJI, SONITPUR, BISWANATH, CHARAIDEO, HOJAI & MAJULI  |
| 29.                | KARNAL RC<br>CODE: 10  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE KARNAL<br>PLOT No.05,SECTOR-12 (PART 1)<br>URBAN ESTATE KARNAL -132001 (HARYANA)<br>PH.OFF :0184-2271514<br>E-MAIL : <a href="mailto:rckarnal@ignou.ac.in">rckarnal@ignou.ac.in</a>   | STATE OF HARYANA (DISTRICT: BHIWANI, FATEHABAD, HISAR, JHAJJAR, JIND, KAITHAL, KARNAL, KURUKSHETRA, MAHENDRAGARH, PANIPAT, REWARI, ROHTAK, SIRSA, SONIPAT, CHARKHI DADRI, YAMUNANAGAR)  |
| 30.                | KHANNA RC<br>CODE: 22  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE I.T.I. BUILDING<br>BULEPUR, (DISTRICT LUDHIANA)<br>KHANNA – 141401<br>PUNJAB<br>PH.OFF : 01628-229993/237361<br>E-MAIL : <a href="mailto:rckhanna@ignou.ac.in">rckhanna@ignou.ac.in</a>   | STATE OF PUNJAB (DISTRICT: GURDASPUR, AMRITSAR, TARN TARAN, KAPURTHALA,MALERKOTLA,PATHANKOT,SRI MUKTSAR SAHIB, JALANDHAR, HOSHIARPUR, SBS NAGAR/NAWANSHAHR, BARNALA, SANGRUR, BATHINDA, MANSA, MUKTSAR, LUDHIANA, FAZILKA,FEROZEPUR, FARIDKOT,MOGA) |
| 31.                | KOHIMA RC<br>CODE: 20  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE NEAR MOUNT HERMON SCHOOL, DON BOSCO, HR. SEC SCHOOL ROAD, KENDOUZOU, KOHIMA – 797001<br>NAGALAND<br>PH.OFF : 0370-2260366/2260167<br>FAX :0370-2260216<br>E-MAIL : <a href="mailto:rckohima@ignou.ac.in">rckohima@ignou.ac.in</a> | STATE OF NAGALAND ( DISTRICT: KOHIMA, DIMAPUR, WOKHA, MOKOKCHUNG, ZUNHEBOTO, TUENSANG, LONGLENG, KIPHIKE, MON, PEREN, PHEK)   |

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| 32.        | KOLKATA RC<br>CODE: 28   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE BIKASH BHAWAN,<br>4TH FLOOR,<br>NORTH BLOCK,<br>SALT LAKE,<br>BIDHAN NAGAR,<br>KOLKATA - 700 091<br>WEST BENGAL<br>PH.OFF : 033-23349850, 23592719,<br>033-23589323( RCL)<br>FAX :033-23347576<br>E-MAIL : <a href="mailto:rckolkata@ignou.ac.in">rckolkata@ignou.ac.in</a> | STATE OF WEST BENGAL (DISTRICT: KOLKATA,<br>NORTH 24 PARAGANAS, SOUTH 24 PARAGANAS,<br>PURBA, MEDINIPUR, PASCHIM MEDINIPUR,<br>BANKURA, HOWRAH, HOOGHLY, PURULIA,<br>BURDWAN, NADIA)  |
| 33.        | KORAPUT RC<br>CODE: 44   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE DISTRICT<br>AGRICULTURE OFFICE ROAD,<br>BEHIND WOMEN'S COLLEGE<br>AT/PO/DISTT.- KORAPUT-764020,<br>ORISSA<br>PH.OFF : 06852-251535<br>FAX : 06852-252503<br>E-MAIL : <a href="mailto:rckoraput@ignou.ac.in">rckoraput@ignou.ac.in</a>                                       | STATE OF ORISSA (DISTRICT: KORAPUT,<br>MALKANGIRI, RAYAGADA, NABARANGPUR,<br>KALAHANDI, NUAPADA, BALANGIR)  |
| 34.        | LUCKNOW RC<br>CODE: 27   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE 5-C/INS-1,<br>SECTOR-5, VRINDAVAN YOJNA,<br>TELIBAGH<br>LUCKNOW-226029<br>PH. OFF : 0522-2442832<br>E-MAIL : <a href="mailto:rclucknow@ignou.ac.in">rclucknow@ignou.ac.in</a>   | STATE OF UTTAR PRADESH (DISTRICT:<br>AURAIYA, BAHRAICH, BALRAMPUR, BANDA,<br>BARABANKI, BAREILLY, BASTI, CHITRAKUT,<br>FAIZA BAD, FARUKHABAD (FATEHGARH),<br>FATEHPUR, GONDA, HAMIRPUR,<br>HARDOI, JALAUN (ORAI), JHANSI, KANNAUJ,<br>KANPUR RURAL, KANPUR URBAN, KAUSHAMBI,<br>LAKHIMPUR(KHERI), LALITPUR, LUCKNOW,<br>MAHOBA, PILIBHIT, RAE BAREILY,<br>SHAHJANANPUR, SHRAVASTI,<br>SIDHARTH NAGAR, SITAPUR, UNNAO) |
| 35.        | MADURAI RC<br>CODE: 43   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE SIKKANDAR<br>CHAVADI, ALANGANALLUR ROAD,<br>MADURAI-625018<br>TAMIL NADU<br>PH.OFF : 0452-2380733 : 0452-2380775<br>FAX : 0452-2380588<br>E-MAIL : <a href="mailto:rcmadurai@ignou.ac.in">rcmadurai@ignou.ac.in</a>   | STATE OF TAMIL NADU ( DISTRICT:<br>COIMBATORE, DINDIGUL, ERODE, KARUR,<br>MADURAI, NILGIRIS, PUDUKKOTTAI, RAMA-<br>NATHPURAM, SIVAGANGAI, THANJAVUR, THENI,<br>THIRUVARUR, THoothukudi, TIRUNELVELI<br>AND TENKASI TIRUCHIRAPPALLI, TIRUPUR,<br>VIRUDHUNAGAR AND ARIYALUR)  |
| 36.        | MUMBAI RC<br>CODE: 49  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE<br>PLOT NO.43, SECTOR 09, OPP.DAV<br>PUBLIC SCHOOL,<br>NEW PANVEL EAST, TALUKA-<br>PANVEL, DISTT-RAIGAD, MUMBAI-<br>410206,<br>MAHARASHTRA<br>PH.OFF : 022-27489764<br>FAX : 022-25925411<br>E-MAIL : <a href="mailto:rcmumbai@ignou.ac.in">rcmumbai@ignou.ac.in</a>        | STATE OF MAHARASHTRA (DISTRICT: MUMBAI,<br>THANE, RAIGARH, RATNAGIRI PALGHAR,<br>MUMBAI SUBURBAN)   |

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| 37.        | NAGPUR RC<br>CODE: 36  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE GYAN VATIKA 14,<br>HINDUSTAN COLONIY<br>AMARAVATI ROAD NAGPUR 440033<br>MAHARASHTRA<br>PH. OFF : 0712-2536999, 2537999,<br>0712-202200<br>FAX :0712-2538999<br>E-MAIL : <a href="mailto:rcnagpur@ignou.ac.in">rcnagpur@ignou.ac.in</a>   | STATE OF MAHARASHTRA (DISTRICT:<br>AMRAVATI, BULDHA NA, AKOLA, WASHIM,<br>HINGOLI, PARBHANI, NANDED, YAVATMAL,<br>WARDHA, CHANDRAPUR, NAGPUR, BHA NDARA,<br>GONDIA,GADCHIROLI)                   |
| 38.        | NOIDA RC CODE:<br>39   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE C- 53, SECTOR 62<br>INSTITUTIONAL AREA NOIDA 201305<br>UTTAR PRADESH<br>PH.OFF : 0120-2405012/2405014<br>FAX :0120-2405013<br>E-MAIL : <a href="mailto:rcnoida@ignou.ac.in">rcnoida@ignou.ac.in</a>  | STATE OF UTTAR PRADESH(DISTRICT: GAUTAM<br>BUDH NAGAR, GHAZIABAD, MEERUT, BA GHPAT,<br>BULA ND SHAHR,HAPUR) STATE OF DELHI<br>(MAYUR VIHAR PH – I & II, MAYUR VIHAR EXTN.,<br>VASUNDHARAENCLAVE) |
| 39.        | PANAJI RC<br>CODE: 08  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE H. NO. 1576,<br>NEAR P&T STAFF QUARTERS, ALTO<br>PORVORIM<br>P.O. POVORIM-403521 GOA<br>PH.OFF : 0832-2414553<br>E-MAIL : <a href="mailto:rcpanaji@ignou.ac.in">rcpanaji@ignou.ac.in</a>   | STATE OF GOA (DISTRICT: NORTH GOA, SOUTH<br>GOA), STATE OF KARNATAKA (DISTRICT:<br>UTTARAKANNAD) STATE OF MAHARASHTRA<br>(DISTRICT: SINGDHURG)   |
| 40.        | PATNA RC CODE:<br>05   | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE INSTITUTIONAL<br>AREA,<br>MITHAPUR<br>PATNA-800 001,<br>BIHAR<br>PH.OFF : 0612-2219539/2219541<br>FAX :0612-2219538<br>E-MAIL : <a href="mailto:rcpatna@ignou.ac.in">rcpatna@ignou.ac.in</a>   | STATE OF BIHAR ( DISTRICT: ARWAL,<br>AURANGABAD, BHOJPUR, BUXAR, GAYA, JAMUI,<br>JEHANABAD, KAIMUR, LAKSHISARAI, NALANDA,<br>NAWADA, PATNA, ROHTAS, SHEIKHPURA,<br>VAISHALI, SIWAN, SARAN)       |
| 41.        | PORT BLAIR RC<br>CODE: 02  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE KANNADA<br>SANGHA BUILDING, OPPOSITE<br>CENTRAL WORKSHOP APWD,<br>18, TAGORE ROAD, MOHANPURA,<br>PORT BLAIR, SOUTH-744104<br>ANDAMAN & NICOBAR, ISLANDS<br>PH.OFF :03192-242888<br>FAX : 03192-230111 E-MAIL :<br><a href="mailto:rcportblair@ignou.ac.in">rcportblair@ignou.ac.in</a> | ANDAMAN & NICOBAR ISLANDS (U.T.)<br>(DISTRICT: NORTH & MIDDLE ANDAMAN, SOUTH<br>ANDAMAN, NICOBAR)  |
| 42.        | PUNE RC CODE:<br>16  | REGIONAL DIRECTOR IGNOU<br>REGIONAL CENTRE 1ST FLOOR,<br>MSFC BUILDING 270, SENAPATI<br>BAPAT ROAD<br>PUNE - 411 016<br>MAHARASHTRA<br>PH.OFF : 020-25671867/25651321 FAX<br>:020-25671864<br>E-MAIL : <a href="mailto:rcpune@ignou.ac.in">rcpune@ignou.ac.in</a>   | STATE OF MAHARASHTRA (DISTRICT:<br>NANDURBA R, DHULE, JALGAON, AURANGABAD,<br>NASIK, JALNA, AHMADNAGAR, BID, PUNE,<br>OSMANABAD, , SANGLI, SATARA, KOLHAPUR)                                     |

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| 43.        | RAGHUNATHGAN<br>J RC CODE: 50  | REGIONAL DIRECTOR IGNOU REGIONAL<br>CENTRE KARMATIRTHA COMPLEX,1st<br>FLOOR,<br>B-9,UMARPUR, (NEAR UMARPUR<br>CROSSING HAAT BAZAR),<br>P.O-GHORSHALA, P.S-RAGHUNATHGANJ,<br>DIST- MURSHIDABAD<br>WEST BENGAL L-742 235<br>PH.OFF : 03483-271555/271666<br>E-MAIL : <a href="mailto:rcraghunathgani@ignou.ac.in">rcraghunathgani@ignou.ac.in</a> | STATE OF WEST BENGAL (DISTRICT:<br>MURSHIDABAD, BIRBHUM, MALDA)  |
| 44.        | RAIPUR RC<br>CODE: 35  | REGIONAL DIRECTOR IGNOU REGIONAL<br>CENTRE IGNOU COMPLEX, KACHNA<br>RAIPUR - 492014<br>CHHATTISGARH<br>PH.OFF : 0771-2283285, 2971322 FAX :0771-<br>2971323<br>E-MAIL : <a href="mailto:rcraipur@ignou.ac.in">rcraipur@ignou.ac.in</a>  | STATE OF CHHATTISGARH (DISTRICT: BILA<br>SPUR, DHAMTARI, DURG, JANJGIR-<br>CHAMPA, JASHPUR, KANKER, KAWARDHA,<br>KORBA, KORIYA,MAHASAMUND, RAJGARH,<br>RAIPUR, RAJNANDGAON, SURAJPUR,<br>SARGUJA, BALOD, BALOBAZAR, BA<br>LRAMPUR, BEMETARA, GARIABA NDH,<br>MUNGELI, BASTA R, NARAYANPUR,<br>DANTEWADA, BIJAPUR, SUKMA,<br>KUNDAGOAN) |
| 44.        | RAIPUR RC<br>CODE: 35  | REGIONAL DIRECTOR IGNOU REGIONAL<br>CENTRE IGNOU COMPLEX, KACHNA<br>RAIPUR - 492014<br>CHHATTISGARH<br>PH.OFF : 0771-2283285, 2971322<br>FAX :0771-2971323<br>E-MAIL : <a href="mailto:rcraipur@ignou.ac.in">rcraipur@ignou.ac.in</a>   | STATE OF CHHATTISGARH (DISTRICT: BILA<br>SPUR, DHAMTARI, DURG, JANJGIR-<br>CHAMPA, JASHPUR, KANKER, KAWARDHA,<br>KORBA, KORIYA,MAHASAMUND, RAJGARH,<br>RAIPUR, RAJNANDGAON, SURAJPUR,<br>SARGUJA, BALOD, BALOBAZAR, BA<br>LRAMPUR, BEMETARA, GARIABA NDH,<br>MUNGELI, BASTA R, NARAYANPUR,<br>DANTEWADA, BIJAPUR, SUKMA,<br>KUNDAGOAN) |
| 45.        | RAJKOT RC<br>CODE: 42  | REGIONAL DIRECTOR IGNOU REGIONAL<br>CENTRE SAURASHTRA UNIVERSITY<br>CAMPUS<br>RAJKOT-360005, GUJARAT<br>PH.OFF : 0281-2572988 FAX : 0281-2571603<br>E-MAIL : <a href="mailto:rcrajkot@ignou.ac.in">rcrajkot@ignou.ac.in</a>   | STATE OF GUJARAT (DISTRICT: RAJKOT,<br>KACHCHH, JAMNAGAR, PORBANDAR,<br>JUNAGADH, AMRELI, BHAVNAGAR,<br>SURENDRANAGAR, DEV-BHOOMI DWARKA,<br>GIR-SOMNATH, BOTAD, MORBI), & DIU(U.T.)   |
| 46.        | RANCHI RC<br>CODE: 32  | REGIONAL DIRECTOR IGNOU REGIONAL<br>CENTRE 2nd FLOOR, KRISHNA MALL,<br>ASHOK NAGAR RANCHI - 834022,<br>JHARKHAND PH.OFF : 0651-2244688,<br>2244699, 2244677 FAX :NA<br>E-MAIL : <a href="mailto:rcranchi@ignou.ac.in">rcranchi@ignou.ac.in</a>  | STATE OF JHARKHAND (DISTRICT: RANCHI,<br>LOHARDAGA, GUMLA, SIMDEGA, PALAMU,<br>LATEHAR, GARHWA, WEST SINGHBHUM,<br>SARAIKELA KHARSAWAN, EAST<br>SINGHBHUM, HAZARIBAGH, CHATRA,<br>KODERMA, KHUNTI, RAMGARH,BOKARO,<br>DHANBAD)   |
| 47.        | SAHARSA RC<br>CODE: 86   | REGIONAL DIRECTOR IGNOU REGIONAL<br>CENTRE KOSHI CHOWK SHARSHA-852201,<br>BIHAR<br>PH.OFF : 06478-219015/295252 FAX :<br>E-MAIL : <a href="mailto:rcsaharsa@ignou.ac.in">rcsaharsa@ignou.ac.in</a>  | STATE OF BIHAR COVERING (DISTRICTS:<br>KHAGARIYA, SAHARSA, SUPAUL,<br>MADHEPURA, KATIHAR, ARARIYA,<br>KISHANGANJ & PURNEA)   |
| 48.        | SHILLONG RC<br>CODE: 18  | REGIONAL DIRECTOR IGNOU REGIONAL<br>CENTRE UMSHING, MAWKYNROH, NEHU<br>CAMPUS, SHILLONG - 793 022 MEGHALAYA<br>PH.OFF : 0364-521117/2521271/0364-<br>2520503 FAX :0364-2521271<br>E-MAIL : <a href="mailto:rcshillong@ignou.ac.in">rcshillong@ignou.ac.in</a>   | STATE OF MEGHALAYA (DISTRICT: EAST<br>GARO HILLS, EAST JAITIA HILLS , EAST<br>KHASI HILLS, NORTH GARO HILLS, RI-BHOI,<br>SOUTH GARO HILLS, SOUTH WEST GARO<br>HILLS, SOUTH WEST KHASI HILLS, WEST<br>GARO HILLS, WEST JAITIA HILLS, WEST<br>KHASI HILLS)   |

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| 49.     | SHIMLA RC<br>CODE: 11  | REGIONAL DIRECTOR IGNOU REGIONAL CENTRE BLOCK NO. 9,SDA COMPLEX,KASUMPTI SHIMLA-171 009, HIMACHAL PRADESH PH.OFF : 0177-2624612/2624613 FAX :0177-2624611<br>E-MAIL : <a href="mailto:rcshimla@ignou.ac.in">rcshimla@ignou.ac.in</a>                                     | STATE OF HIMACHAL PRADESH (DISTRICT: BILASPUR, CHAMBA, HAMIRPUR, KANGRA, KINNAUR, KULLU, LAHUL & SPITI, MANDI, SHIMLA, SIRMAUR, SOLAN, UNA)  |
| 50.     | SILIGURI RC<br>CODE: 45  | REGIONAL DIRECTOR IGNOU REGIONAL CENTRE 17/ 12 J. C. BOSE ROAD, SUBHAS PALLY, SILIGURI - 734001 WEST BENGAL PH.OFF :0353-2526818 FAX : NA<br>E-MAIL : <a href="mailto:rcsiliguri@ignou.ac.in">rcsiliguri@ignou.ac.in</a>   | STATE OF WEST BENGAL (DISTRICT: COOCHBEHAR, JALPAIGURI, DARJEELING, UTTAR DINAJPUR, DAKSHIN DINAJPUR, ALIPURDUAR)  |
| 51.     | SRINAGAR RC<br>CODE:30   | REGIONAL DIRECTOR STATE IGNOU REGIONAL CENTRE KURSOO RAJ BAGH, SRINAGAR - 190008 JAMMU & KASHMIR(UT)<br>PH.OFF : 0194-2953017 FAX :0194-2311259<br>E-MAIL : <a href="mailto:rcsrinagar@ignou.ac.in">rcsrinagar@ignou.ac.in</a>   | STATE OF JAMMU & KASHMIR (SRINAGAR REGION-DISTRICT: ANANTNAG, BANDIPORE, BARAMULLA , BUDGAM, GANDERBAL, KARGIL, KULGAM, KUPWARA, LEH, PULWAMA SHOPIAN, SRINAGAR)   |
| 52.     | TRIVANDRUM<br>RC CODE: 40  | REGIONAL DIRECTOR IGNOU REGIONAL CENTRE RAJADHANI COMPLEX OPP PRS HOSPITAL, KILLI PPALAM KARAMANA PO, TRIVANDRUM -695002 KERALA<br>PH.OFF : 0471-2344113/2344120 FAX :0471-2344121 E-MAIL : <a href="mailto:rctrivandrum@ignou.ac.in">rctrivandrum@ignou.ac.in</a>       | STATE OF KERALA (DISTRICT: KOLLAM, PATHANAMTHITTA, THIRUVANANTHAPURAM) STATE OF TAMILNADU (DISTRICT: KANYAKUMARI)  |
| 53.     | VARANASI RC<br>CODE: 48  | REGIONAL DIRECTOR IGNOU REGIONAL CENTRE GANDHI BHAWAN B.H.U. CAMPUS VARANASI-221005 , UTTAR PRADESH<br>PH.OFF : 0542 2368622/2369629/2368448 FAX : NA<br>E-MAIL : <a href="mailto:rcvaranasi@ignou.ac.in">rcvaranasi@ignou.ac.in</a>                                     | STATE OF UTTAR PRADESH (DISTRICT: AMBEDKAR NAGAR, AZAMGARH, BALLIA, CHANDAULI, DEORIA, GHAZIPUR, GORAKHPUR, JAUNPUR, KUSHINAGAR, MAHARAJGANJ, MAU, MIRZAPUR, SANT KABIR NAGAR, SANT RAVIDAS NAGAR, SONEBHDRA, VARANASI, ALLAHABAD, PRATAPGARH, SULTANPUR)          |
| 54.     | VATAKARA RC<br>CODE: 83  | REGIONAL DIRECTOR IGNOU REGIONAL CENTRE NO.14/329 B-E,(ADJ.TO 110 KV.KSEB SUBSTATION), ARAKKILAD ROAD, PUTHUR, KOZHIKODE VATAKARA-673104, KERALA<br>PH.OFF : 0496-2516055/2515413/2525281<br>E-MAIL : <a href="mailto:rcvatakara@ignou.ac.in">rcvatakara@ignou.ac.in</a> | STATE OF KERALA (DISTRICT: KANNUR, KASARAGOD WAYANAND, KOZHIKODE, MALAPPURAM, MAHE, (UNION TERRITORY OF PUDUCHERRY)  |
| 55.     | VIJAYAWADA<br>RC CODE: 33  | REGIONAL DIRECTOR IGNOU REGIONALCENTRES. S.K.P.V.V HINDU HIGH SCHOOL PREMISES, KOTHAPET, VIJAYWADA 520 001, ANDHRA PRADESH<br>PH.OFF : 0866-2565253/2565959<br>FAX :0866-2565353<br>E-MAIL : <a href="mailto:Rcvijayawada@Ignou.Ac.In">Rcvijayawada@Ignou.Ac.In</a>      | STATE OF ANDHRA PRADESH (DISTRICTS: KRISHNA, GUNTUR, PRAKASHAM, NELLORE, CHITTOOR,KADAPA, KURNOOL, ANANTAPUR)  |
| 56.     | VISAKHAPATNA M RC CODE: 84                                       | REGIONAL DIRECTOR IGNOU REGIONAL CENTRE 2nd FLOOR,VUDA COMPLEX USHODAYA JUNCTION SECTOR-12, MVP COLONY VISAKHAPATNAM- 530017 ANDHRA PRADESH PH.OFF :0891-2511200 FAX : NA<br>E-MAIL : <a href="mailto:rcvisakhapatnam@ignou.ac.in">rcvisakhapatnam@ignou.ac.in</a>       | STATE OF ANDHRA PRADESH COVERING (DISTRICTS : EAST GODAVARI, WEST GODAVARI, PARVATHIPURAM MANYAM,ALLURI SITHA RAMARAJU, ANAKAPALLI, KAKINADA, DR.AMBEDKAR KONASEEMA, WEST GODAVARI, VISAKHAPATNAM, VIZIANAGARAM & SRIKAKULAM, ELURU INCLUDING YANAM OF PUDUCHERRY) |

## 12. Address and Codes of Regional Centres and Study Centres

### 1. List of existing B.Sc. Study Centres for B.Sc. Programme with Botany, Chemistry, Mathematics, Physics and Zoology

| S.NO. | RC NAME           | RC CODE | LC CODE | PLACE OF LSC                                |
|-------|-------------------|---------|---------|---|
| 1     | AHMEDABAD         | 9       | 902     | M.S. UNIVERSITY                             |
| 2     | AHMEDABAD         | 9       | 952     | MG SCIENCE INSTITUTE                        |
| 3     | AIZWAL            | 19      | 1903    | GOVERNMENT KOLASIB COLLEGE                  |
| 5     | AIZWAL            | 19      | 1923    | PACHHUNGA UNIVERSITY COLLEGE                |
| 6     | ALIGARH           | 47      | 2713    | ALIGARH MUSLIM UNIVERSITY, ALIGARH          |
| 7     | ANGUL             | 89      | 2108    | G M UNIVERSITY SAMBALPUR                    |
| 10    | ANGUL             | 89      | 2103    | GOVT COLLEGE ROURKELA                       |
| 11    | ANGUL             | 89      | 8900    | IGNOU REGIONAL CENTRE ANGUL                 |
| 12    | ARMY-CHANDIMANDIR | 52      | 5201    | WESTERN COMMAND HRDC                        |
| 14    | BANGALORE         | 13      | 1390    | HASANATH COLLEGE FOR WOMEN, BANGALORE       |
| 15    | BANGALORE         | 13      | 1319    | SRI SIDDARTHA INSTT. OF TECH., TUMKUR       |
| 16    | BHAGALPUR         | 13      | 505     | MARWARI COLLEGE                             |
| 17    | BHAGALPUR         | 13      | 571     | RD & DJ COLLEGE                             |
| 18    | BHOPAL            | 15      | 1501    | MOTILAL VIGYAN MAHAVIDYALAYA, BHOPAL        |
| 19    | BHOPAL            | 15      | 1506    | HOLKAR SCIENCE COLLEGE                      |
| 20    | BHOPAL            | 15      | 1500    | IGNOU REGIONAL CENTRE BHOPAL                |
| 21    |                   |         |         |   |
| 22    | BHUBANESHWAR      | 21      | 2106    | F.M. COLLEGE, BALASORE                      |
| 23    | BHUBANESHWAR      | 21      | 2104    | KHALIKOTE COLLEGE                           |
| 24    | BHUBANESHWAR      | 21      | 2111    | B.J.B. AUTONOMOUS COLLEGE; BHUBANESWAR      |
| 27    | BHUBANESHWAR      | 21      | 2135    | KSUB COLLEGE, BHANJANAGAR                   |
| 28    | BHUBANESHWAR      | 21      | 2141    | KENDRAPADA COLLEGE                          |
| 29    | BHUBANESHWAR      | 21      | 2103    | ROURKELA                                    |
| 30    | BHUBANESHWAR      | 21      | 2108    | SAMBALPUR                                   |
| 31    | BIJAPUR           | 85      | 1303    | J.S.S. COLLEGE VIDYAGIRI DHARWAD            |
| 32    | BIJAPUR           | 85      | 1324    | BASAVESHWAR SCIENCE COLLEGE BAGALKOT        |
| 34    | CHANDIGARH        | 6       | 6007    | SGGS COLLEGE, CHD                           |
| 35    | CHENNAI           | 25      | 2534    | ER. PERUMAL MANIMEKALAI P'NIC               |
| 36    | CHENNAI           | 25      | 2509    | SACRED HEART COLLEGE                        |
| 37    | CHENNAI           | 25      | 2578    | GURU NANAK COLLEGE                          |
| 38    | CHENNAI           | 25      | 2593    | VOORHEES COLLEGE                            |
| 44    | COCHIN            | 14      | 1402    | SACRED HEART COLLEGE                        |
| 45    | DARBHANGA         | 46      | 504     | BRA BIHAR UNIVERSITY                        |
| 46    | DARBHANGA         | 46      | 550     | GANESH DUTT COLLEGE                         |
| 47    | DARBHANGA         | 46      | 551     | SAMASTIPUR COLLEGE                          |
| 50    | DEHRADUN          | 31      | 2711    | MB PG COLLEGE HALDWANI                      |
| 51    | DEHRADUN          | 31      | 31031   | GOVT. PG COLLEGE AGASTYAMUNI, RUDRAPRAYAG   |
| 52    | DEHRADUN          | 31      | 2726    | L.S.M. GOVERNMENT P.G. COLLEGE, PITHORAGARH |
| 53    | DEHRADUN          | 31      | 2715    | GOVERNMENT PG COLLEGE, GOPESHWAR            |
| 54    | DEHRADUN          | 31      | 2748    | GOVT PG COLLEGE UTTARKASHI                  |
| 58    | DEHRADUN          | 31      | 2754    | DR. P.D.B. GOVT. P.G. COLLEGE, KOTDWARA     |
| 59    | DEHRADUN          | 31      | 2762    | D.S.B CAMPUS KUMAON UNIV., NAINITAL         |
| 60    | DEHRADUN          | 31      | 2705    | D.A.V. PG COLLEGE DEHRADUN                  |
| 61    | DEHRADUN          | 31      | 2717    | SSJ CAMPUS KUMAON UNIVERSITY, ALMORA        |
| 66    |                   |         |         |   |

|     |                                      |    |       |   |
|-----|--------------------------------------|----|-------|---|
| 67  | DELHI 1 (MOHAN ESTATE (SOUTH DELHI)) | 7  | 711   | GARGI COLLEGE                                   |
| 68  | DELHI 1 (MOHAN ESTATE (SOUTH DELHI)) | 7  | 765   | JAMIA MILLIA ISLAMIA UNIVERSITY                 |
| 69  | DELHI 1 (MOHAN ESTATE (SOUTH DELHI)) | 7  | 1007  | PT. J.L. NEHRU GOVT. COLLEGE                    |
| 70  | DELHI 1 (MOHAN ESTATE (SOUTH DELHI)) | 7  | 7189  | SRI AUROBINDO COLLEGE (MORNING)                 |
| 71  | DELHI 1 (MOHAN ESTATE (SOUTH DELHI)) | 7  | 7191  | ACHARYA NARENDRA DEV COLLEGE                    |
| 72  | DELHI 2                              | 29 | 29052 | HANSRAJ COLLEGE                                 |
| 73  | DELHI 2                              | 29 | 29058 | ZAKIR HUSSAIN COLLEGE                           |
| 74  | DELHI 2                              | 29 | 729   | SWAMI SHRADHANAND COLLEGE                       |
| 81  | DELHI 2                              | 29 | 29065 | MIRANDA HOUSE UNIVERSITY OF DELHI               |
| 88  | DELHI 3 NARAINA                      | 38 | 38042 | BHASKARACHARYA COLLEGE OF APPLIED SCIENCES      |
| 89  | DELHI 3 NARAINA                      | 38 | 38045 | SHIVAJI COLLEGE                                 |
| 90  | DELHI 3 NARAINA                      | 38 | 1006  | DRONACHARYA GOVERNMENT COLLEGE                  |
| 91  | DELHI 3 NARAINA                      | 38 | 38046 | RAJDHANI COLLEGE RAJA GARDEN                    |
| 92  | DELHI 3 NARAINA                      | 38 | 38044 | DPG DEGREE COLLEGE                              |
| 93  | DEOGHAR                              | 87 | 3609  | A.S. COLLEGE                                    |
| 94  | DEOGHAR                              | 87 | 3604  | S.P. COLLEGE                                    |
| 95  | DEOGHAR                              | 87 | 87005 | DEOGHAR COLLEGE, DEOGHAR                        |
| 96  | DEOGHAR                              | 87 | 3605  | SAHIBGANJ COLLEGE                               |
| 104 | DEOGHAR                              | 87 | 8700  | IGNOU REGIONAL CENTRE DEOGHAR                   |
| 105 | DEOGHAR                              | 87 | 87009 | B.S.K. COLLEGE, BARHARWA                        |
| 106 | GUWAHATI                             | 4  | 411   | BAJALI COLLEGE, BARPETA                         |
| 107 | GUWAHATI                             | 4  | 404   | BIRJHORA MAHAVIDYALAYA                          |
| 108 | GUWAHATI                             | 4  | 408   | HANDIQUE GIRLS COLLEGE, GUWAHATI                |
| 109 | GUWAHATI                             | 4  | 4196  | PRAGJYOTISH COLLEGE                             |
| 110 |                                      |    |       |   |
| 111 | GUWAHATI                             | 4  | 404   | BONGAIGAON                                      |
| 112 | GUWAHATI                             | 4  | 4196  | GUWAHATI  |
| 113 | HYDERABAD                            | 1  | 111   | AURORA DEGREE COLLEGE, HYDERABAD                |
| 114 | IMPHAL                               | 17 | 1707  | D.M. COLLEGE OF SCIENCE, IMPHAL                 |
| 119 | IMPHAL                               | 17 | 1705  | THOUBAL GOVERNMENT COLLEGE, THOUBAL             |
| 120 | IMPHAL                               | 17 | 1703  | PRESIDENCY COLLEGE, MOTBUNG                     |
| 121 | IMPHAL                               | 17 | 1709  | JIRIBAM HIGHER SECONDARY SCHOOL-JIRIBAM, IMPHAL |
| 122 | ITANAGAR                             | 3  | 303   | JAWAHARLAL NEHRU COLLEGE, PASSIGHAT, ITANAGAR   |
| 123 |                                      |    |       |   |
| 124 | JABALPUR                             | 41 | 41016 | GOVT. DEGREE COLLEGE, JUNNARDEO                 |
| 125 | JABALPUR                             | 41 | 1592  | GOVT. SCIENCE COLLEGE PANDHURNA                 |
| 126 | JABALPUR                             | 41 | 1565  | GOVT. PG COLLEGE, NARSINGHPUR                   |
| 127 | JABALPUR                             | 41 | 41016 | GOVT. DEGREE COLLEGE, JUNNARDEO                 |
| 128 | JABALPUR                             | 41 | 1589  | GOVT. A.B.COLLEGE BAIHAR                        |
| 129 | JABALPUR                             | 41 | 1567  | GOVT. J.S.T. PG COLLEGE, BALAGHAT               |
| 130 | JABALPUR                             | 41 | 1561  | GOVT. P.G.TILAK COLLEGE, KATNI                  |
| 131 | JABALPUR                             | 41 | 1589  | GOVT. A.B.COLLEGE, BAIHAR                       |
| 132 | JABALPUR                             | 41 | 1560  | GOVT. P. G. COLLEGE, SEONI                      |
| 133 | JABALPUR                             | 41 | 1566  | GOVT. C.V. COLLEGE, DINDORI                     |
| 134 | JABALPUR                             | 41 | 1565  | GOVT. PG COLLEGE, NARSINGHPUR                   |
| 135 | JABALPUR                             | 41 | 1592  | GOVT. SCIENCE COLLEGE PANDHURNA                 |

|     |          |    |       |   |
|-----|----------|----|-------|---|
| 136 | JABALPUR | 41 | 1599  | MATA GUJARI MAHILA MAHIVIDYALYA, JABALPUR                     |
| 137 | JAIPUR   | 23 | 23138 | GOVT. PG COLLEGE, RAJGARH, ALWAR                              |
| 138 | JAIPUR   | 23 | 2310  | D.A.V. COLLEGE, SRIGANGANAGAR                                 |
| 139 | JAIPUR   | 23 | 23132 | GOVT. PG COLLEGE, KARAULI                                     |
| 140 | JAIPUR   | 23 | 2308  | RAJRISHI COLLEGE, ALWAR                                       |
| 141 | JAIPUR   | 23 | 2306  | GOVT COLLEGE, AJMER   |
| 142 | JAIPUR   | 23 | 2385  | GOVT P.G.COLLEGE, DHOLPUR                                     |
| 143 | JAIPUR   | 23 | 23133 | GOVT. PG COLLEGE, BARAN                                       |
| 144 | JAIPUR   | 23 | 23135 | GOVT. ARTS PG COLLEGE, KOTA                                   |
| 145 | JAIPUR   | 23 | 2331  | MAHARANA PRATAP PG GOVT COLLEGE, CHITTORGARH                  |
| 146 | JAIPUR   | 23 | 23192 | SETH GYANIRAM BANSIDHAR PODAR COLLEGE<br>NAWALGARH, JHUNJHUNU |
| 147 | JAIPUR   | 23 | 23193 | GOVERNMENT COLLEGE GANDHI CIRCLE, JAIPUR                      |
| 148 | JAIPUR   | 23 | 23195 | SHRI SANT SUNDAR DAS GOVT GIRLS COLLEGE<br>GUPTESHWAR ROAD    |
| 149 | JAMMU    | 12 | 1232  | GOVT. M.A.M. COLLEGE, JAMMU                                   |
| 150 | JAMMU    | 12 | 1267  | GOVT DEGREE COLLEGE, KISTWAR                                  |
| 151 |          |    |       |   |
| 152 |          |    |       |   |
| 153 | JODHPUR  | 88 | 88008 | MAHILA P.G. MAHAVIDYALAYA, JODHPUR                            |
| 154 | JODHPUR  | 88 | 88014 | SHRI TAGORE P.G. COLLEGE KUCHAMAN CITY, NAGPUR                |
| 155 | JODHPUR  | 88 | 2311  | KUCHAMAN COLLEGE, KUCHAMAN CITY                               |
| 156 | JODHPUR  | 88 | 2361  | GOVT. BANGUR P.G. COLLEGE, PALI                               |
| 157 | JODHPUR  | 88 | 2362  | GOVT. P.G. COLLEGE (BOYS), SIROHI                             |
| 158 | JODHPUR  | 88 | 2304  | ONKARMAL SOMANI COLLEGE OF COM                                |
| 159 | JODHPUR  | 88 | 88012 | ARAVALI MAHVIDHYALAY  |
| 160 | JORHAT   | 37 | 37015 | DEBRAJ ROY COLLEGE, GOLAGHAT                                  |
| 161 | JORHAT   | 37 | 421   | CHAIDUAR COLLEGE  |
| 162 | JORHAT   | 37 | 409   | IGNOU PROG. STUDY CENTRE, JORHAT                              |
| 163 | KARNAL   | 10 | 1005  | CHOTU RAM COLLEGE OF EDUCATION, ROHTAK                        |
| 164 | KARNAL   | 10 | 1009  | GOVERNMENT P.G. COLLEGE, HISSAR                               |
| 165 | KHANNA   | 22 | 2206  | GURU NANAK GIRLS COLLEGE, LUDHIANA                            |
| 166 | KHANNA   | 22 | 2212  | DOABA COLLEGE, JALANDHAR CITY                                 |
| 167 |          |    |       |   |
| 168 | KOLKATA  | 28 | 2809  | BANWARILAL BHALOTIA COLLEGE, ASANSOL                          |
| 169 | KOLKATA  | 28 | 2810  | MAULANA AZAD COLLEGE, KOLKATA                                 |
| 170 | KOLKATA  | 28 | 2813  | MIDNAPUR COLLEGE, MIDNAPORE                                   |
| 171 | KOLKATA  | 28 | 2814  | DINABANDHU ANDREWS COLLEGE, KOLKATA                           |
| 172 | KOLKATA  | 28 | 2842  | BHAIRAB GANGULY COLLEGE, KOLKATA                              |
| 173 | KOLKATA  | 28 | 2800  | IGNOU REGIONAL CENTRE KOLKATA, KOLKATA                        |
| 174 | KOLKATA  | 28 | 28165 | DR KANAILAL BHATTACHARYYA COLLEGE HOWRAH                      |
| 175 |          |    |       |   |
| 176 | KORAPUT  | 44 | 44034 | KHARIAR AUTONOMOUS COLLEGE, NUAPADA                           |
| 177 | KORAPUT  | 44 | 2107  | RAJENDRA COLLEGE, BOLANGIR                                    |
| 178 | KORAPUT  | 44 | 2110  | VIKRAM DEV COLLEGE, JEYPORE                                   |
| 179 |          |    |       |   |
| 180 | LUCKNOW  | 27 | 2720  | LUCKNOW CHRISTIAN P G COLLEGE, LUCKNOW                        |
| 181 | LUCKNOW  | 27 | 2704  | BAREILLY COLLEGE, BAREILLY                                    |
| 182 | LUCKNOW  | 27 | 2767  | PT. JAWAHAR LAL NEHRU (PG) COLLEGE BANDA                      |
| 183 | MADURAI  | 43 | 2541  | CENTRAL PRISON-COIMBATORE(ONLY FOR PRISON<br>INMATES)         |

|     |            |    |       |  |
|-----|------------|----|-------|--|
| 184 | MADURAI    | 43 | 2550  | CENTRAL PRISON - TRICHY  |
| 185 | MADURAI    | 43 | 2502  | DR.G.R.D. COLLEGE OF SCIENCE   |
| 186 | MADURAI    | 43 | 2503  | THIYAGARAJAR COLLEGE, MADURAI  |
| 187 | MADURAI    | 43 | 2504  | BISHOP HEBER COLLEGE   |
| 188 | MADURAI    | 43 | 43016 | VIVEKANANDA COLLEGE  |
| 189 | MUMBAI     | 49 | 1603  | SATHAYE COLLEGE, IGNOU STUDY CENTRE<br>DIXIT ROAD VILE PARLE (E), MUMBAI   |
| 190 | NAGPUR     | 36 | 36009 | INSTITUTE OF SCIENCE, R T ROAD, CIVIL LINE, NAGPUR<br>MAHARASHTRA  |
| 191 |            |    |       |  |
| 192 | NOIDA      | 39 | 39010 | NANAKCHAND ANGLO SANSKRIT COLLEGE MEERUT   |
| 193 | NOIDA      | 39 | 2702  | ST. JOHN'S COLLEGE   |
| 194 | NOIDA      | 39 | 2714  | HINDU COLLEGE, MORADABAD   |
| 195 | NOIDA      | 39 | 2718  | M.M.H. COLLEGE GHAZIABAD   |
| 196 | NOIDA      | 39 | 2739  | GOVERNMENT P.G. COLLEGE, NOIDA   |
| 197 | NOIDA      | 39 | 2743  | LAJPAT RAI (P.G.) COLLEGE SAHIBABAD, SAHIBABAD   |
| 198 | NOIDA      | 39 | 2749  | S.D. COLLEGE, MUZAFFARNAGAR,   |
| 199 | NOIDA      | 39 | 2761  | S.S.V. (P.G.) COLLEGE HAPUR, APUR  |
| 200 | NOIDA      | 39 | 2764  | BABU SHIVNATH AGRAWAL COLLEGE, MATHURA   |
| 201 | NOIDA      | 39 | 2798  | J.V. POST GRADUATE COLLEGE   |
| 202 | NOIDA      | 39 | 2799  | D.N. (PG) COLLEGE MEERUT, MEERUT   |
| 203 | NOIDA      | 39 | 3702  | MAHARAJ SINGH COLLEGE, SAHARANPUR  |
| 204 |            |    |       |  |
| 205 | NOIDA      | 39 | 2707  | M.M.P.G. COLLEGE, MODINAGAR  |
| 206 | NOIDA      | 39 | 3900  | IGNOU REGIONAL CENTRE NOIDA  |
| 207 | NOIDA      | 39 | 39047 | RAMESHWARI DEVI KANYA MAHAVIDYALAYA AGRA   |
| 208 | NOIDA      | 39 | 2702  | ST. JOHN'S COLLEGE, AGRA, AGRA   |
| 209 | NOIDA      | 39 | 2798  | J.V. POST GRADUATE COLLEGE, BARAUT   |
| 210 | NOIDA      | 39 | 7107  | DR. T.N. OJHA, MAHARAJA AGRASEN COLLEGE,<br>VASUNDHARA ENCLAVE,NEAR CHILLA SPORTS<br>COMPLEX,NEW DELHI-110096, DELHI |
| 211 | NOIDA      | 39 | 2718  | JCXQ+P7V, MMH COLLEGE RD, MODEL TOWN WEST,<br>KOTGAON, MODEL TOWN, DAULATPURA, GHAZIABAD,<br>GHAZIABAD               |
| 212 |            |    |       |  |
| 213 |            |    |       |  |
| 214 | PANAJI     | 8  | 802   | DHEMPE COLLEGE OF ARTS AND SCIENCE, MIRAMAR,<br>PANAJI, PANAJI   |
| 215 | PATNA      | 5  | 509   | J.P. UNIVERSITY, CHAPRA  |
| 216 | PATNA      | 5  | 511   | GAYA COLLEGE , GAYA  |
| 217 | PATNA      | 5  | 524   | BIHAR NATIONAL COLLEGE, PATNA  |
| 218 | PATNA      | 5  | 529   | ANUGRAH NARAYAN COLLEGE, PATNA   |
| 219 | PATNA      | 5  | 568   | MUSLIM SCIENCE COLLEGE, PATNA, T.P.S. COLLEGE,<br>PATNA  |
| 220 |            |    |       |  |
| 221 | PATNA      | 5  | 591   | M.V. COLLEGE, BUXAR  |
| 222 | PATNA      | 5  | 5204  | SARDAR VALLABHBHAI PATEL COLLEGE BHABUA  |
| 223 |            |    |       |  |
| 224 | PORT BLAIR | 2  | 201   | JNR MAHAVIDYALALA, PORT BLAIR  |
| 225 | PUNE       | 16 | 1639  | M.S.P MANDALS BALBHIM ARTS,SCIENCE & COMMERCE<br>COLLEGE, BEED   |
| 226 | PUNE       | 16 | 16144 | ABEDA INAMDAR SENIOR COLLEGE OF ARTS,SCIENCE   |

|     |               |    |       |   |
|-----|---------------|----|-------|---|
|     |               |    |       | AND COMMERCE,PUNE   |
| 227 | PUNE          | 16 | 16137 | JALNA EDUCATION SOCIETYS RG BAGDIA ARTS SB LAKHOTIA COMMERCE AND R BEZONIJ SCIENCE COLLEGE JALNA, JALNA |
| 228 | PUNE          | 16 | 1608  | KTHM COLLEGE, NASIK   |
| 229 | PUNE          | 16 | 1610  | VIVEKANAND ARTS & SDS COMMERCE COLLEGE, AURANGABAD  |
| 230 |               |    |       |   |
| 231 | PUNE          | 16 | 16159 | JET'S ZULAL BHILAJIRAO PATIL COLLEGE , PUNE   |
| 232 |               |    |       |   |
| 233 | RAGHUNATHGANJ | 50 | 2820  | RDK COLLEGE OF COMMERCE, MURSHIDABAD, WEST BENGAL   |
| 234 | RAIPUR        | 35 | 1505  | GOVT E RAGHAVENDRA RAO, BILASPUR  |
| 235 |               |    |       |   |
| 236 | RAJKOT        | 42 | 42020 | KAMANI SCIENCE COLLEGE, AMRELI  |
| 237 | RANCHI        | 32 | 503   | P.K. ROY MEMORIAL COLLEGE, DHANBAD  |
| 238 | RANCHI        | 32 | 510   | G.L.A. COLLEGE, DALTONGANJ, PALAMAU   |
| 239 | RANCHI        | 32 | 513   | MARWARI COLLEGE, RANCHI   |
| 240 | RANCHI        | 32 | 525   | MAHILA COLLEGE, CHAIBASA, WEST SINGHBHUM  |
| 241 | RANCHI        | 32 | 528   | ST. COLUMBA'S COLLEGE, HAZARIBAGH   |
| 242 | SAHARSA       | 86 | 555   | SHISHIR KUMAR SINGH M.L.T. COLLEGE, SARSA   |
| 243 | SAHARSA       | 86 | 508   | PURNEA COLLEGE, PURNEA  |
| 244 | SAHARSA       | 86 | 561   | IGNOU STUDY CENTRE, KATIHAR   |
| 245 |               |    |       |   |
| 246 | SHILLONG      | 18 | 1877  | IGNOU STUDY CENTRE  |
| 247 | SHILLONG      | 18 | 1802  | TURA GOVERNMENT COLLEGE   |
| 248 | SHILLONG      | 18 | 1877  | LAITUMKHRAH   |
| 249 | SHIMLA        | 11 | 1102  | GOVERNMENT P.G. COLLEGE, MANDI  |
| 250 | SHIMLA        | 11 | 1101  | GOVERNMENT DEGREE COLLEGE, SHIMLA   |
| 251 | SHIMLA        | 11 | 1104  | GOVERNMENT DEGREE COLLEGE   |
| 252 | SHIMLA        | 11 | 1105  | GOVERNMENT DEGREE COLLEGE   |
| 253 | SHIMLA        | 11 | 1113  | GOVT. P.G. COLLEGE GDC. BILASPUR  |
| 254 | SHIMLA        | 11 | 1133  | GOVT. DEGREE COLLEGE GDC. POANTA SAHIB  |
| 255 | SHIMLA        | 11 | 1113  | BILASPUR  |
| 256 | SHIMLA        | 11 | 1105  | DHARAMSHALA   |
| 257 | SHIMLA        | 11 | 1133  | DIST.SIRMOUR  |
| 258 | SHIMLA        | 11 | 1104  | HAMIRPUR  |
| 259 | SILIGURI      | 45 | 45015 | NORTH BENGAL ST. XAVIERS COLLEGE, RAJGANJ   |
| 260 | SILIGURI      | 45 | 45015 | SILIGURI  |
| 261 | SRINAGAR      | 30 | 1248  | GOVERNMENT DEGREE COLLEGE PULWAMA, PULWAMA  |
| 262 | SRINAGAR      | 30 | 1202  | GOVT. AMAR SINGH COLLEGE, SRINAGAR  |
| 263 | SRINAGAR      | 30 | 1209  | SHRI PRATAP SINGH COLLEGE, SRINAGAR   |
| 264 | SRINAGAR      | 30 | 1210  | GOVERNMENT DEGREE COLLEGE SOPORE, SOPORE  |
| 265 | SRINAGAR      | 30 | 1211  | GOVERNMENT DEGREE COLLEGE ANANTNAG, ANANTNAG  |
| 266 | SRINAGAR      | 30 | 1249  | GOVT. DEGREE COLLEGE KARGIL, KARGIL   |
| 267 | SRINAGAR      | 30 | 30039 | GOVT COLLEGE FOR WOMEN M A ROAD, SRINAGAR   |
| 268 | TRIVANDRUM    | 40 | 1404  | CATHOLICATE COLLEGE   |
| 269 | TRIVANDRUM    | 40 | 1441  | MAR IVANIOS INSTITUTE OF ADVANCE STUDIES  |
| 270 | VARANASI      | 48 | 48028 | ST ANDREWS COLLEGE, GORAKHPUR   |
| 271 | VARANASI      | 48 | 2737  | M.D.P.G. COLLEGE, PRATAPGARH  |

|     |                |    |       |  |
|-----|----------------|----|-------|--|
| 272 | VARANASI       | 48 | 27101 | PG COLLEGE GHAZIPUR                      |
| 273 | VARANASI       | 48 | 2708  | UDAI PRATAP AUTONOMOUS COLLEGE, VARANASI |
| 274 | VARANASI       | 48 | 48028 | CIVIL COURT ROAD                         |
| 275 | VARANASI       | 48 | 27101 | GHAZIPUR                                 |
| 276 | VARANASI       | 48 | 2737  | VARANASI                                 |
| 277 | VARANASI       | 48 | 2708  | VARANASI                                 |
| 278 | VATAKARA       | 83 | 1403  | JDT ISLAM, CALICUT                       |
| 279 | VATAKARA       | 83 | 1405  | SREE NARAYANA COLLEGE, KANNUR            |
| 280 | VATAKARA       | 83 | 1430  | ST. MARRY'S COLLEGE                      |
| 281 | VISAKHAPATNAM  | 84 | 109   | VISAKHAPATNAM                            |
| 282 | VISHAKHAPATNAM | 84 | 84002 | GOVT DEGREE COLLEGE                      |

## **IGNOU Policy Regarding Sexual Harassment at the Work Place**

In compliance with the guidelines of the Supreme Court, IGNOU has adopted a policy that aims to prevent/ prohibit/ punish sexual harassment of women at the workplace. Academic/non-academic staff and students of this University come under its purview. Information on this policy, rules and procedures can be accessed on the IGNOU website ([www.ignou.ac.in](http://www.ignou.ac.in)). Incidents of sexual harassment may be reported to the Regional Director of the Regional Centre you are attached to or to any of the persons whose details are available in following link:

<http://ignou.ac.in/userfiles/IGNOU%20CASH.pdf>