B.Sc. Part-I (Sem-I & II)                             Prospectus No. 2017121
Exam. 2016-17

SANT GADGE BABA AMRAVATI UNIVERSITY

विज्ञान विद्याशाखा
(FACULTY OF SCIENCE)

अभ्यासक्रमिका
विज्ञान स्नातक भाग-1
सत्र-1, परीक्षा हिताली-2016
सत्र-2, परीक्षा उन्नाही-2017

PROSPECTUS
OF
B.Sc. Part-I
SEMESTER-I EXAMINATION W-2016
SEMESTER-II EXAMINATION S-2017

2016

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Amravati University
Amravati- 444 602

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SANT GADGE BABA AMRAVATI UNIVERSITY
SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects, papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc. refer the University Ordinance Booklet the various conditions/provisions pertaining to examinations as prescribed in the following Ordinances-

Ordinance No. 1: Enrolment of Students.
Ordinance No. 2: Admission of Students
Ordinance No. 4: National Cadet Corps
Ordinance No. 6: Examination in General (relevant extracts)
Ordinance No. 18/2001: An Ordinance to provide grace marks for passing in a Head of passing and Improvement of Division (Higher Class) and getting Distinction in the subject and condonation of deficiency of marks in a subject in all the faculties prescribed by the Statute NO.18, Ordinance 2001.
Ordinance No. 9: Conduct of Examinations (Relevant extracts)
Ordinance No. 10: Providing for Exemptions and Compartments
Ordinance No. 19: Admission Candidates to Degrees
Ordinance No.109: Recording of a change of name of a University Student in the records of the University
Ordinance No. 138: For improvement of Division
Ordinance No.19/2001: An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dr. Ajay P. Deshmukh
Registrar
Sant Gadge Baba Amravati University
SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
DIRECTION

No.: 16/2010 Date: 11/06/2010

Subject: Examinations leading to the Degree of विज्ञान स्नातक (Bachelor of Science) (Three Year Degree Course-Semester Pattern), Directon, 2010.


AND

Whereas, the Academic Council while considering the above letter in its meeting held on 30.4.2008, vide item No. 55 has resolved to refer the same to Dean's Committee, and the Dean's Committee in its meeting held on 19.07.2008 has decided to refer the matter to all Board of Studies.

AND

Whereas the recommendations of various Board of Studies in the faculty of Science regarding Upgradation and Revision of various syllabi and introduction and implementation of Semester Pattern Examination System at under graduate level was considered by the faculty of Science in its meeting held on 7.12.2009 and constituted a Committee of all Chairmen of Board of Studies and one member nominated by Chairmen of respective B.O.S. under the Chairmanship of Dean of faculty to decide the policy decision regarding semester pattern examination system.

AND

Whereas, the faculty of Science in its emergent meeting held on 11th May, 2010 vide item No. 26, has considered, accepted and recommended to Academic Council, the policy decision regarding introduction of Semester pattern and the draft syllabi of B.Sc. Part-I (Semester-I & II) along with draft ordinance and other details. The recommendations of the faculty was approved by the Academic Council in its emergent meeting held on 28.5.2010, vide item No. 35 D).

AND

Whereas, Ordinance No. 143 in respect of Examinations leading to the Degree of विज्ञान स्नातक (Bachelor of Science) is in existence in the University as per annual pattern examination system.

AND

Whereas, new scheme of examination as per semester pattern is to be implemented from the Academic Session 2010-11 for Semester-I & onwards which is regulated by an Ordinance and framing of an Ordinance for the above examination is likely to take some time.

AND

Whereas, the admission of students in the semester pattern at B.Sc. Part-I (Semester-I) are to be made in the Academic Session 2010-11.

Now, therefore, I, Dr. Kamal Singh, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called, "Examinations leading to the Degree of विज्ञान स्नातक (Bachelor of Science) (Three Year Degree Course-Semester Pattern), Directon, 2010."

2. This direction shall come into force with effect from the date of its issuance.

3. (i) The following shall be the examination leading to the Degree of विज्ञान स्नातक (Bachelor of Science) in the faculty of Science-

   (1) The विज्ञान स्नातक भाग-1, सत्त्र-1 व 2 (B.Sc. Part-I, Sem-I & II) Examination;
   (2) The विज्ञान स्नातक भाग-2, सत्त्र-3 (B.Sc. Part-II, Semester-III) Examination;
   (3) The विज्ञान स्नातक भाग-2, सत्त्र-4 (B.Sc. Part-II, Semester-IV) Examination;
   (4) The विज्ञान स्नातक अन्त्या, सत्त्र-5 (B.Sc. Final, Semester-V) Examination; and
   (5) The विज्ञान स्नातक अन्त्या, सत्त्र-6 (B.Sc. Final, Semester-VI) Examination.

   (ii) The period of Academic Session shall be such as may be notified by the University.

4. (i) The theory examination of Semester-I & II shall be simulta neously conducted by the University at the end of Semester-II in Summer.

   (ii) The examination of Semester-III, IV, V & VI shall be conducted by the University and shall be held by the end of each semester separately.
(iii) The main examination of Semester-III & V and that of Semester-
IV & VI shall be held in Winter and Summer respectively.
(iv) The supplementary examination for Semester-I & II shall be held
in Winter and that of Semester-III & V and Semester-IV & VI in
Summer and Winter respectively.
That means the theory examination of all the Semesters shall be
conducted by the University and shall be held as per the schedule.

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Name of the Examination</th>
<th>Main Examination</th>
<th>Supplementary Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Semester-I &amp; Semester-II</td>
<td>Summer (Simultaneously)</td>
<td>Winter (Simultaneously)</td>
</tr>
<tr>
<td>2</td>
<td>Semester-III &amp; Semester-V</td>
<td>Winter</td>
<td>Summer</td>
</tr>
<tr>
<td>3</td>
<td>Semester-IV &amp; Semester-VI</td>
<td>Summer</td>
<td>Winter</td>
</tr>
</tbody>
</table>

5. Subject to their compliance with the provisions of this Direction and
of other Ordinances in force from time to time, the following persons
shall be eligible for admission to the examinations, namely:-
(a) A student of a College who has prosecuted a regular
course of study for not less than one academic year
prior to that examination;
(b) A teacher in a Educational Institution eligible under
the provisions of Ordinance No.18, and
(c) A women candidate who has not pursued a regular course
of study.
Provided that in the case of the persons eligible under clauses (b) and
(c) an applicant to the examination shall have attended a full course of
laboratory instructions in a College in the subject in which laboratory
work is prescribed. The candidate shall submit a Certificate to that
effect signed by the Principal of the college.

6. (I) The Students passing H.S.C. Examination with Physics, Chemistry and Mathematics shall offer following subjects at
B.Sc. Part-I Examination.
(i) English and any one of the following languages Marathi, Hindi, Urdu, Sanskrit and Supplementary English.
(ii) Three optional subjects atleast one subject from the
following groups be selected.

Group A : - Chemistry, Industrial Chemistry, Petro-
Chemical Science, Electronics, Mathematics.

Group B : - Physics, Geology, Statistics, Computer
Science, Computer Application, Information
Technology and Geography.

The Students passing H.S.C. Examination with Chemistry
and Biology shall offer following subjects:-
(i) English and any one of the following languages.
Marathi, Hindi, Urdu, Sanskrit and Supplementary
English.
(ii) Chemistry.
(iii) Two optional subjects form the following group
be selected.

Group C : - Botany, Zoology, Bio-Chemistry, Geography,
Fisheries, Environmental Science, Microbiology,
Geology, Food Science, Industrial Microbiology,
Biotechnology and Appiculture.
For Vocational subjects sanctioned by
U.G.C. there shall be following scheme of
Combination of subjects :-
Students with Mathematics at H.S.C Examination
shall select two subjects from Group D and one
from Group F.
Students passing with Biology, at H.S.C
Examination. Shall select two subjects from
Group E and One from Group F.

Group D : - Physics, Chemistry, Mathematics, Electronics,
Statistics Computer Science, Computer
Application, Information Technology and Geology.

Group E : - Chemistry, Botany, Zoology, Micro-Biology,
Geology, Geography, Environmental Science,
Industrial Microbiology and Biochemistry.

Group F : - Biological Techniques and Specimen Preparation.
Industrial Chemistry, Instrumentation, Computer
Application, Seed Technology, Industrial Fish and
Fisheries, Computer Maintenance, Biotechnology
and other Vocational subjects proposed by U.G.C.
from time to time shall be included in Group F.
The students passing HSC examination with
Physics, Chemistry, Biology and Mathematics shall
have the option of opting Bioinformatics subject with any one subject from Group-G and any one subject from Group-H.

**Group G:**
- Botany
- Zoology
- Bio-Chemistry
- Microbiology
- Industrial Microbiology
- Biotechnology

**Group H:**
- Chemistry
- Physics
- Electronics
- Statistics
- Geology
- Mathematics
- Computer Science

(II) The students passing H.S.C. examination (M.C.V.C. stream) with technical trades mentioned in column No.2 of the following table shall be eligible for admission to the B.Sc. Part-I course in the optional subjects mentioned in column Nos. 3 of the said table as per the scheme given in Group A to H.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>M.C.V.C. group and trade</th>
<th>Subjects allowed for admission to B.Sc. Part-I (Any three from the following)</th>
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<tbody>
<tr>
<td>1</td>
<td>Para Medical Group Medical Laboratory Technician Trade</td>
<td>Botany, Zoology, Computer Application (Vocational), Microbiology, Biochemistry, Biotechnology (Regular/Vocational), Geology, Geography, Environmental Science, Seed Technology (Vocational), Industrial Fish &amp; Fisheries (Vocational), B.T.S.P. (Vocational), Chemistry, Bioinformatics.</td>
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<td>2</td>
<td>Agricultural Group Horticulture Trade or Crop Science Trade</td>
<td>Zoology, Chemistry, Computer Application (Vocational), B.T.S.P. (Vocational), Seed Technology (Vocational), Microbiology, Biochemistry, Biotechnology (Regular/Vocational), Geology, Geography, Environmental Science, Botany, Bioinformatics.</td>
</tr>
<tr>
<td>3</td>
<td>Fisheries Group Inland Fisheries Trade Fish Processing Technology Trade</td>
<td>Botany, Chemistry, Computer Application (Vocational), B.T.S.P. (Vocational), Industrial Fish &amp; Fisheries (Vocational), Microbiology, Biochemistry.</td>
</tr>
</tbody>
</table>

(III) In the case of विद्यालय स्नातक भाग-२ सत्र-३ व ४ (B.Sc. Part-II, Sem-III & IV) Examination:-

have passed not less than one academic year previously the विद्यालय स्नातक भाग-१, सत्र-१ व २ (B.Sc. Part-I, Sem-I & II) Examination of the University or an examination recognised as equivalent thereto, and

(IV) In the case of the विद्यालय स्नातक अध्ययन सत्र-५ व ६ (B.Sc. Final, Sem-V & VI) Examination:- have passed not less than one academic year previously the विद्यालय स्नातक भाग-२, सत्र-३ व ४ (B.Sc. Part-II, Sem-III & IV) Examination of the University or an examination recognised as equivalent thereto;

7. Subject to his/her compliance with the provisions of this Direction and other Ordinances (pertaining to Examination in General) in force from time to time, the applicant for admission, at the end of the course of study of a particular semester to an examination specified in column (1) of the table below, shall be eligible to appear at it, if,

(i) he/she satisfied the condition in the table and the provisions thereunder.
(ii) he/she has prosecuted a regular course of study in a college affiliated to the University.
(iii) he/she has in the opinion of the Principal shown the satisfactory progress in his/her studies.
Every examinee for the B.Sc. Part-II, Sem-III & Sem-IV, Examination shall be examined in each of the three Science subjects in which he has been examined at the B.Sc. Part-I, Sem-I & II Examination.

An examinee who is successful at the B.Sc. Final, Sem-V & VI, Examination may offer an additional subject mentioned in Para (6) (iii) not offered by him at the B.Sc. Part-I, Sem-I & II Examination, on his prosecuting a regular course of study for one academic year in that subject. Such an examinee shall not be permitted to take any other examination simultaneously with the examination in the additional subjects. The fee for the additional subject shall be as prescribed by the University from time to time.

The fee for the examination shall be as prescribed by the University from time to time.

The practical examination of all semesters shall be conducted annually. That means the practical examination shall be conducted as per following schedule.

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Semester</th>
<th>Examination</th>
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<tr>
<td>1</td>
<td>Semester-I &amp; II</td>
<td>Summer</td>
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<td>2</td>
<td>Semester-III &amp; IV</td>
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<td>Summer</td>
</tr>
</tbody>
</table>

The scheme of awarding internal marks shall be as per Appendix-G appended with this Direction.

Successful examinees at the B.Sc. Final, Sem-VI Examination who obtain not less than 60% marks in
aggregate of Sem-I, II, III, IV, V & VI Examination taken together shall
be placed in the First Division, those obtaining less than 60% but not
less than 45% in the Second Division, and all other successful
examinees in the pass Division.

Explanation:
Division at the विषय म्हणजे अत्यन्त, तत्त्व-५ व जो (B.Sc. Final, Sem-V &
Sem-VI) Examination shall be declared on the basis of the marks
obtained in the Science Subjects at the Sem-I, II, III, IV, V & VI
Examination taken together.

18. There shall be no classification of successful examinees at the Sem-
I to Sem-V Examinations.
19. An examinee successful in the minimum period prescribed for the
examination, obtaining not less than 75% of the maximum marks
prescribed in the subject shall be declared to have passed the
examination with Distinction in the subject.

Explanation:
(1) Distinction shall be awarded only in Science Subjects including
Mathematics.
(2) Distinction at the विषय म्हणजे अत्यन्त (B.Sc. Final) Examination
shall be awarded on the basis of the marks obtained at the विषय म्हणजे
म्हणजे तत्त्व-१, तत्त्व-२, विषय म्हणजे तत्त्व-२, तत्त्व-३ व जो; विषय म्हणजे
तत्त्व-तत्त्व-५ व जो (B.Sc. Part-I, Sem-I & II; B.Sc. Part-II,
Sem-III & IV, and B.Sc. Final-Sem-V & VI) Examination taken
together.
(3) Distinction shall not be awarded to an examinee availing of the
provision of the exemptions and compartments at any of the
examination.

20. Provisions of Ordinance No18/2001 in respect of an Ordinance to
provide grace marks for passing in a Head of passing and Improvement
of Division (Higher Class) and getting Distinction in the subject and
condonation of deficiency of marks in a subject in all the faculties
prescribed by the Statute NO.18, Ordinance 2001 shall apply.
21. (A) The students who have passed B.Sc.Final examination of this
University or any other statutory University shall be eligible to
seek admission for studying practical of any other optional
subjects offered for B.Sc. Degree for simultaneous study of
complete three year course for that subject in one year and to
appear simultaneously for all parts of examination leading to
the degree of Bachelor of Science (additional) in that subject,
subject to the following condition.
### Appendix-A

#### Examination Scheme

**विज्ञान स्नातक भाग-१**

(B.Sc. Part-I) (Semester-I)

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<tr>
<td>1</td>
<td>Compulsory English</td>
<td>40</td>
<td>10</td>
<td>50</td>
<td>18</td>
<td>δ</td>
<td>δ</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Languages</td>
<td>40</td>
<td>10</td>
<td>50</td>
<td>18</td>
<td>δ</td>
<td>δ</td>
<td>50</td>
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<td>Mathematics (Paper-I)</td>
<td>60</td>
<td>15</td>
<td>150</td>
<td>54</td>
<td>δ</td>
<td>δ</td>
<td>150</td>
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<tr>
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<td>Mathematics (Paper-II)</td>
<td>60</td>
<td>15</td>
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<td>δ</td>
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<td>5</td>
<td>Science subjects excluding Mathematics</td>
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<td>100</td>
<td>35</td>
<td>50</td>
<td>18</td>
<td>150</td>
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</tbody>
</table>

**Grand Total of Semester-I : 450+100**

### Appendix-B

#### Examination Scheme

**विज्ञान स्नातक भाग-२. वर्ग ३**

(B.Sc. Part-II) (Semester-II)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mathematics (Paper-V)</td>
<td>60</td>
<td>15</td>
<td>150</td>
<td>60</td>
<td>δ</td>
<td>δ</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>Mathematics (Paper-VI)</td>
<td>60</td>
<td>15</td>
<td></td>
<td></td>
<td>δ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Science subjects excluding Mathematics</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>40</td>
<td>50</td>
<td>20</td>
<td>150</td>
</tr>
</tbody>
</table>

**Grand Total of Semester-II : 450**

### Appendix-C

#### Examination Scheme

**विज्ञान स्नातक भाग-२. वर्ग ४**

(B.Sc. Part-II) (Semester-III)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mathematics (Paper-VII)</td>
<td>60</td>
<td>15</td>
<td>150</td>
<td>60</td>
<td>δ</td>
<td>δ</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>Mathematics (Paper-VIII)</td>
<td>60</td>
<td>15</td>
<td></td>
<td></td>
<td>δ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Science subjects excluding Mathematics</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>40</td>
<td>50</td>
<td>20</td>
<td>150</td>
</tr>
</tbody>
</table>

**Grand Total of Semester-III : 450**

### Appendix-D

#### Examination Scheme

**विज्ञान स्नातक भाग-२. वर्ग ५**

(B.Sc. Part-II) (Semester-IV)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mathematics (Paper-VII)</td>
<td>60</td>
<td>15</td>
<td>150</td>
<td>60</td>
<td>δ</td>
<td>δ</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>Mathematics (Paper-VIII)</td>
<td>60</td>
<td>15</td>
<td></td>
<td></td>
<td>δ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Science subjects excluding Mathematics</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>40</td>
<td>50</td>
<td>20</td>
<td>150</td>
</tr>
</tbody>
</table>

**Grand Total of Semester-IV : 450**
### Appendix-E

**विज्ञान स्नातक अंत्य रत्न ५**

(B.Sc. Final) (Semester-V)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Subject</th>
<th>Examination Scheme</th>
<th>Theory</th>
<th>Practical</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max. Mar. Marks</td>
<td>Max. Int. Marks</td>
<td>Total</td>
</tr>
<tr>
<td>1</td>
<td>Mathematics (Paper-IX)</td>
<td>60 15 150</td>
<td>60</td>
<td>δ</td>
<td>δ</td>
</tr>
<tr>
<td>2</td>
<td>Mathematics (Paper-X)</td>
<td>60 15</td>
<td></td>
<td>δ</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Science subjects excluding Mathematics</td>
<td>80 20 100</td>
<td>40</td>
<td>50</td>
<td>20</td>
</tr>
</tbody>
</table>

**Grand Total of Semester-V : 450**

### Appendix-F

**विज्ञान स्नातक अंत्य रत्न ६**

(B.Sc. Final) (Semester-VI)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Subject</th>
<th>Examination Scheme</th>
<th>Theory</th>
<th>Practical</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max. Mar. Marks</td>
<td>Max. Int. Marks</td>
<td>Total</td>
</tr>
<tr>
<td>1</td>
<td>Mathematics (Paper-VII)</td>
<td>60 15 150</td>
<td>60</td>
<td>δ</td>
<td>δ</td>
</tr>
<tr>
<td>2</td>
<td>Mathematics (Paper-VIII)</td>
<td>60 15</td>
<td></td>
<td>δ</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Science subjects excluding Mathematics</td>
<td>80 20 100</td>
<td>40</td>
<td>50</td>
<td>20</td>
</tr>
</tbody>
</table>

**Grand Total of Semester-VI : 450**

### Note:
1. There shall be only one theory paper of each science subject other than Mathematics for every semester.
2. Distribution of marks of practical within the limit of Max. Marks shall be as prescribed by the B.O.S. of the concerned subject.

### Appendix-G

The internal assessment marks assigned to each theory paper as mentioned in Appendix-A to F shall be awarded on the basis of assignment, class test, attendance, project assignments, Seminar, Study tour, Industrial visit, Visit to educational institutions and research organization, field work, group discussion or any other innovative practice/activity. The marking scheme for each of the practice/activity shall be as under:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Semester</th>
<th>Practice/Activity</th>
<th>Details of marking scheme</th>
<th>Total marks for</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Languages</td>
<td>Mathematics</td>
</tr>
<tr>
<td>1</td>
<td>Semester-I &amp; II</td>
<td>Assignment</td>
<td>Two assignments per theory paper</td>
<td>04</td>
</tr>
<tr>
<td>2</td>
<td>Semester-I &amp; II</td>
<td>Class Test</td>
<td>Two class test (on passing test)</td>
<td>06</td>
</tr>
<tr>
<td>3</td>
<td>Sem-III, IV, V &amp; VI</td>
<td>Project Assignment</td>
<td>On latest developments in the subject in 100-200 words</td>
<td>δ</td>
</tr>
<tr>
<td>4</td>
<td>Sem-III, IV, V &amp; VI</td>
<td>Class Test</td>
<td>Two class test (on passing test)</td>
<td>δ</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5</td>
<td>Sem-III, IV, V &amp; VI</td>
<td>Seminar, Study tour, Industrial visit, Visit to educational institutions, research organization, field work, group discussion or any other innovative practice/activity</td>
<td>Any one of the activity with report of the activity.</td>
<td>0</td>
</tr>
</tbody>
</table>

**Total marks of Sem-III/ IV/V VI**

---

**Note:**
1. The concerned teacher shall have to keep the record of all the above activities till the passing out of that batch.
2. At the beginning of each semester, every teacher shall inform his/her students unambiguously the method he/she proposes to adopt a scheme of marking for the internal assessment.
3. Teacher shall announce the schedule of activity for Internal Assessment in advance in consultation with HOD/Principal.
4. Normally the teacher concerned may conduct three written tests spread periodically during the semester and award the marks on the test on passing of any two tests.
5. The internal marks shall be displayed on the notice board before three weeks of the commencement of the theory examination. Grievances if any, of the student regarding Internal Assessment marks shall be settled by the Principal at college level in consultation with the concerned teacher.
6. Final submission of internal marks to the University shall be before commencement of the theory examinations.

**CERTIFICATE**

Name of College / Institution:
___________________________________________________________
___________________________________________________________

Name of the Department:
___________________________________________________________
___________________________________________________________

This is to certify that this Book contains the bonafide record of the practical work of Shri/Kumari/Shrimati
___________________________________________________________
___________________________________________________________

of B.Sc.Part-____ (Semester-____) during the Academic year ________

Dated: / /20

Signature of the Teacher who taught the examinee
1. é é é é é é é é é é
2. é é é é é é é é é é

Head of the Department

(Note: In absence of certificate for practical record book (Appendix-H), examinee shall not be allowed to appear for the practical examination.)

Sd/-
Amravati
Date: 11/6/2010

Vice-Chancellor

*****
Sang Gadge Baba Amravati University, Amravati

DIRECTION

No. : 37 / 2011 Date : 26.7.2011

Subject : Corrigendum to Direction No.16/2010 in respect of Examinations leading to the Degree of (Bachelor of Science) (Three Year Degree Course – Semester Pattern)

Whereas, the Direction No. 16 of 2010 regarding Examinations leading to the Degree of (Bachelor of Science) (Three Year Degree Course – Semester Pattern), Direction-2010 is in existence.

AND

Whereas, the existing provision regarding theory examination of Semester-I & II shall be simultaneously conducted by the University at the end of Semester-II in Summer as well as the practical examinations shall be conducted annually for each semester.

AND

Whereas, the Committee constituted by the faculty of Science, under the Chairmanship of Dean of the faculty in its meeting held on 28.6.2011 and 14.7.2011 has considered the issues regarding conduction of theory and practical examination of B.Sc. Semester-I to VI at the end of each semester, from the Academic Session 2011-12.

AND

Whereas, making amendments in the Ordinance for above examination is a time consuming process.

AND

Whereas, it is necessary to carryout the corrections to Direction No.16 of 2010 issued earlier as stated in para No.1 above, urgently.

Now, therefore, I, Dr. Mohan K. Khedkar, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called "Corrigendum to Direction No.16/2010 in respect of Examinations leading to the Degree of (Bachelor of Science) (Three Year Degree Course – Semester Pattern)."

2. This direction shall come into force from the date of its issuance.

3. From the Academic Session 2011-12, theory and practical examinations of each Semester shall be conducted separately at the end of each semester.

Sd/-

Amravati (Dr. Mohan K. Khedkar)
Vice-Chancellor

Date : 26/7/2011

*****

DIRECTION

No. : 1 / 2012 Date : 23.1.2012

Subject : Corrigendum to Direction No.16/2010 in respect of Examinations leading to the Degree of (Bachelor of Science) (Three Year Degree Course – Semester Pattern)

Whereas, the Direction No.16 of 2010 in respect of Examinations leading to the Degree of (Bachelor of Science) (Three Year Degree Course – Semester Pattern) in the faculty of Science is in existence.

AND

Whereas, corrigendum to Direction No.16 of 2010 in respect of Examinations leading to the Degree of (Bachelor of Science) (Three Year Degree Course – Semester Pattern) was issued vide Direction No.37/2011 on dated 26.7.2011.

AND

Whereas, the Academic Council in its meeting held on 13.1.2012 vide item Nos.14 (5) (E) and 14 (5) (O) respectively has accepted to allow the students passing H.S.S.C. examination (M.C.V.C. stream) with Medical Laboratory Technician Trade for admission to B.Sc. Part-I under the group- Chemistry, Environmental Science, Industrial Microbiology, and the recommendations of the Monitoring Committee under the Chairmanship of Dean, faculty of Science of its meeting dated 15.11.2011 regarding correction in marking scheme of Internal Assessment Marks at B.Sc. level.

AND

Whereas, as per decision of Academic Council, the above correction are to be carried out in Column No.3 against Sr.No. 1 under the sub-clause (II) of Para 6 and in Appendix-G of Direction No.16 of 2010 issued earlier for the Examinations leading to the Degree of (Bachelor of Science) (Three Year Degree Course – Semester Pattern) in the faculty of Science for Summer-2012 examinations and onwards.

AND

Whereas, it is necessary to carry out the corrections in the above said Direction immediately.

Now, therefore, I, Dr. Mohan K. Khedkar, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called "Corrigendum to Direction No.16/2010 in respect of Examinations leading to the Degree of (Bachelor of Science) (Three Year Degree Course – Semester Pattern) ."

Sd/-

Amravati (Dr. Mohan K. Khedkar)
Vice-Chancellor

Date : 26/7/2011
21

(Three Year Degree Course) (Semester Pattern) in the faculty of Science.

2. This direction shall come into force from the date of its issuance.

3. In Direction No.16/2010 in respect of Examinations leading to the Degree of (Bachelor of Science) (Three Year Degree Course) (Semester Pattern) in the faculty of Science-

A) the words "Industrial Microbiology" after the word "Biotechnology" in column No.3 against Sr.No.1 under the table of Sub-clause (II) of para 6 of Direction No.16 of 2010 shall be added.

B) in Appendix-G following corrections be carried out:

1. In column No.4, at Sr.No.1, the words "Two assignments" be replaced by the words "One assignment".

2. In column No.4, at Sr.No.2, the words & signs "Two Class Tests (On passing test)" be replaced by the words "One test".

3. In column No.4, at Sr.No.3, the words & signs "Two Class Tests (On passing test)" be replaced by the words "One test".

4. In column No.4, at Sr.No.5, the words "Any one of the activity" be replaced by the words "Any one of the activities".

5. The Note No.4 be deleted and substituted by the following para. The test with maximum 30 marks be conducted for the students and the marks be allotted based on the performance of the students as under-

<table>
<thead>
<tr>
<th>Languages</th>
<th>Mathematics</th>
<th>Other Sci. subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sem-I &amp; II</td>
<td>Sem-I &amp; II</td>
<td>Sem-III to VI</td>
</tr>
<tr>
<td></td>
<td>06</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>10</td>
</tr>
</tbody>
</table>

For the score 24 and above.

<table>
<thead>
<tr>
<th></th>
<th>Sem-I &amp; II</th>
<th>Sem-III to VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 18 to 23</td>
<td>05</td>
<td>08</td>
</tr>
<tr>
<td>From 11 to 17</td>
<td>04</td>
<td>06</td>
</tr>
<tr>
<td>From 0 to 10</td>
<td>00</td>
<td>00</td>
</tr>
</tbody>
</table>

6. The following Note be added at Sr.No.7 - The student who remain absent for internal assessment through out the semester, Zero marks be given to him/her while posting the marks instead of writing Ab before his/her name.

Sd/-
Amravati
(Mohan K. Khedkar)
Date: 23/1/2012
Vice- Chancellor

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
and other details for the subject Forensic Science at B.Sc. level were accepted by the Hon'ble Vice-Chancellor u/s 14(7) of the M.U.Act, 1994 on 15.4.2015 on behalf of Faculty of Science.

AND

Whereas, the Academic Council in its meeting held on 6.5.2015 while considering the above recommendations of Faculty of Science vide item No. 35) 2) G) has approved the Draft Syllabi and other details for the subject Forensic Science at B.Sc. level to be implemented from the Academic Session 2015-16.

AND

Whereas, the matter is required to be regulated by framing the Ordinance and making of an Ordinance may likely to take some time.

AND

Whereas, the Academic Session 2015-16 is commencing in June, 2015.

Now, therefore, I, Dr.M.K.Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University, Amravati in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act, 1994, do hereby direct as under:

1) Corrigendum to Direction No. 16 of 2010 in respect of Examinations leading to the Degree of विज्ञान स्नातक (Bachelor of Science) (Three Year Degree Course I Semester Pattern), Direction, 2015.

2) This Direction shall come into force w.e.f. the date of its issuance.

3) As per Government Resolution No. कृषी.भ/2012/प्र.क्र.289(अ)/ व्यक्तित्व, दि.28.9.2012,

   i) The students passing the Certificate Course Examination from Computer, Electronics, Electric and Chemical group shall be eligible for admission to B.Sc. Part-I under the Group-A, B, D & H.

   ii) The students passing the Certificate Course Examination from Paramedical and Agriculture group shall be eligible for admission to B.Sc. Part-I under the Group-C, E, F & G.

4) For the admitted and hereinafter admitting students to B.Sc. Part-I, in Direction No.16/2010 in para 6(II), in Sr.No.2 of the table, in the column of वी.की.वि.सी. Group and Trade, the trades दairy Technology, Poultry Production, Seed Production Technology, Watershed Management, Post Harvest Technology be added below the Trade Crop Science Trade under Agriculture Group and the trade Watershed Management be also added below the Trade Electronics Technology Trade.

5) Forensic Science subject shall be started as an optional subject for B.Sc. Degree course in the University.

6) In Direction 16/2010, in Para 6. (I), the subject Forensic Science shall be added in Group-C after the subject Apiculture, in Group-E after the subject Biochemistry and in Group-G after the subject Biotechnology.

Date: 03/07/2015

Sd/-

(Dr.M.K.Khedkar)
Vice-Chancellor
Sant Gadge Baba Amravati University

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
DIRECTION
No. : 15 of 2015  
Date : 24/09/2015

Subject : Corrigendum to Direction No. 16 of 2010 in respect of Examinations leading to the Degree of बिज्ञान विद्यालय (Bachelor of Science) (Three Year Degree Course - Semester Pattern), Direction, 2015.

Whereas, Direction No.16/2010 in respect of Examinations leading to the Degree of बिज्ञान विद्यालय (Bachelor of Science) (Three Year Degree Course - Semester Pattern), Direction 2010, in the Faculty of Science is in existence in the University.

AND

Whereas, Direction No. 16 of 2010 in respect of Examinations leading to the Degree of बिज्ञान विद्यालय (Bachelor of Science) (Three Year Degree Course - Semester Pattern), Direction 2010 is already corrected by Direction Nos. 37/2011, 1/2012 & 5/2015.

AND


AND

Whereas, the Hon'ble Vice-Chancellor has constituted the Ad-hoc Committees for the subjects Renewable Energy & Animation for preparation of draft syllabi and other details.

AND

Whereas, the recommendations of Ad-hoc Committee of its meeting held on 6.8.2015 for the subject "Renewable Energy" and 18.09.2015 for the subject "Animation" regarding draft syllabus and other details for the above subjects at B.Sc. level were accepted by the Hon'ble Vice-Chancellor u/s 14(7) of the Maharashtra Universities Act, 1994 on 24.9.2015 on behalf of Faculty of Science and Academic Council.

AND

Whereas, the above recommendations of the Draft Syllabi and other details for the subjects i) Renewable Energy & ii) Animation at B.Sc. level to be implemented for B.Sc. Part I from the Academic Session 2015-16.

AND

Whereas, the matter is required to be regulated by framing the Ordinance and making of an Ordinance may likely to take some time.

AND

Whereas, the Academic Session 2015-16 is already started.

Now, therefore, I, Dr.M.K.Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University, Amravati in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act, 1994, do hereby direct as under:

1) This Direction shall be called as "Corrigendum to Direction No. 16 of 2010 in respect of Examinations leading to the Degree of बिज्ञान विद्यालय (Bachelor of Science) (Three Year Degree Course - Semester Pattern), Direction, 2015".

2) This Direction shall come into force w.e.f. the date of its issuance.

3) The subjects i) Renewable Energy & ii) Animation shall be started as optional subjects for B.Sc. Degree course in the University.

4) In Direction 16/2010, in Para 6. (I), the subject "Renewable Energy" and "Animation" shall be added at the end of Group-A.

Date : 24/09/2015
Sd/-
(Dr.M.K.Khedkar)
Vice-Chancellor

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
The Executive Council, dated 1/2-4-1977, 11-7-1977 has prescribed the Teaching periods in the various subject in the Faculty of Science as follows.

<table>
<thead>
<tr>
<th>Subject</th>
<th>B. Sc. Part - I</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory</td>
<td>Practical</td>
</tr>
<tr>
<td>1. Chemistry</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>2. Physics</td>
<td>6 + 1 Tutorial</td>
<td>6</td>
</tr>
<tr>
<td>3. Botany</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>4. Zoology</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>5. Geology</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>6. Mathematics</td>
<td>9 + 1 Tutorial</td>
<td>-</td>
</tr>
<tr>
<td>7. Statistics</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>8. English Languages:</td>
<td>4 + 1 Tutorial</td>
<td>-</td>
</tr>
<tr>
<td>9. Supplementary English</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>10. Marathi</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>11. Hindi</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>12. Sanskrit</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>13. Biochemistry</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>14. Microbiology</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>15. Electronics</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>16. Computer Science</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

**Note:**

1) *The strength of a batch of practical and Tutorials for Undergraduate classes shall be 16 with an addition of 10% with the permission of Vice-Chancellor. *(As amended by the Executive Council dated 27/28-4-1979).*

2) A Period will be counted of 45 minutes duration at Undergraduate level.

3) For Tutorial class a batch will be of 16 students with an addition of 10% with the permission of the Vice-Chancellor per week.

****

**SYLLABUS PRESCRIBED FOR B.Sc. PART-I**

**SEMESTER-I**
1. COMPULSORY ENGLISH

Text Book Prescribed: REALMS OF GOLD (SPACIAL EDITION)
Edited by Board of Editors, Sant Gadge Baba Amravati University, Amravati.
Publisher: Orient Blackswan Pvt. Ltd. Mumbai.

Prose Passages:
1. The Power of Prayer: Abdul Kalam
2. Rising Tide of Urban Chaos: Colin Legum
3. The Gold Frame: R.K. Laxman
4. Vivekananda: The Great Journey to the West: Romain Rolland
5. Good Manners: J.C. Hill

Poems:
1. The Village Schoolmaster: Oliver Goldsmith
2. Lucy: William Wordsworth
3. When I Set Out for Lyonesse: Thomas Hardy
4. All in June: W. H. Davies.

Grammar: Parts of Speech, Use of Articles and Prepositions, Tenses, Transformation of Sentences.

Communication Skills: Everyday English – Part I
Preparing a CV and Writing Letters.

Pattern of Question Paper and Distribution of Marks.
Maximum Marks: 40
Time: Three Hours

Q. 1: Prose Passages No. 1 to 5
There shall be five short answer questions...05 marks
Q. 2: Prose Passages No. 1 to 5
There shall be five long answer questions. Out of these, students will have to answer any two questions of five marks each...10 marks
Q. 3: Poems No. 1 to 4
There shall be four long-answer questions. Out of these students will have to answer any two questions of five marks each...10 marks
There shall be five questions based on the prescribed grammar and usage...05 marks

[Note: The paper setter shall have his/her discretion as regards selection]

Q. 5: There shall be two questions based on Everyday English – Part I.
Out of these students will have to answer any one...05 marks
Q. 6: There shall be one question on preparing a CV for seeking a job...05 marks

Total...40 marks

2. COMPULSORY ENGLISH

Text Book Prescribed: REALMS OF GOLD (SPACIAL EDITION)
Edited by Board of Editors, Sant Gadge Baba Amravati University, Amravati.
Publisher: Orient Blackswan Pvt. Ltd. Mumbai.

Prose Lessons Prescribed:
1. With the Photographer: Stephen Leacock
2. A Talk on Advertising: Herman Wouk
3. Making a Contract: Philip Bingham
4. The Scientific Point of View: J. B. S. Haldane
5. The Sun, the Planets and Stars: C. Jones.

Poems Prescribed:
1. The Best of School: D. H. Lawrence
2. Ballad of the Landlord: Langston Hughes
3. To the Indians Who Died in Africa: T. S. Eliot

Grammar: Parts of Speech, Use of Articles and Prepositions, Tenses, Transformation of Sentences.

Communication Skills: Note-making and Reporting, Paragraph Writing.

Pattern of Question Paper and Distribution of Marks.
Maximum Marks: 40
Time: Three Hours

Q. 1: There shall be five short answer questions based on prescribed prose passages...05 marks
Q. 2: There shall be five long answer questions based on prescribed prose passages. Out of these, students will have to answer any two questions of five marks each...10 marks
Q. 3: There shall be four long-answer questions based on prescribed poems. Out of these students will have to answer any two questions of five marks each...10 marks
Q. 4: There shall be five questions of one mark each, from Grammar Sec-


**2. मराठी अनिवार्य**

विज्ञान स्नातक भाग-१, सत्र-१ व सत्र-२

अम्यकमासाची सूचना वाचनकरिता पाठ्यपुस्तक "शालका" ओरिंटल बुक्सलेब्यायन प्र.मिं.मंडार ४००००१ यांनी प्रकाशित केल्या आहेत.

उपरोच शालका पाठ्यपुस्तक विज्ञान शाखा भाषा अम्यकमासांनी संपादित केलेले असेल व त्यात खालील घटकांचा पाठ्यांश आहेल.

<table>
<thead>
<tr>
<th>सत्र-१</th>
<th>घटक अ (गद्य)</th>
</tr>
</thead>
<tbody>
<tr>
<td>१)</td>
<td>पुरुष सूक्त</td>
</tr>
<tr>
<td>२)</td>
<td>विज्ञान काशीतल सत्य आणि काठित</td>
</tr>
<tr>
<td>३)</td>
<td>येडूंची लोकशास्त्राची शैली</td>
</tr>
<tr>
<td>४)</td>
<td>लोकगत</td>
</tr>
<tr>
<td>५)</td>
<td>महात्मा ज्योतिराल कुले</td>
</tr>
<tr>
<td>६)</td>
<td>ग्राहक वाचको अखेचरे कितांत</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>घटक ब (पद)</th>
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<tbody>
<tr>
<td>१)</td>
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| घटक क (व्याहारिक मराठी) |
| कार्यालयाच्या पत्रव्यवहार |

| सत्र-२ | घटक अ (गद्य) |

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**चेठ ३ तास**

<table>
<thead>
<tr>
<th>सत्र-१</th>
<th>गुण - ४०</th>
</tr>
</thead>
</table>
| विष्णुवाचक | प्रश्नपत्रिका राहिल.
| सूचना वाचन करिता पाठ्यपुस्तक - "शालका" | प्रश्न-१ घटक अ - दिशाधारी प्रश्न (कोणताही एक) | गुण - १० |
| प्रश्न-२ घटक अ - लांचतारी प्रश्न (कोणतेही दोन) | गुण - (५५५५५५५०) |
| प्रश्न-३ घटक ब - लांचतारी प्रश्न (कोणतेही दोन) | गुण - (५५५५५५५०) |
| प्रश्न-४ घटक क - व्याहारिक मराठी - कार्यालयाच्या पत्रव्यवहार | पाच गुणांचे दोन प्रश्न राहिल.

<table>
<thead>
<tr>
<th>सत्र-२</th>
<th>गुण - ४०</th>
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| विष्णुवाचक | प्रश्नपत्रिका राहिल.
| सूचना वाचन करिता पाठ्यपुस्तक - "शालका" | प्रश्न-१ घटक अ - दिशाधारी प्रश्न (कोणताही एक) | गुण - १० |
| प्रश्न-२ घटक अ - लांचतारी प्रश्न (कोणतेही दोन) | गुण - (५५५५५५५०) |
| प्रश्न-३ घटक ब - लांचतारी प्रश्न (कोणतेही दोन) | गुण - (५५५५५५५०) |
प्रश्न-4 घटक क - व्याख्याति मराठी- प्रसारमाध्यम व्याख्याति लेखन गुण - \((4+5=10)\)
पाच गुणांचे दोन प्रश्न राहिल.

3. हिंदी अभिव्यक्ति
प्रश्न संबंध संचार शैक्षिक सत्र 2010-11
पाठ्यपुस्तक - अभिलेख

समय 3 घंटे पूर्णक - 40
प्रश्न इकाई - आधारभूत पाठ्यक्रम
प्रश्न-1 (क) दीघोंतरी प्रश्न (एक) 08 अंक
प्रश्न-2 (ख) लघुतरी प्रश्न (दोन) 08 अंक
द्वितीय इकाई - माध्यमिक पाठ्यक्रम (विज्ञान संकाय)
प्रश्न-3 (ग) दीघोंतरी प्रश्न (एक) 08 अंक
प्रश्न-4 (घ) लघुतरी प्रश्न (दोन) 08 अंक
प्रश्न-5 अतिलघुतरी प्रश्न
आधारभूत पाठ्यक्रमपर आधारित चार एवं माध्यमिक पाठ्यक्रमपर आधारित चार ऐसे कुल आत्र प्रश्न एक-एक अंक के लिए पुढे जाणेगे।

शून्या - प्रश्न 5 को छठाचार सभी प्रश्न विकल्प के साथ पुढे जाणेगे।

हिंदी अभिव्यक्ति
द्वितीय संबंध संचार शैक्षिक सत्र 2010-11
पाठ्यपुस्तक - अभिलेख

समय 3 घंटे पूर्णक - 40
सौंदर्य इकाई - व्याख्याति
प्रश्न-1 ला - संदर्भ रहित व्याख्या (एक) 10 अंक
प्रश्न-2 रा - कविताओंपर आधारित (2 प्रश्न) 10 अंक
चतुर्थ इकाई - व्याख्याति माध्यम एवं व्याकरण
प्रश्न-3 रा - अंग्रेजी से हिंदी मे अनुवाद 05 अंक
प्रश्न-4 था - पत्रलेखन (कार्यालयीन) 07 अंक
प्रश्न-5 (अ) मुहावरे और लोकोक्तियाँ (२) 08 अंक
(ब) शब्द समूह के लिये एक शब्द (२) 04 अंक
(क) वाक्य शुद्ध क्रियाए (१) 02 अंक

कुल अंक 40
या विषयाची एक प्रस्ताविका राहील.
सुमाचे वाचनाक्रमाने पाठ्यपुस्तक काव्यसूत्रांतून कल्पित विविध रस्सुपण्य या महाकाव्याचा द्वितीय सर्ग वरील गुण ४० पाठ्यपुस्तकाची पुढीलप्रमाणे चार गटात विभागणी करावी.

गट-१: रस्सुपण्य (ड्वितीय सर्ग) या तील्या श्लोक १ ते २४
गट-२: रस्सुपण्य (ड्वितीय सर्ग) या तील्या श्लोक २५ ते ५०
गट-३: रस्सुपण्य (ड्वितीय सर्ग) या तील्या श्लोक ५१ ते ७४
गट-४: कल्पित स्त्रीस्त्री, दिवसीपाची यथिकोण, नान्दीनी, वसिंध, वज्रपाणी, सुरविष सेनानी: गौरीपुर: कल्पितशास्त्री माहिती.

प्रस्तावन्याच्या स्वरूपात गुणविभागणी पुढील प्रमाण चाली.

बेठ : ३ तास
गुण : ४०

प्रश्न १: गट १ महीन २ श्लोकपैकी एकाचा अनुवाद : ०६
प्रश्न २: गट २ महीन २ श्लोकपैकी एकाचा अनुवाद : ०६
प्रश्न ३: गट ३ महीन २ श्लोकपैकी एकाचा अनुवाद : ०६
प्रश्न ४: गट १, २, ३ यांत आयानित दीपोत्तरी प्रश्न : १०
दोन पैकी एक
प्रश्न ५: गट ४ महीन दिष्या ३ पैकी २ २४

संख्या-२ संस्कृत (आध्यात्म)
या विषयाची एक प्रस्ताविका राहील.
सुमाचे वाचनाक्रमाने पाठ्यपुस्तक भवदृढीता २४ वा अध्यय.
वरील पाठ्यपुस्तकाची पुढील प्रमाणे चार गटात विभागणी करावी.

गट-१: भवदृढीता २४ वा अध्यय
श्लोक १ ते ८
गट-२: भवदृढीता २४ वा अध्यय
श्लोक ९ ते १७
गट-३: भवदृढीता २४ वा अध्यय
श्लोक १८ ते २७
गट-४: तिरुगु, तिरुगुणाचे स्वरूप, वार्य, फल, प्रकृती गुणातीत इत्यादी.

प्रश्नन्याच्या स्वरूपात गुणविभागणी पुढील प्रमाणे असाली.

बेठ : ३ तास
गुण : ४०
6. **SUPPLEMENTARY ENGLISH**

**1S Supplementary English**

**Time : 3 Hours**

**Total Marks : 40**

**Text Book Prescribed :**

*Wisdom and Experience*

Edited by Board of Editors, Sant Gadge Baba Amravati University, Amravati.

**Publisher :**

Orient Blackswan Pvt. Ltd. Mumbai.

**Prose Section :**

1. The Sun, the Planets & the Stars by C. Jones
2. Water : The Elixir of Life by C. V. Raman
3. Sir Isaac Newton by Nathaniel Hawthorne
4. Toasted English by R. K. Narayan
5. What is Courage? by William Slim

**Poetry Section :**

1. A Requiem by William Shakespeare
2. The Sun Rising by John Donne
3. From Paradise Lost by John Milton
4. The Chimney Sweeper by William Blake

**Grammar :**

Parts of Speech, Use of Articles and Prepositions, Tenses, Transformation of Sentences.

**Professional :**

1) Interviews Communication
2) Group discussions

**Distribution of Marks.**

<table>
<thead>
<tr>
<th>Question</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q. 1 : There shall be five short answer questions based on prescribed prose.</td>
<td>5</td>
</tr>
<tr>
<td>Q. 2 : There shall be five long answer questions based on prescribed prose, out of these students will have to answer any two questions of five marks each</td>
<td>10</td>
</tr>
<tr>
<td>Q. 3 : There shall be four long answer questions based on prescribed prose poems. Out of these, students will have to answer any two questions of five marks each</td>
<td>10</td>
</tr>
</tbody>
</table>

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**2S Supplementary English**

**Time : 3 Hours**

**Total Marks : 40**

**Text Book Prescribed :**

*Wisdom and Experience*

Edited by Board of Editors, Sant Gadge Baba Amravati University, Amravati.

**Publisher :**

Orient Blackswan Pvt. Ltd. Mumbai.

**Prose Section :**

1. The Gold Frame by R. K. Laxman
3. The Power of Prayer by A. P. J. Abdul Kalam
4. Why is the Sea Blue? by G. Venkataraman
5. The Myths of Artificial Intelligence by Attila Narin

**Poetry Section :**

1. Ode to Autumn by John Keats
2. The Road Not Taken by Robert Frost
3. Ballad of the Landlord by Longston Hughes
4. The Wind hows by G. M. Hopkins

**Grammar :**

Parts of Speech, Use of Articles and Prepositions, Tenses, Transformation of Sentences.

**Professional :**

1) Soft Skills
2) Public Speaking

**Communication :**

1) Writing Skills
   1) Curriculum Vitae
   2) Report writing
Distribution of Marks.

<table>
<thead>
<tr>
<th>Question</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.1</td>
<td>There shall be five short answer questions based on prescribed prose. 0.5 marks</td>
</tr>
<tr>
<td>Q.2</td>
<td>There shall be five long answer questions based on prescribed prose, out of these students will have to answer any two questions of five marks each 10 marks</td>
</tr>
<tr>
<td>Q.3</td>
<td>There shall be four long answer questions based on prescribed poems. Out of these, students will have to answer any two questions of five marks each 10 marks</td>
</tr>
<tr>
<td>Q.4</td>
<td>There shall be five questions of one marks each, from Grammar Section-Parts of Speech, Use of articles and Prepositions, Tenses, Transformation of Sentences 0.5 marks</td>
</tr>
<tr>
<td>Q.5</td>
<td>There shall be one question either on Soft skills or on Public speaking 0.5 marks</td>
</tr>
<tr>
<td>Q.6</td>
<td>There shall be one question either on Curriculum Vitae or on Report Writing 0.5 marks</td>
</tr>
</tbody>
</table>

Total 40 marks

Notes: 1. For additional knowledge & practice of Grammar the following books are suggested.
   - English Grammar Practice by Raj N. Bakshi, Publisher Orient Blackswan Pvt. Ltd. Mumbai.

7. MATHEMATICS

Notes: (1) There shall be Two Papers of 60 marks each for every Semester.
(2) There shall be FIVE units in each theory paper.
(3) There shall be Total Six Questions in each paper. Out of these Six, there shall be One Compulsory Question (based on all five units) and Five Questions on Five units with alternative choice from the same unit.
(4) Each question will carry 10 marks.
(5) Each paper will have 3Hrs.duration.

Layout of Question Paper

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question No. 1</td>
<td>Compulsory question based on all five units 10 Marks</td>
</tr>
<tr>
<td>Question No. 2</td>
<td>Either/Or (on unit-I) 10 Marks</td>
</tr>
<tr>
<td>Question No. 3</td>
<td>Either/Or (on unit-II) 10 Marks</td>
</tr>
</tbody>
</table>

Semester I

1S Mathematics Paper-I
(Algebra and Trigonometry)
(Implemented fro the A.S. 2015-16)

Unit-I: De Moivre’s theorem, roots of complex number, circular functions, hyperbolic function, inverse hyperbolic function. Relation between circular functions and hyperbolic functions. Separation of real and imaginary parts of the circular and hyperbolic functions of complex variable.

Unit-II: Trigonometric series: Gregory series, Euler’s series, Machin’s series, Rutherford’s series, summation of series, series based upon \( \sin x, \cos x, \sinh x, \cosh x \), exponential series, logarithmic series and series based upon Gregory series.

Unit-III: Elements of quaternion: Definition. Equality and addition, multiplication, complex conjugate of a quaternion, norm, inverse, quaternion as a rotation operator, geometric interpretation, a special quaternion product, operator algorithm, quaternion to matrices.

Unit-IV: Theory of equations: Relations between the roots and coefficients, transformation of equations, cubic equations (Cardon method), Descartes’ rule of signs, biquadratic equations.

Unit-V: Matrices: Rank of a matrix, row rank, column rank, eigenvalues, eigenvectors and the characteristic equation of a matrix. Cayley-Hamilton theorem and its application.

References Books:
7) T M Karade, Maya S. Bendre, Lectures on Algebra and Trigonometry.

Semester I

1S Mathematics Paper-II
(Differential and Integral Calculus)
(Implemented from the A.S. 2015-16)

Unit-I: Definition of the limit of a function, basic properties of limits, continuous functions and classification of discontinuities.

Unit-II: Differentiability, successive differentiation, Leibnitz theorem, indeterminate forms and L'Hospital rule.

Unit-III: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Maclaurin and Taylor series expansions.

Unit-IV: Partial derivatives and differentiation of real valued function of two variables, homogeneous functions, Euler's theorem on homogeneous functions.

Unit-V: Integration of the form \( \int \frac{P_n(x)}{\sqrt{Q}} \, dx \), reduction formulae for \( \int \sin^n x \, dx \), \( \int \cos^n x \, dx \) and Walli's formula, \( \int \tan^n x \, dx \), \( \int \cot^n x \, dx \), \( \int \sec^n x \, dx \), \( \int \sec^n x \, dx \), \( \int \sin^n x \cos^m x \, dx \), quadrature, rectification.

References:
2) Ayres F.Jr.: Calculus, Schaum\textregistered Outline series, McGRaw Hill, 1981.

8. PHYSICS

There shall be one theory paper and one practical of four hour duration for each semester examination of B.Sc. Part-I (Physics).

Theory papers:
Semester-I (1S-PHY: Mechanics, Properties of Matter, Waves and Oscillation)
Semester-II (2S-PHY: Kinetic theory, Thermodynamics and electric currents)

Practical: The distribution of marks for practical examination will be as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record Book</td>
<td>10</td>
</tr>
<tr>
<td>Viva-voce</td>
<td>10</td>
</tr>
<tr>
<td>Experiment</td>
<td>20</td>
</tr>
<tr>
<td>Assignment</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

a) A student will have to perform at least ten experiments per semester.

b) The semester examination will be of Four Hour duration and student will have to perform one experiment in the semester examination.

c) In assignment, every student should be asked to submit the detailed report on one of experiments he or she has performed. The detailed report should include the theoretical background of the experiment.

Evaluation of the student during the semester:

The teacher should explain, discuss and demonstrate one experiment per turn in the first twelve turns of the semester. At the same time in every turn, a teacher will have to conduct a test in the first period of the turn, based on the experiment; he or she has explained in the previous turn. The test is to be carried out with the interest to make the student aware of the basics of the experiments. This will enhance the viva voce competence of the student. A record of these tests is to be maintained in the department duly signed by the teacher incharge and head of the
department. The record is to be maintained in the following format. Each assignment should be of at least 15 marks. Find the average and assign it in the end Semester practical examination.

Record of Marks scored in the assignments during the semester

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the student</th>
<th>Expt 1</th>
<th>Expt 2</th>
<th>Expt 3</th>
<th>Expt 4</th>
<th>Expt 5</th>
<th>Expt 6</th>
<th>Expt 7</th>
<th>Expt 8</th>
<th>Expt 9</th>
<th>Expt 10</th>
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<tbody>
<tr>
<td>1</td>
<td>ABC</td>
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<tr>
<td>2</td>
<td>DEF</td>
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Signature of the teacher incharge

Once this part is over, actual experimentation work should begin. The date-wise record is to be maintained in the following format.

Date-wise Record of the experiments performed

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Signature of the teacher incharge


1S-PHYSICS


UNIT-I : Kepler’s laws of planetary motion, Newton’s law of gravitation, acceleration due gravity, variation with altitude and depth, Gravitational field, Gravitational Potential; Gauss’s theorem, gravitational potential and intensity due to uniform solid sphere at a point inside and outside the sphere.
Numericals.

UNIT-II: Motion of a Rigid body; rotational motion; moment of inertia; Principle of Perpendicular & Parallel axes, Radius of Gyration; M.I of regular shaped bodies like ring, disc, hollow sphere, solid sphere, cylinder & bar about different axes. Linear momentum, angular momentum, Conservation of Linear Momentum & angular momentum Numericals.


UNIT-IV : Superposition of two SHM of same frequency along the same line Interference, superposition of two mutually perpendicular SHM of same Frequency, Lissajous figures. Standing waves, velocity of longitudinal waves (Newton’s formula) velocity of waves by Kundt’s tube, velocity of transverse waves in stretched string, harmonics and overtones. Production and detection of ultrasonic waves and its applications. Numericals

UNIT-V : Introduction of Elasticity; Hooke’s Law of Elasticity, Three Elastic constants; Relation between, u, s, k and h. Bending of beam and Bending moment; Cantilever, Depression of centrally loaded beam, twisting couple, torsional pendulum; Maxwell’s needle. Numericals.

UNIT-VI : Kinematics of moving fluids; Streamline and turbulent flow, viscous drag, Coefficient of viscosity, equation of continuity; Euler’s equation, Bernoulli’s theorem, Poiseulle’s equation, Reynolds number, Terminal velocity, Stokes’s law, Variation of viscosity with temperature. Surface tension, angle of contact and wetting, Jaeger’s method Numericals

Practical: (Every student will have to perform at least 10 experiments from the following list. At the time of examination, each student will
have to perform 1 (one) experiment
1. Study of laws of Parallel and perpendicular axes for moment of inertia.
2. Determination of coefficient of restitution for inelastic collision.
3. Moment of inertia of fly wheel.
4. Study of compound pendulum.
5. To determine moment of inertia of a body using bifilar suspension.
7. Acceleration due to gravity by Kater’s pendulum.
8. Study of Oscillations of mass under different combinations of springs.
9. Young’s modulus by cantilever.
10. Young’s Modulus by bending of beam.
11. Modulus of rigidity by statical method.
12. Young’s modulus by Vibration Method.
14. Coefficient of Viscosity by Poiseulle’s method.
15. Surface tension by Quincke’s method.
16. Determination of Surface tension by Jager’s method.

Reference BOOKS : Semester 1S-PHY
1. Mechanics 1 Chadha T.K.
2. Waves and Oscillations 1 Chaudhary R.N.
3. University Physics I Mechanics of Particles waves and Oscillations 1 Kamal, Anwar
4. Mechanics 1 Shukla R.K.
5. Mechanics 1 Shrivastava P.K.
6. Properties of Matter 1 Murugeshan R
7. Properties of Matter 1 Briljal
8. Text book of vibrations and waves 1 Puri, MacMillan Publisher India Ltd.
11. Mechnics & properties of matter 1 D.S.Mathur
12. Fundamental of Physics 1 Halliday & Resncik (6th edition)
13. Concepts of Physics Vol I & Vol II by H.C.Varma

9. CHEMISTRY
1S Chemistry
(Effective from session 2013-14)

The examination in Chemistry of First semester shall comprise of one theory paper, internal assessment and practical examination. Theory paper will be of 3 Hrs. duration and carry 80 marks. The internal assessment will carry 20 marks. The practical examination will be of 6 hours duration and carry 50 marks.

The following syllabi is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question in every unit with internal choice for each of 12 marks & one compulsory question covering all the syllabus of Semester-I (8 marks).

B.Sc. Part- I (Semester- I)
1S Chemistry

Total Lectures: 84
Marks: 80

Unit I

A| Periodic Properties:

B| Ionic bonding:
Unit II

A] S-Block element:
Comparative study of 1st and 2nd group elements with reference to electronic configuration, ionisation energy, oxidation states, reactivity and flame colouration. Diagonal relationship between Li and Mg.

B] P-Block element:

Unit III

A] Electronic Displacements:
Inductive effect, Electromeric effect, Resonance and Hyperconjugation (definition, and applications of these effects).

B] Reactive Intermediates:
Carbocations, Carbanions and free radicals: their generation stability and reactions.

C] Aliphatic Hydrocarbons:

Alkenes: Methods of formation (With mechanism): i) Dehydrohalogenation of alkyl halides (E$_1$ & E$_2$) ii) Dehydration of alcohols. Reactions: Electrophilic and free radical addition of HX and X$_2$ (with mechanism).

Alkynes: Preparation from vicinal and germinal dihalides, Reaction-Hydrogenation.

Alkadienes: Classification, 1,3-Butadiene- Preparation from cyclohexene, Reactions- Addition of H$_2$, Br$_2$ and HBr.

Unit IV: Aromatic Hydrocarbons

A] Nomenclature and Isomerism of Aromatic Compounds. Structure of Benzene: Kekule structure and Molecular orbital structure.

B] Aromaticity and Huckel's rule Aromatic, antiaromatic and non-aromatic systems.


Unit V: Thermodynamics

A] Orientation: Effect of substituent groups. Theory of reactivity and orientation on the basis of inductive and resonance effects (-CH$_3$, -OH, -NO$_2$ and -Cl groups).


Unit VI


B] Phase Rule:
Statement of phase rule, explanation of phase, number of components and degree of freedom. Application of phase rule to water and sulfur system.
Semester I
1S Chemistry Practicals

Total Laboratory Sessions: 26  Marks: 50

Exercise I: Inorganic Qualitative analysis

12 Laboratory sessions

Semimicro qualitative analysis of inorganic salt mixture containing two acidic radicals and two basic radicals of same or different groups. At least six mixtures to be given.

Analysis of basic radicals to be done by using spot test reagents. Following radicals to be given carbonate, nitrite, sulphite, sulphide, chloride, bromide, iodide, nitrate and sulphate, silver(I), lead(II), copper(II), bismuth(III), cadmium(II), tin(II), arsenic(III), antimony(III), iron(III), chromium(III), aluminium(III), nickel(II), cobalt(II), manganese(II), zinc(II), calcium(II), strontium(II), barium(II), magnesium(II).

Exercise II: Organic Preparations

14 Laboratory sessions

1. Preparation of acetanilide (Acetylation).
2. Preparation of Benzanilide (Benzoylation).
3. Preparation of m-di-Nitrobenzene (Nitration).
4. Preparation of tri-Bromoaniline from Aniline (Bromination).
5. Preparation of Benzoic acid from Benzamide (Hydrolysis).
6. Preparation of Benzoic acid from benzaldehyde (Oxidation).
7. Preparation of phenylazo β β naphthol dye (Diazotisation).
8. Preparation of sulphanilic acid from aniline (Sulphonation).

Organic Preparations Using Green Chemistry Concept
10. Base catalysed Aldol Condensation (Synthesis of dibanzal propanone).

Note:

a) Student should perform the single stage preparation with the help of given procedure.
b) Melting point and percentage yield should be reported.
c) The sample should be submitted.
d) Students should recrystallize the sample with suitable solvent.
e) Students should know the reaction and its mechanism of given single stage preparation.

Distribution of Marks for Practical Examination

Time: 6 hours (One Day Examination)  Marks: 50

| Exercise-I | 18 |
| Exercise-II | 18 |
| Viva-Voce  | 07 |
| Record     | 07 |
| Total      | 50 |

Books Recommended:

3. Selected Topics in Inorganic Chemistry by Malik, Tuli and Madan- S. Chand & Co.
6. Concise Inorganic Chemistry by J.D. Lee, ELBS.
10. Chemistry Facts, Patterns & Principles by Kneen, Rogers and Simpson, ELBS.
12. Inorganic complex compounds by Murmann, Chapman & Hall.
23. Stereochemistry and mechanism through solved problems by P.S. Kalsi.
30. Comparative Practical Organic Chemistry (Qualitative Analysis) by V.K. Ahluwalia and Sunita Dhingra, Orient Longman.
31. Comprehensive Practical Organic Chemistry (Preparation and Qualitative Analysis) by V.K. Ahluwalia and Renu Agrawal, Orient Longman.
34. Principles of Physical Chemistry: Maron and Prutton.
39. Practical Physical Chemistry: Palit and De.
40. Practical Physical Chemistry: Yadao.
41. Practical Physical Chemistry: Khosla.
42. Laboratory Manual of Physical Chemistry: W.J. Popiel.
43. Practical Chemistry: Dr. S.B. Lohiya, Bajaj publ., Amravati.
45. Text book of Chemistry, B.Sc.-I, First Semester, Bokey Prakashan, Amravati

10. INDUSTRIAL CHEMISTRY (REGULAR/VOCATIONAL)

The examination in Industrial Chemistry (Regular/Vocational) of First semester shall comprise of one theory paper, internal assessment and practical examination. The internal assessment will carry 20 marks. The practical examination will be of 6 to 8 hours duration and carry 50 marks.

The following syllabi is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question in every unit with internal choice for each of 12 marks & one compulsory question covering all the syllabus of Semester-I (8 marks).

1S INDUSTRIAL CHEMISTRY (REGULAR/VOCATIONAL)

Total Lectures: 84
Marks: 80

UNIT-I:
A] Dimensions and Units: Fundamental and derived quantities, Interconversions of units.
B] Mole Concept: Mole, Atomic weight, Molecular weight, Equivalent weight, Methods of expressing compositions of i) solid mixtures, ii) liquid solutions, iii) gaseous mixtures Problems based on these.

UNIT-II:

UNIT-III:
A] Energy: General idea about conventional energy sources, and non-conventional Energy Sources i) Solar energy, Space heating and water heating by solar energy, Production of electricity by solar energy, Tidal power, Wind energy, Biomass energy

UNIT-IV:
A] Fuels : Classification, Units of heat and calorific value
B] Liquid fuels: Petroleum-Origin and classification, Fractional distillation of crude oil, Cracking, Mining of petroleum, natu-
UNIT-V :

Concept of heat conduction, General heat conduction equation, Thermal conductivity, Thermal diffusivity.
Nature of heat transfer by convection, Forced and free convection, Phenomenon of pool boiling, Filmwise and dropwise condensation.
Nature of heat transfer by radiation, Absorptivity, Reflectivity, and Transmissivity, Kirchoff's law, Emissive power and emissivity, Concept of black body, Planck's law and Wien's displacement law.
Heat exchangers, Classification of heat exchangers on the basis of direction of fluid flow, U-tube heat exchanger, Kettle reboiler.

UNIT-VI : Fluid Mechanics:

Definition and classification of fluids, Types of fluid flow-Laminar and Turbulent fluid flow, Equation of continuity, Bernoulli's equation, Pipe joints and fittings, Valves and pumps, Reciprocating and centrifugal pump, Venturimeter, Orificemeter, Pitot-tube, rotameter, Manometer, Reynolds number, Reynold's experiment.

Books Recommended:
1) Stoichiometry - B. I. Bhatt and S. M. Vora
2) Introduction to Stoichiometry - K. A. Gavane
4) Unit Operation: I - K. A. Gavane
5) Industrial Chemistry - B. K. Sharma
6) A Text Book of Engineering Chemistry - S. S. Dara
7) Conventional and Non-conventional Energy Sources - R. C. Rai
8) Non-conventional Energy Sources - G. D. Rai
9) Principles of Physical Chemistry - Puri and Sharma
10) A Text Book of Physical Chemistry - P. L. Soni
11) Unit Operation - McCabe and Smith, McGraw Hill
12) Engineering Heat Transfer - Gupta and Prakash
13) Unit Operations II - K. A. Gavane

1S Industrial Chemistry Practical

List of Experiments

UNIT–I
1. Problems based on Mass Relation.
2. Numerical Problems on Units and Conversions.
3. Preparation of Standard Solution of (Any Two)
   i) Oxalic acid   ii) Copper sulphate, iii) Potassium dichromate
4. Standardization of following Solutions (Any Two)
   i) Potassium Permanganate ii) Sodium hydroxide
   iii) Sodium thiosulphate
5. Determination of moisture content in the given coal sample.
6. Determination of ash content in the given coal sample.
7. Determination of flash point and fire point of given fuel sample.

UNIT–II
1. Determination of molecular weight of given sample by Rast's method.
2. Determination of viscosity of lubricant oil by Redwood viscometer.
3. Determination of Aniline point of diesel.
4. Comparison of the calorific value of the two fuels.
5. Measurement of pressure difference between two points within pipeline, using manometer.
6. Measurement of flow rate at a particular point by Venturimeter.
7. Determination of thermal conductivity of rubber by using Lee's disc method.

Distribution of Marks for Practical Examination.

Time: 6 – 8 hours (One Day Examination) Marks: 50

Unit I: Exercise No.1 (Numericals) é é é .. 06
Exercise No.2 (Practical Expt.) é é é .. 12
Unit II: Exercise No.2 (Practical Expt.) é é é .. 10
Viva-Voce é é é .. 10
Record é é é .. 10
Total: 50
11. PETROCHEMICAL SCIENCE

The examination in Petrochemical Science of First semester shall comprise of one theory paper, internal assessment and practical examination. Theory paper will be of 3 Hrs. duration and carry 80 marks. The internal assessment will carry 20 marks. The practical examination will be of 6 to 8 hours duration and carry 50 marks.

The following syllabi is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question in every unit with internal choice for each of 12 marks & one compulsory question covering all the syllabus of Semester-I (8 marks).

Syllabus:

1S Petrochemical science

Total Lectures: 84
Marks: 80

Note: Figures to the right hand side indicate number of lectures.

UNIT I

Basic concept in Petro-chemistry.
PH, Molarity, Normality, Mole, Molality, Mole fraction, Mole ratio, Parts per million (p.p.m.), Weight fraction, Vapors pressure, Calorific value, Acid, Base, Equivalent weight, Atomic weight, Molecular weight, I.P., A.S.T.M, Arrhenius constant, Avogadrou's number.

Units and Conversion of: Temperature, Pressure, Length, Weight, Residence time, Viscosity.

UNIT II

Fuel and Petroleum Industry
Definition Petroleum, Fuel, Conventional and nonconventional fuel
Type of Petroleum fuel, Primary and secondary, International Petroleum Scinario, National natural gas and petroleum scenario, Petroleum refineries in India, their location, capacity, year of installation, and organization. Map of petroleum reservoir in India.

Types of Natural gas, Wet, Dry, Lean gas, Associated gas, Casing head gas.

UNIT III

Formation, Exploration and Drilling of Crude oil or Petroleum
Formation:- Condition under which petroleum crude is formed, Occurrence of petroleum crude, conversion of organic matter in to petroleum crude, Theories of origin of petroleum(organic, inorganic)

Drilling:- Method of drilling, Cable tool drilling, Rotary drilling, Drilling fluid their function, Composition, Classification.

UNIT IV

Chemistry and Composition of Petroleum
Composition, Characteristics, Constituents of Petroleum or crude oil Types of Hydrocarbons and Non- hydrocarbons present in petroleum
Classification of crude oil:- with Characterization factor, Correlation index, Key fraction, Method of structural group analysis

UNIT V

Refinery Operation
Field operation, Desalting, Dehydration, De-emulsification
Necessity of the fractionation crude oil, Distillation:- introduction, Atmospheric distillation (ADU), vacuum distillation (VDU), Fractions from ADU and VDU, the range of carbon number, boiling point, and molecular weight, and details of composition of various fraction

UNIT VI

Quality Monitoring of petroleum product
Classification of Laboratory tests
Distillation, Vapor pressure, Flash point, Fire point, Octane number, Cetane number, Aniline point, Diesel index, Calorific value, Smoke Point, Viscosity, Viscosity index, Penetration index, Freezing point, Cloud and pour point, Drop point of grease, Melting and Settling point of wax, Gum content, acidity and alkalinity, Copper corrosion test, Density and APT, Refractive index, Conradson carbon residue (CCR).

Semester – I

1S Petrochemical Science Practical

List of Experiments:
1. Density and API gravity of Given sample
2. Acid value of Petroleum sample
3. Drop point and melting of wax
4. Viscosity by U-tube Viscometer
5. Congealing point of wax
6. Saponification value of petroleum sample
7. Flash point and Fire point of petroleum sample
8. Numerical problems on unit conversion
9. Preparation of standard solution

**Distribution of Marks for Practical Examination.**

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<th>Time: 6 hours (One Day Examination)</th>
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<td>Exercise No.2 (Practical Expt.)</td>
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<td>Viva-Voce</td>
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12. GEOLOGY


UNIT-IV: Physical Geology - I: Weathering - Physical Weathering and Chemical Weathering, biological weathering. Susceptibility of Rocks & Minerals to weathering. Geological work done by Wind and River

UNIT-V: Physical Geology - II

UNIT-VI: Paleontology & Stratigraphy:
- Fossils Definition - Modes of Preservation and Importance. Index and Zone Fossils. Physiographic Division of India. Principles of Stratigraphy and Correlation. Geological Time Scale and Stratigraphic Scale of India.

Practicals
3. Study of elements of Symmetry in the Crystals from Normal Seven Classes.
4. Demarcating Physiographic division of India on outline Map.
5. Identifying Mode of preservation in fossils - Cast / Mould / Imprint etc.

Practical Examination will be of 4 hours duration and Carry 50 Marks. The distribution of marks for Practicals will be as follows.

**Semester – I**

A) I Megascopic Identification of Minerals 12 Marks
    II Megascopic Identification of Rocks 12 Marks
    III Symmetry Elements of Crystals 10 Marks
    IV Physiographic Division of India 02 Marks
    V Fossil - Modes of Preservation 04 Marks

B) Record 05 Marks
C) Viva-Voce 05 Marks

**Total** 50 Marks.
There shall be following paper and practical for B. Sc. Part I Semester one examination. The syllabus is based on six theory periods and six practical periods per week (Total 75 – 80 theory sessions and 25 practical sessions per complete semester). There shall be one compulsory paper of 3 hours duration, in theory as stated below and practical examination extending for 4 hours. Every examinee shall offer the following paper of 100 marks (out of which 80 marks will be for written examination and 20 marks for internal assessment) and practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

### Paper I

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<td>Internal Assessment</td>
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<td>Practical</td>
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**Total 150 Marks**

### UNIT-I: Plant Diversity

**Diversity & Applications of Microbes and Cryptogams**

**UNIT-II: Algae**

1. Classification according to F. E. Fritsch and G. M. Smith up to classes
2. General characters of algae with reference to Habitat, Thallus organization, Pigmentation, Reserve food and Reproduction
3. General characters of following classes with special reference to examples mentioned
   - Chlorophyta - Oedogonium
   - Charophyta - Chara (Thallus structure and reproduction)
   - Phaeophyta - Sargassum (Thallus structure and reproduction)
   - Rhodophyta - Batrachospernum

### UNIT-III: Fungi

1. Classification according to Ainsworth (1973)
2. General characteristics of following classes with special reference to examples mentioned
   - Mastigomycotina : Albugo (Cystopus)
   - Ascomycotina : Aspergillus
   - Basidiomycotina : Puccinia graminis-tritici
   - Deuteromycotina : General characters
3. Lichen-Types & Economic importance

### UNIT-IV: Bryophyte

1. Classification according to G. M. Smith
2. General characters, thallus organization and life cycle of
   - Hepaticopsida - Marchantia
   - Bryopsida - Funaria
3. Evolution of sporophyte in bryophytes
4. Affinities of bryophytes with algae and pteridophytes
5. Brief Account on some Indian Bryologist.

### UNIT-V: Pteridophyte

1. Pteridophytes as First Vascular Plants.
2. Classification according to G. M. Smith
3. General characters of the following classes with special reference to examples mentioned
   - Sphenopsida - Equisetum
   - Filicopsida - Marsilea
4. Stele types in pteridophytes
5. Heterospory and Seed Habit in Pteridophytes

### UNIT-VI: Application of Microbes Cryptogams

1. Economic Importance of Algae with special reference to Food, Industries, Agriculture and Harmful aspects
2. Mycorrhiza Types and Application
3. Role of Fungi in Industries, Medicine, Food & Agriculture
4. Plant Diseases
   - Viral - TMV
   - Bacteria - Black arm of cotton (Xanthomonos malvacearum)
   - Fungal - Tikka disease of groundnut (Cercospora sps.)
5. Economical and Ecological Importance of Bryophytes
LABORATORY EXERCISE:

I. ALGAE
Preparation of temporary mount, identification with reason of following algal materials:
edogonium, Hydrodictyon, Chara, Vaucheria, Ectocarpus, Sargassum, Batrachospermum

II. FUNGI AND PLANT PATHOLOGY
(1) Study of following genera:
   Albugo, Uncinula, Penicillium, Agaricus, Puccinia, Cercospora
(2) Study of Crustose, Fruticose & Foliose Lichen
(3) Study of symptoms of fungal, viral, bacterial and Mycoplasmal diseases
(4) Collection of fungal specimen & infected plant part from local region
(5) Demonstration of Mushroom Cultivation Technology

III. BRYOPHYTES
Study of external and anatomy features of vegetative and reproductive parts of following genera:
   Marchantia, Anthoceros, Funaria, Polytrichum and Sphagnum

IV. PTERIDOPHYTES
Study of Pteridophyte external and anatomy features of vegetative and reproductive parts of following genera:
   Lycopodium, Equisetum, Osmunda, Selaginella, Adiantum, Marsilea and any one fossil specimen

Note:
1. Omit the details of development of sex organs and sporophyte.
2. Botanical excursion (Two local and one outside the state is compulsory)
3. Common algal, fungal, pathological, bryophytic and pteridophytic collection and excursion report must be submitted at the time of practical examination.

BOOKS RECOMMENDED
14. ENVIRONMENTAL SCIENCE

1S Environmental Science
(CONCEPTS OF ENVIRONMENTAL SCIENCE)


UNIT – II. A. Natural Resources - Definition, classification.

a). Water Resources (Freshwater) - types, availability, demand utilization and conservation.

b). Forest resources - Distribution, Indian types, utilization and conservation.
c). Mineral resources - types, availability, distribution, utilization and conservation.

B. Soil - Definition, composition, formation, soil profile. Humus - significance and role. (Lectures-14)

UNIT – III. Environmental meteorology-I.

UNIT – IV. Environmental meteorology-II.
Atmospheric pressure, Vapor pressure, saturated vapor pressure, concept of fog. Clouds - definition, formation and types. Precipitation - types (orographic, convective, cyclonic), forms of precipitation (rain, drizzle, sleet, hail, snow). Monsoon - Meaning origin, Indian monsoon (Bay of Bengal branch and Arabian Sea branch) and significance. El-Nino - concept and mechanism. (Lectures-14)

UNIT – V. Environmental Geosciences.
a). Climatic types and their distribution - Tropical Rainforest, Savanna, Taiga and Tundra with respect to their temperature, wind pattern, precipitation and vegetation.
b). Geological hazards - Earth quakes, Floods, Volcano's, Cyclones (causes, distribution types and effects). (Lectures-14)

UNIT – VI Marine Environment
c). Marine Resources - Food, medicinal, mineral, ornamental, petroleum deposits. (Lectures-14)
Note- Visit to:
1. Meteorological Station
2. Ecosystem- Forest / pond / River.
3. Landslide/ Rock fall/ Flood affected areas.

BOOKS FOR REFERENCE:
1. Physical geography by Savendra Singh
2. Climatology by S.K. Lal
3. Climatology by Savendra Singh.
5. Engineering and general Geology by Parbin Singh
11. A Text Book of Marine Ecology by Balkravan Nair .

PRACTICAL - I

PRACTICAL COURSE FOR B.Sc. PART- I, SEMESTER-I
(Environmental Science)

A) Experiments on water analysis.
1. Measurement of pH. Determination of
3. Determination of total Hardness.
5. Determination of alkalinity.
7. Determination of turbidity.

B) Experiments on Soil and rocks and minerals.
1. Determination of soil temperature.
2. Determination of soil moisture by tensiometer.
3. Determination of soil bulk density.
5. Determination of soil electrical conductivity.
6. Determination of soil pH.
7. Determination of soil acidity
8. Determination of soil organic content.
10. To study the properties of rocks and minerals (Streak, lusture, texture hardness, color etc.).

C) Experiments on meteorology.
1. Measurement of humidity and relative humidity.
2. Measurement of light intensity at different time.
3. To monitor wind speed and direction.
5. Observation of clouds.

D) Spotting.
1. Rocks and minerals.
2. Observations and comments on meteorological instruments.
3. Economically important plants of forest origin (medicinal, timber yielding, fiber yielding, resinous and other).

EQUIPMENTS:
1. pH meter
2. Conductivity meter.
3. Anemometer & wind vane.
4. Sieves.
5. Psychrometer (Dry-wet bulb thermometer).
6. Rain gauge.
8. Turbidimeter.
9. Lux meter.
10. Soil thermometer
11. Tensiometer

DISTRIBUTION PF PRACTICAL MARKS

Time : 4 hrs.
Q.1 Experiment on water analysis ------------------------------- 10
Q.2 Experiment on soil analysis -------------------------------10
Q.3 Experiment on meteorology ------------------------------- 08
Q.4 Spotting (any four) -----------------------------------08
Q.5 Tour Diary --------------------------------------------04
Q.6 Practical record ----------------------------------------05
Q.7 Viva-voce -------------------------------------------05

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TOTAL 50
15. SEED TECHNOLOGY (VOCATIONAL)

There shall be one theory paper of 80 marks and practical examination of 50 marks for each semester. Duration of theory paper shall be 3 hours and practical examination shall be of 4 hours.

The syllabus is based on 6 lectures and 6 practical periods per week. One on job training of one month duration shall be compulsory for each semester.

IS-Seed Technology

SEED DEVELOPMENT, SEED PHYSIOLOGY AND INTRODUCTION TO PLANT BREEDING

UNIT I: Fertilization.
Seed structures and texture
Endosperm and embryo development Immature seed and germination.
Polyembryony
Apomixis.
Development of fruit and seed Monoanxic, Diauxic.
Physiological and Harvestable maturity.
Peroxidase test, GA3 test, RFLP Classification of fruits
Use and limitation of laboratory techniques.
Biochemical methods, electrophoresis, phenol colour
Sequential approach in testing.

UNIT II: Physiology of seed development allometry.
Seed ripening and maturation processes.
Chemical composition of seeds.
Synthesis of food reserves.
Germination, pattern of water absorption. Types of germination and seedling abnormalities in major monocot and dicot crop species, its causes.
Factors affecting germination, its implications.
Breakdown of different seed storage products during germination.

UNIT III: Respiratory pathways during germination.
Enzymatic activities during germination.
Germination stimulators and inhibitors.
Dormancy and ecological implications.
Organic dormancy, Hardseededness.
Causes of dormancy and its breakage.
Seedling establishment and role of endosperm and embryo size on seedling establishment.
Seed deterioration during storage, factors affecting physiological changes, its implications on seed quality.

UNIT IV: Seed vigour, its measurements and crop productivity.
Invigoration treatment to improve seedling establishment and its effect planting value.
Treatments to minimize seed ageing.
Seed longevity behaviour Orthodox and recalcitrant seeds.
Specific problems of dormancy and seed longevity in some important crop species.
Micropropagation techniques; its significance use, scop and limitations.
Seed pelleting and coating artificial seed production (synthetic seeds).

UNIT V: Major families of dicotyledons and monocotyledons
Flower structure, megasporangium, female gametophyte development.
Microsporangium, male gametophyte development.
Pollination, Autogamy, Allogamy
Polyembryony.
Apomixis.
Testing for cultivar genuineness; Objectives, General principles and methods.
Morphology of seeds for variety identification.
Variety descriptors; importance in variety release System, DUS system.
Grow out test in cotton.
General Introduction to plant breeding
Definition, history, nature, scope, objectives.

UNIT VI: Mode of reproduction in plants
Asexual; Parts of plants used for propagation, apomixis.
Pollination: self-pollination and cross pollination; agencies for cross pollination (air, insects, water and animals).
Fertilization: Germination of pollen grain, growth of pollen tube, fusion of egg and sperm nuclei, double fertilization.
Sterility and incompatibility Definition of sterility.
Types of sterility cytoplasmic, genetic, cytoplasmic genetic.
Utility of male sterility in hybrid seed production.
Definition of incompatibility. Morphological, enetic and biochemical basis of self incompatibility
Utility of self incompatibility
Use of chemical hybridising agents.

PRACTICALS
SEED DEVELOPMENT, SEED PHYSIOLOGY AND INTRODUCTION TO PLANT BREEDING.
1. Morphology of dicot seeds.
3. Seedling morphology and adult plant morphology in some major crops for identification in glass house experiments.
4. Phenol test in wheat and paddy.
5. Peroxidase test, 2-4D test.
6. GA test in wheat and other crops.
7. Electrophoresis NaOH Test.
10. Seed leachate conductivity test.
11. Quick viability test.
13. Invigoration treatments.
15. Cytological techniques for the study of chromosomes in plants.

PRACTICAL EXAMINATION
Distribution of marks
1. Identification and classification of seeds (monocot and dicot seeds).......
2. Phenol test in wheat.
3. Seed test (Peroxidase test, GA test) any one.
4. Identify describe specimen A, B, C, and D giving reasons. (Flower, Pollination, Embryology slides or models).
5. Submission of visit reports.
6. Specimen collection and viva voce.

Total Marks 50

Books Recommended
1. The embryology of angiosperms. Bhojwani, S. S. and Bhatnagar, S. P. Physiology of seeds Crocker, W. and Barton, L. V.
2. Principles of seed science and Technology. LO Copeland Business publishing Co., USA.
3. Viability of seeds EH Roberts.
6. Physiology and Biochemistry of seeds. Bewley and Black.
7. Seed Technology R L Aggarwal Oxford IBH.

16. ZOOLOGY
There shall be following paper and practical for B.Sc. Part-I Semester One examination. The syllabus is based on 6 theory periods and six practical periods per week (Total 75-80 theory Sessions and 25 practical sessions during the complete semester). There shall be one compulsory paper of 3 hours duration, in theory as stated below and practical examination extending for four hours. Every examinee shall offer the following paper of 100 marks, (Out of which 80 marks will be for written examination and 20 marks for internal assessments) and practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

Marks
1) Paper-I: Life and diversity of Non-Chordata
Theory (Written) ......... 80
Internal assessments ......... 20
2) Practical: ......... 50

Total : 150 Marks
1S-ZOOLOGY
LIFE AND DIVERSITY OF NON-CHORDATA

UNIT-I:
1. Classification of Non-Chordata.
3. Type study: Plasmodium vivax: Structure, Life-cycle.

UNIT-II:
1. Phylum Porifera: General Characters.
3. Phylum Coelenterata: General Characters.

UNIT-III:
1. Phylum Platyhelminthes: General Characters.
2. Type study: Fasciola hepatica: Habits and habitat, External features, Digestive, Excretory, Reproductive system and Life cycle.
3. Phylum Aschelminthes: General Characters.
4. Type study: Ascaris lumbricoides: Habits and habitat, External features, Digestive, Excretory, Reproductive system and Life cycle.

UNIT-IV:
1. Phylum Annelida: General Characters.
2. Type study: Leech: External features, Digestive, Excretory, Reproductive system.
3. Phylum Arthropoda: General Characters.
4. Type study: Cockroach: Habits and habitat, Digestive system, Respiratory system, Reproductive system.

UNIT-V:
1. Phylum Mollusca: General Characters.
2. Type study: Pila globosa: Habits and habitat, External features (Shell and Body), Digestive, Respiratory and Reproductive system.
3. Phylum Echinodermata: General Characters.
4. Type study: Asterias: Habits and habitat, External features, Digestive system, Water vascular system.

UNIT-VI:
1. Phylum Hemichordata: General Characters, Body organization of Balanoglossus, Affinities of Balanoglossus, with non-Chordata, and Chordata.
2. Corals, coral-reefs.
4. Larval forms and their significance: Amphiblastula, Planula, Trochophore, Bipinnaria, Brachiolaria.

LIFE AND DIVERSITY OF NON-CHORDATA
Practical: Two practical per week each of 3 period duration. The Examination shall be of 4 hrs duration and of 50 marks.

I-Life and diversity of non-chordata
1. Observation, Classification up to classes and sketching of the following animals, (Specimens or Models):
   - Phylum Porifera: Sycon, Bath sponge, Euplectella.
   - Phylum Coelenterata: Obelia, Aurelia, Tubipora.
   - Phylum Platyhelminthes: Taenia, Ascaris (male & female).
   - Phylum Arthropoda: Prawn, Limulus, Aranea, Scolopendra, Julius, Moth, Mosquito.
   - Phylum Mollusca: Chiton, Pila, Dentalium, Unio, Octopus.
   - Phylum Echinodermata: Antedon, Holothuria, , Echinus, Sea star, Brittle star
   - Phylum Hemichordata: Balanoglossus
2. Study of Permanent slides:
   - L.S.Sycon, nematocyst, Ascaris egg, T.S. Ascaris through gonads, T.S.Leech through crop, Compound eye of insect, Radula, Gill lamella and Osphradium of Pila, Scolex and Gravid Proglottid of Taenia.
3. Anatomical Study through Computer Aided Techniques, Video Clipping Models, Photographs and other available resources:
   - a) Leech/Earthworm: Alimentary canal, Reproductive system, Nervous system,
   - b) Grasshopper/Cockroach: digestive system, Nervous system, Reproductive system,
   - c) Culture of Paramoecium and Volvox (To be given to all students)
4. Mountings:
   - a) Mosquito (Aedes, Culex and Anopheles): wings, legs, mouth parts
   - b) Housefly: Mouth parts, legs, wings
   - c) Paramoecium and Volvox
Distribution of Marks during Practical Examination:

<table>
<thead>
<tr>
<th>i) Identification and comments on spots (1-8)</th>
<th>12 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>ii) Labelling of Anatomical diagrams provided (Two)</td>
<td>10 Marks</td>
</tr>
<tr>
<td>iii) Permanent stained micro preparation</td>
<td>08 Marks</td>
</tr>
<tr>
<td>iv) Study tour diary - é é é é é</td>
<td>04 Marks</td>
</tr>
<tr>
<td>v) Permanent stained micro preparation Submitted by examinee é é .é .</td>
<td>04 Marks</td>
</tr>
<tr>
<td>vi) Certified class record - é é é é é</td>
<td>05 Marks</td>
</tr>
<tr>
<td>vii) Check list of 20 locally available invertebrate faunaé é é é</td>
<td>02 Marks</td>
</tr>
<tr>
<td>viii) Viva-voce é é é é é ..</td>
<td>05 Marks</td>
</tr>
</tbody>
</table>

Total: - .é é é 50 Marks

Note:

1) One or two short excursion / study tours are compulsory for observation of animals in their natural habitat.

2) Candidates shall be required to produce at the practical examination the following.

   • Practical record book duly signed by the teacher in charge and Certified by the Head of the department as bonafide work of the Candidate.
   • Five permanent stained micro preparations.
   • Study tour report and field diary duly signed by the teacher.

Reference Books Recommended (All latest editions):

6) S.N.Prasad : Text Book of Invertebrate Zoology.
7) Vishwanathan : Invertebrate Zoology.
8) Majpuria : Invertebrate Zoology.
9) Dhami and Dhami : Non-chordate Zoology.
13) S.S.Lal, Practical Zoology, Invertebrate.
15) Verma and Agarwal Practical Zoology, Invertebrate
16) - Barnes R.D. Invertebrate Zoology -(W.B. Saunders Co.)
17) P.G.Puranik and Thakur, Invertebrate Zoology.

17. INDUSTRIAL FISH AND FISHERIES (vocational)

There shall be a following paper and practical for B.Sc.Part-I Semester One examination. The syllabus is based on 6 theory periods and six practical periods per week (Total 75-80 theory periods and 25 practical during the complete semester). There shall be one compulsory paper of 3 hours duration, in theory as stated below and practical examination extending for four hours. Every examinee shall offer the following paper of 100 marks, (Out of which 80 marks will be for written examination and 20 marks for internal assessments) and practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Paper-I: FISH BIOLOGY</td>
</tr>
<tr>
<td>Theory (Written)</td>
</tr>
<tr>
<td>Internal assessments</td>
</tr>
<tr>
<td>2) Practical:</td>
</tr>
<tr>
<td>Total:</td>
</tr>
</tbody>
</table>

15. INDUSTRIAL FISH AND FISHERIES

FISH BIOLOGY

UNIT I
1. Taxonomy and its applications.
2. Taxonomic data and its collection methods.
4. External morphology of commercially important species of, prawn, crab, lobster, bivalve, gastropod and cephalopods of India.

UNIT II
1. External morphology of commercially important species of Elasmobranch, Teleost of India ,
3. Anatomy of Respiratory system
   4. Accessory Respiratory organs.

   2. Anatomy of excretory system.
   3. Excretion & osmoregulation in marine & freshwater fish

   2. Lateral line receptors, Electric organs
   3. Sound Producing organ.
   4. Food and feeding habits of F.W. Fish, Marine fish, prawn, crab, lobster, bivalve, gastropod and cephalopods.

UNIT V: 1. Sexual dimorphism.
   2. Anatomy of Reproductive system.
   3. Fecundity and its estimation; Fecundity in relation to length, weight, age and food supply.
   4. Spawning and factors affecting spawning.
   5. Types of eggs, pre-embryonic and post embryonic development in major carps.

UNIT VI: 1. Qualitative and quantitative estimation of food consumption: Experimental estimation of food consumption: Experimental studies and stomach content analysis.
   2. Nutrition in fishes and utilization of food, seasonal changes in food, availability of food, food preference, feeding intensity.
   3. Fish migration.
   4. Social behavior of fish aggregation and shoaling.

PRACTICALS
1. External morphology and morphometrical study of a fish, prawn, crab, lobster, bivalve and cephalopods.
2. Methods of collections, handling, identification and preservation of above animals for taxonomic purposes.
3. Identification of commercially important F.W. and Marine fishes, prawns, crabs, bivalves and cephalopods of India.
4. Preparations of wet and dry mounts, wax and plaster castings of fish. Aizarine Preparations and study of skeleton of Teleosts.
5. * Dessections ñ
   * Digestive, Nervous, Circulatory, Reproductive systems in type specimens of fish,
   * Accessory Respiratory organs and gas bladder of fish.
   * Dissections of prawn: - Digestive, Nervous system.
   * Dissections of Crab: - Digestive, Nervous.
6. Permanent stained mounting of statocysts in prawn, scales, and intestinal parasite of fishes.
7. Sexual dimorphism in fishes.

Note: Study tour will be compulsory for observation and collection of fishes, prawns, crabs, mollusks during first semester which will be treated as a part of fbnm the job training. Collection and field dairy are to be submitted at the time of practical examination.

PRACTICALS EXAMINATION
Distribution of Marks.
1. Identification and comments on given specimens 1 to 5 ð 10 Marks
2. Identification of a given species of fish by morphometric study. ð 10 Marks
3. Dissection ð 10 Marks
4. Permanent stained micro-preparation ð 5 Marks
5. (a) Viva voce ð 5 Marks
   (b) Record book and Permanent slide submitted ð 5 Marks
   (c) Field dairy ð 3 Marks
   (d) Collection ð 2 Marks

Total: 50 Marks

18. BIOLOGICAL TECHNIQUES AND SPECIMEN PREPARATION (VOCATIONAL)

There shall be a following paper and practical for B.Sc. Part-I Semester one examination. The syllabus is based on 6 theory periods and six practical periods per week (Total 75-80 theory periods and 25 practical during the complete semester). There shall be one compulsory paper of 3 hours duration, in theory as stated below and practical examination extending for four hours. Every examinee shall offer the following paper of 100 marks, (Out of which 80 marks will be for written examination and 20 marks for internal assessments) and practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

Marks
1) Paper-I: CAPTURE FISHERIES
   Theory (Written) ò .. 80
   Internal assessments ò .. 20
2) Practical: ò .. 50

Total: 150 Marks
1S - Biological Techniques and Specimen Preparation

Biological Techniques and specimen preparation (Animal)

UNIT-I : Description and use of Light microscope, phase contrast microscope and stereoscopic microscope, magnification and resolution. Ocular and stage micrometers and there use in measurement of micro- objects. Some common problems associated with light microscopes : Care of microscope, Cleaning of lenses, Replacement of rack and pinion, use of condenser, mirror position and types, Double demonstration eye piece, Pointer eye-piece, Focusing problems.

UNIT-II : Haemocytometer : Neubaur's chamber for RBC and WBC counting and other uses. Camera Lucida - Construction and functions.


UNIT-IV : Broad classification of animals up to order. Identification of animals commonly used as specimens. Where and how to collect animals and preparation of museum specimens, Preservatives, Dissected animals as museum specimens and preparation of life cycles of specimens.

UNIT-V : Organs and tissues commonly used in the classroom, Scales of fishes (Placoid, Rhomboid, Cycloid and Ctenoid), Ampulla of Lorenzini, Oral hood of Amphioxus, Pectin in birds, skin,. Preparation of Skeletons, (Fish/Amphibian/Reptile/Bird/Mammal). Preparation of liver, pancreas, tongue intestine, stomach, thyroid, kidney, gonads striated muscles, cartilage, squamous epithelium, Bone, of frog and rat.


PRACTICALS
1. Use and maintenance of microscopes. Light compound and dissecting microscopes. Stereoscopic microscopes, Binocular microscopes.
3. Fixatives and mounting media: Bouin's fluid (alcoholic/aqueous), Carnoy's fixatives, Glycerine, Canada balsm, DPX.
4. Hanging drop technique.
5. Micortomy: Preparation of Zoological permanent microslides (Histological)
7. Counting of cells by Haemocytometer .growth curve.
8. Use of ocular and Stage micrometer scales for measurement of micro objects.
10. Preparation of Zoological whole mounts.
12. Dissection and display of dissected specimen.

Practical Examination
Distribution of marks (50 Marks)

Q1. Dissection and its display with proper labeling . 10 marks.
Q2. Permanent stained micropreparation
   Or
   Double stained preparation 8 marks
Q3. blood smear by using nuclear stains. 7 marks
Q4. Counting of blood cells by haemocytometer  10 marks
Or
Measurement of micro-objects by coulometer
Q5. Submission of Zoological museum specimens, skeletons, Models, charts, (At least 3 different types) are to be Submitted at the time of examination.  5 marks
Q6. Practical record  5 marks
Q 7 viva voce  5 marks
Total :  50 Marks

19. STATISTICS
The examination in Statistics of First & Second semester will comprise of one theory paper each, internal assessment and practical examination. Theory paper will be of 3 Hrs. duration and carry 80 marks. The internal assessment will carry 20 marks. The practical examination will be of 4 hours duration and carry 50 marks.
The Distribution of marks for practical will be as follows :
1. Practical record ------------------------------------------ 08 Marks
2. Practical Viva Voce -------------------------------------- 12 Marks
3. Practical problems ---------------------------------------- 30 Marks

The following syllabi is prescribed on the basis of six lectures per week and six practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question in every unit with internal choice for each of 12 marks & one compulsory question covering all the syllabus of Semester-I (8 marks).
The college imparting instructions in Statistics should provide 12 digit desk model electronic calculators to the every student for practical work.

1S STATISTICS
UNIT I : Introduction to Statistics:
1.1 Meaning of statistics as Science, its importance and limitations.
1.2 Scope of Statistics : In the field of Industry, Biological Sciences, Medical Sciences, Agricultural Sciences, Management Sciences, Education and Psychology.
1.3 Statistical Organizations in India and their functions : CSO, NSSO, IIPS, ISI.
1.4 Types of Data : Qualitative and Quantitative data, nominal and ordinal data, discrete and continuous data, frequency and non-frequency data.

UNIT II : Presentation of Data :
2.1 Classification : Rules of Classification and its types.
2.2 Tabulation : Meaning of Tabulation & its types, construction of tables with one or more factors.
2.3 Frequency Distribution : Discrete and continuous frequency distribution, cumulative frequency distribution, ogive curves.
2.4 Central Tendency : It's concept and its measures (A.M., weighted A.M., median, mode, G.M., H.M.) with its merits and demerits.
2.5 Properties of A.M., relation between mean, mode and median, relation between A.M., H.M., G.M.
2.6 Partition values : Quartiles, deciles and percentiles.

UNIT III : Measures of Dispersion, Skewness and Kurtosis :
3.1 Range, Quartile deviation, mean deviation and its coefficients.
3.2 Standard deviation, root mean square deviation, variance and various formulae for calculating variance, C.V.
3.3 Moments : Raw moments and central moments with its relationship, effect of change of origin and scale on moments.

UNIT IV : Theory of Probability :
4.1 Permutation and combination theory, Binomial theorem.
4.2 Algebra of Events.
4.3 Concept of probability, Definitions of (i) Random experiment, (ii) Trial and Events, (iii) Exhaustive event, (iv) Favourable event, (v) Equally likely event, (vi) Mutually exclusive event, , (vii) Independent event & complementary event.
4.4 Classical and Statistical Probability with its limits, simple numerical problems on probability.
4.5 Sample space, discrete sample space (finite & countably infinite), Axiomatic probability, simple theorems on probability with additive and multiplicative law of probability.
4.6 Conditional probability, Independent events and Bayes theorem.

UNIT V : Random Variables and Mathematical Expectations:
5.1 Concept of random variable & its illustration by examples. Discrete and Continuous random variables.
5.2 Probability distribution of a r.v., discrete and continuous distribution function, properties of distribution functions, simple numerical problems on probability distribution.
5.3 Mathematics expectations and its properties. Numerical problems on expectations.
5.4 Expectation of discrete and continuous r.v., expectation of a linear combination of r.v., variance of a r.v. covariance and its properties.

UNIT VI: Generating functions & Bivariate Distributions:
6.1 Probability generating function, moment generating function, relation between p.g.f. and m.g.f., properties of m.g.f.
6.2 Cumulant generating function and their properties.
6.3 Bivariate probability distributions (discrete and continuous), joint, marginal and conditional probability mass functions.
6.4 Marginal distribution functions, joint density function, marginal and conditional density functions.
6.5 Stochastic Independence, numerical problems on bivariate, marginal and conditional functions.
6.6 Addition and multiplication theorem of expectation.

List of Practicals: (1S Statistics)
1. Presentation of data by frequency table.
2. Calculation of arithmetic mean, median and mode for grouped and ungrouped frequency distributions.
3. Calculations of harmonic mean and geometric mean for grouped and ungrouped data.
4. Calculations of partition values as deciles, quartiles and percentiles.
5. Calculation of range, mean deviation and quartile deviation with its coefficients.
6. Calculation of standard deviation and coefficient of variation for grouped and ungrouped data.
7. Problems on calculations of moments (upto third order)
8. Problems on skewness and kurtosis.
11. Problems on conditional probability.
13. Determination of mathematical expectation and variance for discrete and continuous r.v.
14. Computation of covariance between two variables.

Note: The practicals numbered 2, 4 and 6 may be performed on MSEXCEL.

References for 1S and 2S (Statistics)
(1) Brase and Brase: Understandable Statistics.
(2) J.Medhi: Statistical methods, an introductory text.
(6) D.N.Elhance: Fundamentals of Statistics

List of Equipments and Instruments required for a Batch of Students in U.G. Statistics Laboratory: -
(1) Twelve digit desk model electronic calculators 20
(2) Biometrika tables Vol.-I & II 02
(3) Seven figure logarithmic tables 10
(4) Statistical tables (compiled) 10
(5) Random Number Tables 10
(6) Personal Computer with Printer 05
(7) Statistical Poster and chart. 02
20. COMPUTER SCIENCE
OR
20. COMPUTER APPLICATION
OR
20. INFORMATION TECHNOLOGY

The examination in Computer Science will comprise one theory Paper and Practical examination for each semester. The theory paper will be of 3 Hours Duration and carry 80 marks. The Practical examination will be of 4 Hrs duration and carry 50 marks.

The distribution of marks in Practical examination is given as:

1) Program writing / execution (on group A & B) : 30 marks
2) Practical / Record : 10 marks
3) Viva-voce : 10 marks

Total 50 marks

1S : Computer Science or Computer Application or
Information Technology

Paper-I

Computer Fundamentals and C Programming

UNIT-I : Introduction to Computers:

UNIT-II : Introduction to OS:

UNIT-III : Introduction to Internet:
Direct, Types of Internet connection: Direct dial-up, broadband, Internet protocol: TCP/IP, FTP, HTTP. Domain name e-mail address, WWW, web browser: Internet Explorer. Netscape navigator, search engines.

UNIT-IV: Programming Concept: Algorithm flowcharting programming languages, assembler, interpreter, compiler programming process: program design, coding compilation, Execution, testing, debugging documentation structured programming: features and approaches.

UNIT-V: Elements of C: Introduction to C, History, features structure of C program, header file, character set, keywords, identifiers, constants, variables, basic data types, symbolic constants, typedef operators & Expressions: Arithmetic, Relational, logical assignment, Increment and decrement, precedence of operators.

UNIT-VI: I/O Operations:
Formatted I/O: Printf(), Scanf(), Unformatted I/O: getc(), getche(), getchar(), putc(), putche(), putchar(), gets(), Puts(), Control structure: if, if... else, nested if, conditional operator, switch, goto, while, for, do..while, nesting of loops, break, continue.

Books Recommended:
1) Computer fundamental: B Ram, Nas Age publication
4) Information Technology: Alexie and Mathews, Vijay Nikole Publication.
5) IT Tools and Applications: Alexie and Mathews, Vijay Nikole Publication.
6) Programming in C: Ealgurusamy, TMH. Publications.
7) C Programming With C: Ravichandran.
8) Program with C: Byron Gottfried, schaum series Publication.

Practicals: Minimum 16 practicals based on
A. Unit-II, III and MS-WORD, MSEXCEL (Minimum 8 Practicals)
B. Unit-IV to Unit-VI (Minimum 8 Practicals)

21. COMPUTER APPLICATION (VOCATIONAL)
The examinations in vocational subject Computer Application will comprise of one theory papers and practical examination for each semester. The theory paper will be of 3 hours duration and carry 80 marks. The practical examination will be of 4 hours duration and carry 50 marks.

The distribution of marks in the practical examination will be as follows:

1) Practical based on computer lab I : 15 Marks
2) Practical based on computer lab II : 15 Marks
Each unit of theory paper will carry two questions with internal options to solve any one question. Candidates are required to pass separately in theory and practical. The following syllabus is based in 8 theory periods and 4 practical periods (of 2 terms of 2 periods) per week.

1S : Computer Application (Vocational) : Paper-I

Fundamentals of Computer Applications


UNIT-III : Internet : History, URL, Domain, Protocol(FTP,IPV4,IPV6), Wifi, Internet Accounts : Dial up, direct access and broadband. Web browsers : Internet Explorer , Opera, Search Engines. E-mail : Using mail clients such as Microsoft Outlook & Webmail

UNIT-IV : Programming Concept : Algorithm, flowcharting, types programming languages, Programming process : Program design, coding, compilation & Execution, testing & debugging, documentation. Data Structure: Types of DS, operations on DS, Linear Array(Linear, Binary Search, Bubble Sort), STACK(Push,Pop), Introduction to QUEUE

UNIT-V : Structured Programming : History and advantages of C language, structure of C program, character set, identifiers, keywords, constants and variables, symbolic constants, qualifiers, type conversion.

Operators and Expressions : Types of Operators - Arithmetic, Relational, logical, assignment, increment & decrement, bitwise.

UNIT-VI : I/O Operations : Formatd I/O : printf(), scanf() Unformatted I/O : getch(), getche(), getchar(), putch(), putche(), putchar(), gets(), puts().

Control structures : Branching - simple if, if-else, Conditional operator(? : ), nested if, switch.

Looping - while, do-while, for statements, comma operator, goto label, break, continue, nested loops: while, do-while, for.

Books Recommended :
1) Computer Fundamentals & Networking - P.K.Sinha
2) Fundamentals of Computer - B.Ram
3) Internet Book - Clstenes
4) Information Technology - Alexies & Mathews - Vijay Nikole

Reference Books :
1) Fundamentals of Computer - V.Rajaraman
2) Computer Network-Andrew Tennanbaum
3) 3 Local Area Network - Keiser - TMH
4) I.T. tools and applications - Alexie & Mathews - Vijay Nikole
5) ABC of Internet - Christian Crumblish (BPB)

PRACTICALS :
Computer Lab.-I : Minimum 8 practical based on :
1) Windows 95/98/Me 2000/XP
2) M.S.Office (Word, Excel, Power Point)

Computer Lab.-II : Minimum 8 practical based on Unit-IV, V and VI.

Study tour : Study tour may be arranged to computer industry, software development organisations, institute, software technology park, I.T. park.

22. ELECTRONICS

General Provisions/Instructions

Part A
(i) The Examination in Electronics of each semester shall comprise of one theory paper of 80 marks of three hours duration and internal assessment of 20 marks.
(ii) Theory paper of each semester shall comprise of six units. Each unit shall be completed in maximum 15 teaching periods of 48 minutes duration.
(iii) There shall six questions of twelve marks on each unit with alternate choice and One compulsory question (08 subquestions of 01 mark each) of 08 marks covering syllabi of all units (short answer type).
Part B
(i) The Practical examination of each semester of the B. Sc. (Electronics subject) shall be of 50 marks of 4 hours duration and shall be held at the end of each semester at the places as decided by the university.

(ii) Distribution of 50 marks assigned to practical for (Semester I to V) is as under -

1. Experiment: 30 Marks (Construction, testing and performance)
2. Practical record: 10 Marks
3. Viva-voce: 10 Marks

Total: 50 Marks

(iii) Project will be given to a group of not more than four students.

(iv) Teacher may adopt any innovative practice for demonstration of practicals on the aspects given.

(v) College/Department may prepare laboratory manuals of experiments

Semester I
1S-Electronics
Basics of Electronics

Unit I: Passive Components and Network theorems
Introduction to Resistors, Capacitors, Inductors and Transformers, Concept of ideal dc voltage and current source, KVL, KCL, Thevenin, Norton, maximum power transfer, Millman’s theorem (statement, proof, simple numerical application for dc only).

UNIT II: Measuring Instruments:
Principles of voltmeter, ammeter, ohmmeter, Multirange DC voltmeter, ohm per volt rating, loading effect, Multirange DC Ammeter, Series & shunt type ohmmeter, Multimeter (use & drawback). CRO Block diagram & explanation, CRT construction & working, use of CRO (measurement of frequency, amplitude & phase.)

Unit III: Semiconductor Diode and Regulated power supply:
Operation and characteristics of PN junction diode, Avalanche and Zener breakdown mechanism, Half wave and full wave rectifiers (ripple factor, efficiency, PIV ratings), C, L and \( \pi \) filters, Concept of unregulated and regulated power supply, Zener diode voltage regulator, Three terminal IC regulator.

Unit IV: Bipolar Transistors:
NPN and PNP transistor (construction and working) CB, CE & CC configuration, leakage currents, Input and output characteristics of CE mode, relation between \( \alpha \) and \( \beta \), Load line and operating point, Amplification action of CE amplifier, biasing and stability, Self & fixed bias circuit.

Unit V: Switching and Optoelectronic devices:
Construction, working and characteristics of FET, MOSFET, UJT, SCR, relation of FET parameters, Construction, working & characteristics of LDR, LED, photodiode, photovoltaic cell (Solar cell).

Unit VI: Integrated Circuits:
Introduction to IC technology, advantages and disadvantages, Classification of ICs, Basic steps in fabrication of monolithic ICs, Fabrication of diode, resistor & transistor. Scale of integration up to VLSI Basic concept of Embedded systems.

Books Recommended:
1) Basic electronics by B.L. Thereja (S.Chand and Company)
2) Digital and Analog technique by Navneet, Kale and Gokhale
3) Element of electronics by Bagde and Singh (S.Chand and Company)
4) Principles of electronics by V.K. Mehta
5) Introduction to digital electronics by Mohinder Singh
6) Electrical and electronics measurement and Instrumentation by A.K. Sawhney
7) Text book of Electrical Technology by B.L. Thereja

Practicals: Minimum Ten experiments at least one on each of the following aspects.
1. Active and Passive components.
2. Network theorems, voltmeter, Ammeter, ohmmeter multimeter and CRO.
3. Regulated power supply, rectifiers, filters, IC regulators.
4. Bi-polar devices and its applications.
5. Uni-polar and optoelectronic devices and its applications.
6. IC testing, IC know how, IC connection, simple IC circuits, mounting of IC on PCB and checking of voltage at each pin.

23. BIOCHEMISTRY

The examination shall comprise of two theory papers, one in each semester and one practical in each Semester. Each theory paper will be of 3 Hrs. duration and carry 80 marks. The internal assessment will carry 20 marks. The practical examination will be of 6 to 8 hours duration in one day and shall carry 50 marks.

The following syllabi is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has
been divided into 6 units. There shall be one question on every unit with internal choice for each of 12 marks & one compulsory question covering all the syllabus of Semester-I (8 marks).

The distribution of marks in practical shall be as follows:

A) Any five tests for section I - 15 marks
B) Any one experiment from sec-II - 10 marks
C) Any one Experiment from sec.-III - 10 marks
D) Viva Voce - 8 marks
E) Class Work & Practical Record - 7 marks

Total - 50 marks

1S Biochemistry
Biomolecules And Nutrition.

UNIT-I: Carbohydrates:
Defination, classification, asymmetric carbon, optical isomerism, D & L isomerism, Epimerism, ring structure of pentoses & hexoses, ?? anomers, mutarotation
Reactions of aldehyde, ketone groups & hydroxyl groups, amino sugars, deoxy sugars, types of glycosidic bonds, structure, occurrence & biological importance of polysaccharides like starch, glycogen, cellulose & mucopolysaccharides like heparin, hyaluronic acids, chondroitin sulphates.

UNIT-II: Lipids:
Defination & classification. Fatty acids: introduction, nomenclature, structure & properties of saturated & unsaturated fatty acids, cis & trans isomerism, triacylglycerols; nomenclature, structure & characterization of fats (hydrolysis, saponification value, acid value, rancidity of fats, iodine number) biological significance of fats, structure & functions of lecithins, cephalins, phosphoinositides & sphingomyelins, glycolipids - cerebrosides, gangliosides & steroids (properties & functions of ergosterol, cholesterol, bile acids)

UNIT-III: Proteins:
Defination, classification based on solubility, shape composition & function. Amino acids: classification, structure & isomers of standard amino acids, Zwitter ionic structure
Physiochemical properties, glucogenic & ketogenic amino acids, non proteinous amino acids (ornithine, citrulline & ?alanine) Peptides: structure of peptide bonds, important peptides

(structure & functions).
Protein structure: Levels of structure, forces stabilizing the tertiary & quaternary structure of proteins, Denaturation & renaturation of proteins, salting in and salting out of proteins, structure & biological functions of fibrous proteins (keratins, collagen, elastins), globular proteins (hemoglobin & myoglobin) catalytic proteins.

UNIT-IV: Nutrition, Balanced diet & Minerals:
A) Energy value & nutritional importance of carbohydrates, lipids & proteins, essential amino acids, essential fatty acids, complete & incomplete proteins, calorie malnutrition, obesity and fatty liver.
B) Balanced diet, dietary standards, infants diet, diet during pregnancy & diet for old persons, RQ, BMR & SDA.
C) Importance of minerals like Na, K, Fe, Cu, Mg, Ca, P, Co, I, & Mn in nutrition.

UNIT-V: Nucleic Acids & Porphyrins:
A) Nucleic acids: Structure of nitrogenous bases, nucleosides, nucleotides, structure of DNA & RNA, denaturation & annealing of DNA, evidence that DNA is genetic material, gene, genome, chromosomes.
B) Chemistry of porphyrins nucleus: Classification, important, metalloporphyrins (hemoglobin, cytochromes, chlorophyll) Bile pigments: chemistry & physiological role.

UNIT-VI: Vitamins & Hormones:
A) Vitamins: Chemistry, sources, daily allowances function & deficiency of water soluble & fat soluble vitamins.
B) Hormones: Defination, classification, mode of action & target sites, chemistry & function of hormones of pituitary, thyroid, parathyroid, adrenal, pancreas, gonads & corpus luteum.

PRACTICAL

Section I : Qualitative Tests and Biochemical Preparations.
 a) Qualitative tests for carbohydrates.
 b) Qualitative tests for proteins, lipids and amino acids.
 c) Preparation of buffer of different pH.
 d) Measurement of pH of given sample by Universal indicator solution, pH strip and pH meter.

Section II: Titrometry
 a) Determination of acid value of fat.
 b) Determination of Saponification number of oil.
c) Estimation of Glycin by Formal titration.
d) Estimation of ascorbic acid by Dye method.

Section III: Colorimetry
a) Verification of Beer’s Lambert’s law.
b) Estimation of Protein by Biuret method.
c) Estimation of Protein by Lowry’s method.

24. MICROBIOLOGY
The examination shall comprise of two theory papers, one in each semester and one practical in each Semester. Each theory paper will be of 3 Hrs. duration and carry 80 marks. The internal assessment will carry 20 marks. The practical examination will be of atleast 4 hours duration in one day and shall carry 50 marks.

The following syllabi is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question on every unit with internal choice for each of 12 marks & one compulsory question covering all the syllabus of Semester-I (8 marks).

1S-Microbiology
Fundamentals of Microbiology and Microbial Physiology

UNIT I : A. History of Microbiology:
   a. Discovery of microscope- Leeuwenhoek, Robert Hook.
   b. Controversy over Spontaneous, generation, Contributions of Aristotle, Redi, Needham, Schulze and Schwan, Schroder & Vandusch, Louis Pasteur, John Tyndall.
   d. Pure culture concept- Joseph Lister, Koch, DeBarry.

B. Scope of Microbiology as a modern Science.
   a. Industrial Microbiology, Environmental Microbiology, Medical microbiology, Food and Dairy Microbiology, Genetic engineering and Biotechnology.
   b. Different types of Microorganisms (outline)
   c. Distribution of Microorganisms in nature, and their beneficial and harmful activities.

UNIT II : A. Microscopy:
   i) Definitions- Magnification, Resolving power, numerical aperture, focal length, Working Distance Aberrations,
   ii) Objectives- Functions, low and high power objectives, Oil Immersion objectives,
   iii) Ocular- Functions, Huygenian, Ramsden, Hyperplane and compensating.
   iv) Condensor- Functions, Abbe, parabolic
   v) Iris diaphragm

B. Principles, construction, ray diagram and applications:
   i) Compound Microscope,
   ii) Darkfield Microscope,
   iii) Phase Contrast microscope
   iv) Fluorescent Microscope,
   v) Electron Microscope.

C. Staining:
   Dyes and Staining.- Definitions, auxochromes, Chromophore, mordents, chromogens, Leucostains, Principles and Methods of the following techniques:
   i. Simple staining
   ii. Differential- Gram, Acid fast,
   iii. Structural-Endospore, flagella.

UNIT III : Classification of Microorganisms:

A. Bacterial Classification:
   i. Definition- Taxonomy, Classification, Taxonomic rank, Identification, Nomenclature,
   ii. Bergey’s manual of systematic Bacteriology, General characteristics enlisting all partswith major characters and examples( Vol.I to IV)
   iii. Methods of Classification: Intuitive, Numerical taxonomy, Genetic relatedness,

B. General characteristics of :
   i. Viruses,
   ii. Fungi (Including yeasts)
   iii. Actinomycetes,
   iv. Mycoplasma and Rickettsia
   v. Algae

UNIT IV: Structural Organization of Bacteria:
   a) Concept of prokaryoes and Eukaryotes; Comparison and Differences.
   b) Typical Bacterial cell
   c) Shape, Size and Arrangement of Bacteria
   d) Structure and functions of following:
i. Capsule and slime layer
ii. Cell wall- Gram positive and Gram negative bacteria.
iii. Cytoplasmic membrane- fluid mosaic model
iv. Flagella- Arrangement, Mechanism of flagellar movement.
v. Pili-Arrangement and function
vi. Ribosomes- Procaryotic and Eucaryotic
vii. Plasmid- Definition, General characters, classes
viii. Bacterial chromosome
ix. Endospors- Structure and arrangements.

UNIT V: A. Microbial Nutrition:
i. Basic Nutritional Requirements: Sources of C, N, O, P, S, Energy, Macronutrients, Growth factors, water etc.
ii. Media; Synthetic, Nonsynthetic, Liquid and Solid, Semisolid, Differential, Enriched, Selective media. Role of beef extract, yeast extract, peptone, agar and gelatin.
iii. Determination of nutritional requirements: Auxanographic technique, Replica plating technique.
iv. Nutritional classification; on the basis of source of carbon and energy

B. Pure Culture Techniques:
i. Definition- Pure and Mixed culture:
ii. Methods of Isolation of Pure culture, Serial dilution, Streak plate, pour plate, spread plate, Enrichment culture, and Single cell isolation method.
iii. Methods of preservation of pure culture- Agar slants, Saline suspension, Overlaying with oil, Freeze drying.

UNIT VI: Reproduction and Growth of Bacteria:
a) Reproduction: Binary fission, Budding, Fragmentation, Sporulation,
b) Growth rate and generation time- Definition, mathematical expression.
c) Bacterial growth curve
d) Synchronous culture: Definition, methods of isolation (Helmstetter-Cummings Technique) and application.
e) Continuous culture: Definition, method (chemostat, and Turbidostat Techniques ) and Application.
f) Measurement of Growth:
i. Cell number measurement- Breed method, Colony count

Microbiology Practicals
1. Microscopy:
i. Different parts of compound microscope
ii. Use and Care of compound microscope
2. Construction, operation and utility of Laboratory equipments;
i. Autoclave
ii. Hot air oven
iii. Bacteriological Incubator
iv. pH meter
v. Centrifuge
vi. Colorimeter/ spectrophotometer
vii. Anaerobic Jar
viii. Bacteriological filters
ix. Laminar air flow
x. Air sampler
xi. BOD incubator
3. Preparation of Nutrient media:
i. Nutrient broth
ii. Nutrient agar
iii. PDA
4. Demonstration of bacteria from; Soil, Water, Air, Milk, Skin
5. Microscopic Examination of bacteria
i. Monochrome staining
ii. Gram staining
iii. Acid fast staining
iv. Negative staining
v. Endospore staining
6. Hanging drop technique to demonstrate Bacterial motility
7. Measurement of size of bacteria
8. Cultivation and Demonstration of
i. Yeast- Saccharomyces cereviceae, Candida albicans.
ii. Molds- Mucor, Rhizopus, Penicillium, Aspergillus
9. Demonstration of
   a) Protozoa-E.histolitica, Paramoecium
   b) Algae - Anabena, Nostoc, Spirogyra
10. Isolation of Pure culture by
    i) Streak plate   ii) Pour plate iii) Spread plate.
11. Enumeration of bacteria in the given sample by standard plate count
12. Demonstration of Replica plate technique / auxanography.

Distribution of Marks
1st Semester Microbiology Practicals

1. Major Experiment - 15 Marks
2. Minor Experiment - 10 Marks
3. Viva Voce - 10 Marks
4. Spotting - 10 Marks
5. Laboratory Journal - 05 Marks

Total 50 Marks

List of Books Recommended For 1S and 2S Microbiology

1) General Microbiology : Stainer, Roger et. al.
2) General Virology : Luria, S.E.
3) Handbook of Genetics : Esser, K.
5) Microbiology : Pelczar, Chan, Krieg.(TMH)
6) Fundamental of Microbiology : Frobisher
7) General Microbiology Vol. I & II : Power & Daginawala. (Himalaya Publication)
8) Zinsser Microbiology : W.K. Joklik
9) General Microbiology : W.G. Walter
10) Elements of Microbiology : M.J. Pelozar & E.C.S. Chan
11) Essays in Microbiology : J.N. Norris & M.H. Richmond
12) Microbiology (Essentials & Applications) : L. Mckane & J. Kandel
13) Basic Microbiology : Volk
14) Chemical Microbiology : Rose

List of Books For PRACTICALS

1) Microbes in Action : Seely, Wander Mark Tarporewala, Bombay
3) Medical Microbiology Vol. II : R. Cruickshank
4) Microbiology Methods : Collins
5) Difco manual
6) Bacteriological Techniques : F.J.Baker
7) Introduction to Microbial Techniques : Gunasekaran
8) Biochemical methods : Sadashivam & Manickam
25. FOOD SCIENCE

The examination in Food Science of First semester shall comprise of one theory paper, internal assessment and practical examination. Theory paper will be of 3 Hrs. duration and carry 80 marks. The internal assessment will carry 20 marks. The practical examination will be of 6 to 8 hours duration and carry 50 marks.

The following syllabus is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question in every unit with internal choice for each of 12 marks & one compulsory question covering all the syllabus of Semester-I (8 marks).

The distribution of marks in practical shall be as follows:
A) Two short experiment - 20 marks (10 Each)
B) One long experiment - 15 marks
C) Viva voce - 10 marks
D) Practical Record - 5 marks

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Total - 50 marks
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1S FOOD SCIENCE
BASIC CHEMISTRY OF FOODS

UNIT - I

Concept of Food Science:
Introduction and Definition of Food Science.
Unit Operation: Definition of SI Unit of length, Weight, Volume.
Composition, formula and definition mole, atomic weight, equivalent weight and molecular weight.
Temperature (Conversion of Celsius Scale to Fahrenheit Scale).
pH and buffer: Definition, ionization of acid (weak and strong acid, measurement of pH, pH value of some common food substances)
Important Terminologies (Definition and Relevance, Melting point, Boiling point, Smoking point, Surface Tension, Sol, Gel, viscosity, Emulsion & foam.)
Physical and chemical properties Melting point, Boiling point, Smoking point, Surface Tension, Sol, Gel, viscosity, Emulsion & foam.

UNIT - II

Introduction and Terminology:
a) Food, Nutrition, Nutrients, Calories, Health, Malnutrition.
Balanced Diet, Basic food groups.
3. Identification of ash value of Food Stuff.
4. Moisture content of Food Stuff.
5. Determination of acidity and pH of Food.
6. Qualitative test for Carbohydrate
7. Qualitative test for Protein
8. Estimation of Total hardness of water using EDTA

26. INDUSTRIAL MICROBIOLOGY

The examination in Industrial Microbiology of First semester shall comprise of one theory paper, internal assessment and practical examination. Theory paper will be of 3 Hrs. duration and carry 80 marks. The internal assessment will carry 20 marks. The practical examination will be of 5 hours duration in one day and carry 50 marks.

The following syllabi is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question in every unit with internal choice for each of 12 marks & one compulsory question covering all the syllabus of Semester-I (8 marks).

The distribution of marks in practical shall be as follows:

A) Two short experiment -20 marks (10 Each)
B) One long experiment -15 marks
C) Viva voce -10 marks
D) Industrial Study Tour Report -03 marks
E) Practical Record -02 marks

Total - 50 marks

1S INDUSTRIAL MICROBIOLOGY

Fundamentals of Industrial Microbiology

UNIT-I : Introduction to Industrial Microbiology

a) Definition, basic concepts of Microbiology
   (i) Discovery of Microorganism
   (ii) Distribution of micro organisms in nature.
   (iii) Beneficial and harmful activity of micro organisms.
   (iv) Basic and applied branches of microbiology.

b) Development and scope of Industrial Microbiology
   (i) Definition, basic concepts of fermentation
   (ii) Products-curd and yoghurt, pickles
   (iii) Contemporary fermentations, organic acids-vinegar and citric acid, antibiotics, enzymes, vitamins.

UNIT-II : Microbial Growth :

a) Microbial growth characteristics and its significance in fermentation
   i) Batch cultures - phases of growth and measurement of growth
   ii) Continuous cultures - characteristics and maintenance
   iii) Diauxic, synchronous and fed batch cultures

b) Effect of environmental factors on growth of microorganisms: Temperature, osmotic pressure, hydrostatic pressure, surface tension, UV light, pH and heavy metals.

UNIT-III : Production strain in Industries :

1. Screening of industrial microorganisms
   a) Primary Screening of - i. Antibiotic producers, ii. Organic Acid producers
   b) Secondary screening

2. Methods of Stock pure culture isolation, Culture Maintenance

UNIT-IV : Fermentation media and Inoculum Preparation :

a) Basic components - water, sources of energy, carbon, nitrogen, minerals
b) Special ingredients - growth factors, buffers, precursors, inhibitors, inducers, anti-foam agents, oxygen requirements, redox potential
c) Types of media used- synthetic, natural, industrial and agricultural wastes
d) Raw materials - Ideal characters and types of raw materials used in industry.
   Inoculum Preparation : Inoculum build up technique.

UNIT-V : Types of Fermentation :

1. Concepts of axenic and mixed cultures in fermentations,
2. Types of Fermentations- Batch and continuous fermentations, Dual and multiple fermentations
UNIT-VI: Industrial Sterilization:
(a) Introduction
(b) Principles of Sterilization
(c) Sterilization of Equipments
(d) Sterilization of Production Media
(e) Sterilization of Air by Filtration

Practicals - Semester-I
1. Study of laboratory equipments:
   a) Optical compound microscope
   b) Incubator
   c) Hot air oven
   d) Autoclave
   e) Centrifuge
   f) Membrane filter
   g) Colorimeter
   h) pH meter

2. Preparation and sterilization of media suitable for the growth of:
   a) Bacteria – Nutrient agar/soil extract agar/soybean casein digest agar
   b) Fungi – Potato dextrose agar/Czapek Dox agar
   c) Yeasts – Glucose yeast extract agar/ Sabouraud’s agar
   d) Actinomycetes – Glycerol Asparagine agar/coconut water agar
   e) Lactic acid bacteria – Neutral red chalk lactose (N R C L) agar atypical peptone tryptone (APT) agar
   f) Algae – Geitler’s medium

3. Isolation and cultivation of microorganisms from appropriate sources on the media described above and their microscopic examination.
   a) Bacteria – From soil, monochrome and Gram staining
   b) Fungi – Aspergillus and Penicillium from soil, lactophenol mounting
   c) Yeasts – Saccharomyces cerevisiae, monochrome staining
   d) Actinomycetes – from soil and cultivation using coverslip/slide/agar cylinder methods and direct microscopic observation
   e) Lactic acid bacteria – from curd or buttermilk, gram staining
   f) Algae – from appropriate sources, direct microscopic observation

4. Effect of temperature, pH and osmotic pressure on growth of bacteria
Enzymes: Nomenclature and Classification, Effect of Temperature, pH, Substrate concentration and enzyme concentration on enzyme activity.

Applications of enzymes in Industries, Food processing, Medicines and Diagnostics.

UNIT-IV : Structure and Function of Cell Organelles

Plant cell wall, Cell Membrane (Models of Membrane i.e. Danielli Davson, Robertson, Singer Nicholson), Mitochondria, Chloroplast, Lysosome, Golgi complex, Vacuoles, Endoplasmic reticulum (Types), Peroxisome, Ribosome, Nucleus.

UNIT-V : Cell Transport and Fractionation

Cell Transport across membrane (Active, Passive, Diffusion, Osmosis, Transporters, Ion channels).
Density Gradient centrifugation, Differential Centrifugation, Cell lysis methods (enzymatic, Chemical, physical, Mechanical). Identification of Sub-cellular fractions (Mitochondria, Chloroplast, Nucleus, Lysosome, Peroxisome).

UNIT-VI : Cytoskeleton, Cell Division and Stem Cells

Cytoskeleton (Microtubules, microfilament and intermediate filament) and cell locomotion.
Cell Division, Cell cycle and Cancer.
Cell-cell signaling, Cell-cell adhesion, Cell junction.
Stem cells: Properties and applications.

Practicals.
1. Cell diversity in plant tissue and animal tissue.
2. Test for carbohydrates (Molisch, Fehling, Benedict, Iodine, Barfoad, Osazone etc).
3. Test for fats/lipids (Saponification, Emulsification, Formaldehyde H2SO4 test).
4. Test for proteins (Biurete, Ninyhydrin, Millon, Xanthoprotic, Coagulation, Precipitation).
5. Quantitative determination of sugar in urine and blood sample.
7. Estimation of RNA and DNA.
8. Chromatographic methods for separation of Biomolecules.
10. Demonstration of Diffusion.
11. Cell lysis methods

12. Density gradient centrifugation.
14. Identification of sub cellular organelle (any one)
15. Mitosis.

Distribution of Practical Marks :-

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<td>Major Experiment</td>
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<td>Minor Experiment</td>
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<td>3</td>
<td>Spotting</td>
<td>10</td>
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<td>4</td>
<td>Viva</td>
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<td>5</td>
<td>Practical Record</td>
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<td>Study Tour/Visit</td>
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Reference Books :- (Fir Sem-I)
4. Biochemistry i Lehninger
5. Essentials of Biochemistry i Dr.U.Satyanarayana, Books and Allied Pvt. Ltd.
7. Cell Biology i Cooper.
8. Cell and Molecular Biology i D.Robertis.
10. An Introduction to Practical Biochemistry i David Plummer.
11. Laboratory Manuual in Biochemistry i Jayaraman.

28. BIOINFORMATICS

1S Bioinformatics

Elementary Mathematics & Statistics

UNIT I : Types of functions, d-neighbourhood of point, Limit of function, Continuity of function, Theorems on Limits and Continuity of functions.
Differentiation of function. Its physical significance. Differentiation of Sum, Difference, Product, Ratio of Functions. Derivative of Trigonometric, Exponential, Logarithmic, Inverse trigonometric, Polynomial, Implicit functions. Increasing and
Decreasing functions. Maxima and Minima. Derivative as a rate of change.


UNIT IV: Representation of data. Discrete data, continues data, Histogram, PolyGram. Frequency curves, Mean, Variability of data- the standard deviation, Median, quartiles, percentile, Skewness, Box and Whisker diagrams. Regression and Correlation, Scatter diagrams, Regression function, Linear correlation and regression lines, Product moment correlation coefficient.

UNIT V: Probability: Experimental probability, probability when outcomes are equally likely, subjective probabilities, Probabilities law. Probability rules for combined events, conditional probability and independent events, Probability trees. Bayes theorem.

UNIT VI: Random Variables and Distributions: Discrete and Continuous Random Variables, Cumulative distribution function, Probability mass function and Probability density function, Expectation of random variables. Experimental Approach and theoretical.

Practical-I: Elementary Mathematics and Statistics:
1. Measures of dispersion- Range, Quartile deviation and mean deviation.
2. Computation of rank correlation coefficient.
4. Large sample test.
5. Application of Chi-square distribution.
6. Random Sampling- SRSWOR and SRSWR.
7. Fitting of binomial distribution.
8. Fitting of normal distribution.
9. Problems on Mean and Mode.
10. Problems on order and degree of differential equation.
11. Standard deviation and coefficient of correlation.

12. Handling of different formula / function.

Distribution of Practical Marks:
(1) Two Major Experiments 40 Marks
(2) Class Record 05 Marks
(3) Viva-voce 05 Marks

Total 50 Marks

Books Recommended:
1) Binmore: "Mathematical Analysis", Cambridge University Press.
5) GorakhPrasad: "Differential Calculus" Pothishala Pvt Ltd, Allahabad
29. APICULTURE

The examination in Apiculture will comprise of one theory paper to each semester of 100 marks each which include 80 marks for theory and 20 marks for internal assessment and practical of 50 marks. Each theory paper shall be of 3 hours duration and practical of 6 hours duration. The syllabi is based on 6 theory periods and 6 practical periods per week.

1S-APICULTURE
(Fundamentals of Bee Keeping)

UNIT-I: A) Fundamental requirement of bee keeping, knowledge of bees, bee plants, equipment and products.

UNIT-II: Estimation of stocking capacity and estimation of yield per hive, migration routes of colonies, native residents, reception to beekeeping tribal population, collecting information of cultivated crop.

UNIT-III: Beekeeping Equipment :- Types of hives, its components, dimension, equipment for protection, feeding. Bee management equipments, was extraction & honey extraction equipment & manufacturing of comb foundation sheet.


UNIT-V: Establishment of Apiary :- Choice of site, climatic condition, topography, availability of water, flora. Optimum number of hive in relation to available of flora within foraging range over stocking.

UNIT-VI: Individual Colony Records :- Colony number, strength, food storage, honey yield. Pollen income.

Semester-I
Practical-I

 Practicals :-
(2) Study of mouth parts of Bees.
(3) Study of bee string.
(4) Study of bee hives (Carana, Melifera)
(5) Study of hive tools.
(6) Study of Castes of honey bees.

(7) Study of honey extraction machine.
(8) Study of wax extraction machine.
(9) Manufacturing of comb foundation sheet.

Field Study :-
1. Inspection of bee colonies.
2. Counting of pollen load.

Distribution of Marks :-
Duration : 4 Hours
1. Identification and comments on honey bee types (Any four) 16
2. Mounting of bees mouth parts 09
3. Bee hives & bee equipments. 10
4. Practical Record 05
5. Field diary 05
6. Viva-voce 05

Total 50

(Note : List of Reference Books and Required equipments is given at the end of syllabi of Semester-II, Apiculture.)

30. Forensic Science
(Effective from session 2015-16)

The examination in Forensic Science of First semester shall comprise of one theory paper, internal assessment and practical examination. Theory paper will be of 3 Hrs. duration and carry 80 marks. The internal assessment will carry 20 marks. The practical examination will be of 4 to 6 hours duration and carry 50 marks.

The following syllabus is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question in every unit with internal choice for each of 12 marks & one compulsory question covering all the syllabus of Semester-I (8 marks).

B.Sc. Part- I (Semester- I)
1S Forensic Science
(Basics of Forensic Science)

Total Lectures: 84 Marks: 80

Note: Figures to the right hand side indicate number of lectures.

Unit I : Developmental Growth of Forensic Science 14L
Introduction to Forensic science nature, need and function. Laws and Principles, basics of Forensic Science. Historical
development and scope of Forensic Science in India. Investigating officers and their assigned role and duties. Global perspective in the field of forensic science: history, development, education and training. Organizational setup of forensic science lab and other national & international agencies. Ethical issues in Forensic Science.

Unit II: Forensic Science Laboratories and Facilities 14L
A) Forensic Science Laboratories and Facilities [5L]
Growth of Forensic Science Laboratories in India. Central and State level Laboratories. Services and functionalities provided by various FSLs. Various divisions in the FSL.
B) Recognition of Bloodstain Patterns [9L]
History of Bloodstain Pattern interpretation, properties of human blood, target surface considerations, Size, Shape and Directionality of bloodstains, Spattered blood, other Bloodstain Patterns, interpretation of Bloodstain on clothing and footwear, Documentation and Photography for Bloodstain Pattern Analysis.

Unit III: Crime and Crime Scene management 14L

Unit IV: Impressions and Prints 14L
Finger prints: Nature, Location, collection and evaluation, taking control samples, Forensic Significance.
Footprints: Importance, Gait Pattern, Casting of footprints in Different medium, Taking Control samples.
Tire Marks: Prints and Skid marks, taking control samples, Forensic Significance.
Lip Prints: Nature, Location, collection and evaluation, taking control samples, Forensic Significance.
Bite Marks: Nature, Location, collection and evaluation, taking control samples, Forensic Significance.
Ear Prints: Nature, Location, collection and evaluation, taking control samples, Forensic Significance.

UNIT V: Forensic Documents 14L

Unit VI: Forensic Medicine 14L
Global Medical Jurisprudence, Legal Procedure in India, Documentary evidence: Medical certificates, medical reports, dying declaration. Determination of time since death, including by histopathological methods. Medico legal investigation of sexual offences, including examination of victims and suspects. Medico legal aspects of death: causes of death such as asphyxia, electrocution, thermal trauma, heat burns, starvation, natural death, sudden death, death by accident. Medico legal aspects of wounds: medical and legal definition of wounds, types of mechanical and regional injuries, aging of wounds.

Semester- I
1S Forensic Science (Basics of Forensic Science)
Total Laboratory sessions: 21 Marks: 50
List of Practicals
1. Collection and Handling of Petroleum samples.
2. Collection and Handling of murder case samples.
3. Collection and Handling of fire crime scene samples.
4. Sketching and Photography of various type of crime scene.
6. To take Plain and Rolled inked fingerprints and to identify the patterns.
8. Lifting of Fingerprints.
9. Detection of forgeries including traced and stimulated forgery and built up documents.
10. Examination of security features of Currency Notes and Indian Passports.
15. Detection of various type of forgery.
16. Identification of Indented and Invisible writing.
17. Identification of typescripts and printing matter.

Distribution of Marks for Practical Examination.

<table>
<thead>
<tr>
<th>Time: 4 – 6 hours</th>
<th>Marks: 50</th>
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<tbody>
<tr>
<td>Exercise- I</td>
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<tr>
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<td>Exercise- III</td>
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<td>07</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

Books Recommended:
1. Introduction to Forensic Science in Crime Investigation By Dr. (Mrs.) Rukmani Krishnamurthy.
2. Forensic Biology by Shrikant H. Lade.
3. Crime Scene Processing and Laboratory Work Book by Patric Jones.
5. Crime Scene Management with Special Emphasis on National level Crime Cases by Dr. Rukmani Krishnamurthy under publishing.
8. Scientific Examination of Questioned Documents by Ordway Hilton.
10. Suspect Documents their scientific examination By Wilson R. Harrison.
11. Speculation in Fingerprint Identification By Chatterjee S. K.
12. Criminal Investigation, Practical Fingerprinting by Briges B. C.

31. Renewable Energy
(Implemented from the Academic Session 2015-16)

Semester-I
1S : Renewable Energy

Fundamentals of Energy Systems

Unit-I: Work and Heat: Definition of work, thermodynamic work, displacement work and other forms of work, Definition of Heat, Work and heat transfer as path function, comparison of work and heat, work done during various processes, P-V diagrams. First law of thermodynamics: Energy of a system, classification of energy, law of conservation of energy law applied to closed system under going a cycle, Joules experiment

Unit-II: First Law applied to flow processes: Steady state, steady flow process, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and diffusers, turbine and compressor pumps, heat exchangers, Throttle valve etc. work done and Heat transfer during steady flow processes.

Second Law of thermodynamics, Kelvin-Plank and Clausius statements, reversible and irreversible processes, Carnot cycle, two propositions regarding the efficiency of Carnot cycles. The thermodynamic temperature scale. Reverse carnot cycle. COP of heat pump and refrigeration. Inequality of Clausius.


Unit IV: Fluid Pressure & Its Measurement: Definition of pressure, units and dimensions, Pressure at a point, Pascal’s law, Hydrostatic pressure law, Absolute and Gauge pressure Measurement of pressure, Simple Manometer & Differential Manometer theory and problems, Mechanical Pressure Gauges.

Unit V: Dynamics of Fluid Flow: Concept of Inertia force and other forces causing motion, Derivation of Euler’s equation and, Modification of Bernoulli’s equation, problem on Bernoulli’s equation without and with losses, Flow through Orifices; classification, Hydraulic Co-efficient of an Orifice and relation between them.

Conventional & Non Conventional Energy Resources.

**Conventional Energy Sources**: Fossil Fuel, Hydro Resources, Nuclear Resources, Coal, Oil, Gas, Thermal Power Stations, Comparison of various conventional energy systems, their prospects and Limitations, Advantages and Disadvantages of Conventional Energy Sources.


**Books Recommended Text Books**:
1) Engineering Thermodynamics - by P.K.Nag.
2) Thermodynamics Volume: I & II; R. Yadav;
3) Basic Engineering Thermodynamics - by Reyner Joel
4) Thermodynamics - by C.P. Arora.
5) Fundamentals of Classical Thermodynamics - by G.J. Vanwylen.
6) Engineering Thermodynamics; P. Chattopadhyay; Oxford
7) Engineering Thermodynamics; Gordon Rogers, Yun Mayhew; Pearson
9) Energy policy for: B.V. Desai (Weiley Eastern),
10) Modeling approach to long term demand and energy implication : J.K.Parikh.
12) TEDDY Year Book Published by Tata Energy Research Institute (TERI),
14) International Energy Outlook –EIA annual Publication
16) Heat and thermodynamics į D.S.Mathur
18) Heat and thermodynamics į Rajam & Arora
19) Heat į Rajkumar & Sharma
22) Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S. K. Kataria & Sons
23) Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Prakashan

**List of Experiments**
1) Study of the processes of Heat Engine
2) Study Layout of Thermodynamics laboratory
3) To investigate the first law of thermodynamic using heat Engine
4) To investigate the Second law of thermodynamic using heat Engine
5) To investigate the relation between pressure and temperature of Saturated Steam
6) To determine the flow rate using convergent nozzle.
7) To determine the nozzle thrust.
8) To determine the efficiency of nozzle
9) Study of heat exchangers
10) Determination of efficiency of pumping system
11) Determination of viscosity of liquid by Poiseuille method.
12) Determination of viscosity of liquid by Stokes method.
13) To determine surface tension of liquid by Jaeger method.

32. Animation
(Implemented from the Academic Session 2015-16)

**Semester I**

**1S : Animation**

**Computer Fundamentals and Animation**

**Unit-I**: Introduction to computer, relevant hardware and software, their list and general-purpose utility in actual practical application, connection diagrams with each other (simple block diagrams expected).

**Unit-II**: Introduction to different operating systems (OS) like Windows, Linux, etc. (their names and general idea should be given), requirements, etc. (brief idea and simple explanation only).

**Unit-III**: Basic idea of networks with block diagrams and definitions only (general-purpose networks like WAN, MAN and the LAN topologies and sub-topologies of LAN), their applications (brief idea and simple explanation only).

**Unit-IV**: Basic idea of memory, RAM, ROM, PROM, EPRROM, etc. their definitions with description (brief idea and simple explanation only)

**Unit-V**: Using internet explorer, different browsers, email, attachment techniques, using compression utilities, search engine techniques (brief introduction), downloading, etc. introduction to POP and SMTP mail server configurations techniques.
Unit-VI: History of animation. Different types of animations and its applications.
(Types: 2D animation, 3D animation, Stop motion animation, etc. & Applications: Entertainment, Education, Computer/Mobile Gaming, Special Effects, etc.)

Practicals: Minimum eight experiments based on above contents are to be performed.

Recommended Books:

The Concerning teachers are also suggested to use other relevant material available on the net, to update the knowledge of the students.

Following are the recommended links, for further search-
1) www.tatamcgrawhill.com
2) www.books.google.co.in
3) www.penguinbooksindia.com
4) www.bookcafe.in
5) www.newindianbooks.com
6) www.newasiabooks.org

Syllabus Prescribed for B.Sc. Part-I Semester-II
(Implemented from the A.S.2015-2016)
7. MATHEMATICS
2S Mathematics Paper-III
(Differential Equations: Ordinary and Partial)


Unit-II: Second order linear differential equations with constant coefficients, homogeneous linear ordinary differential equations, equations reducible to homogeneous differential equations.

Unit-III: Reduction of order, transformation of the equation by changing the dependent variable and independent variable, normal form, method of variation of parameters. Ordinary simultaneous differential equations.

Unit-IV: Formation of partial differential equations, partial differential equations of the first order, total differential equation (Pfaffian). Lagrangeâ€™s method, some special types of equations which can be solved easily by methods other than the general method.


References:
Semester II
2S Mathematics Paper-IV
(Vector Analysis and Solid Geometry)

Unit-I : Scalar and vector product of three vectors, product of four vectors, vector differentiation and vector integration.

Unit-II : Space curve t, n, b vectors, fundamental planes, curvature, torsion, Frenet-Serret formulae.

Unit-III : Gradient, divergence and Curl, directional derivative, line integral (existence and evaluation), work done, Greens theorem.

Unit-IV : Sphere: Different forms of sphere, section of a sphere by a plane, sphere through a given circle, intersection of sphere and a line, orthogonal sphere and condition of orthogonality.

Unit-V : Cone : The equation of a cone with a guiding curve, cone with vertex and origin, right circular cone. Cylinder: equation of right circular cylinder.

References:

8. Physics
2S-Physics
(Kinetic theory, Thermodynamics and electric currents)

UNIT I : Ideal Gas - Kinetic theory of Gases (Assumption, equation without derivation), deduction of Boyle's law, interpretation of temp.; Estimation of RMS speed of molecule; Estimation of Avagadro's number; degrees of freedom; equipartition of energy; specific heat of monatomic gas; extension to di & tri-atomic gases. Real Gas- Vander Waals gas equation of state, Comparison with experimental P-V curves, the critical constants; nature of Vander-Waals forces. Transport Phenomena in gases: Molecular Collision, mean free path, Brownian motion and collision cross section. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure. Numericals

UNIT II : The laws of thermodynamics - The zeroth law, P-V indicator diagrams, work done by and on the system; First law of thermodynamics, internal energy as a state function and other applications; Reversible and irreversible changes; Carnot Cycle
and its efficiency for perfect gases, The Second law of thermodynamics; different versions of second law, Carnot theorem; Entropy, S-T diagram; Principle of increase of Entropy; The thermodynamic scale of temperature; its identity with the perfect gas scale. Impossibility of attaining the absolute zero, third law of thermodynamics. Numericals.

UNIT III: Liquefaction of Gases - Joule-Thomson effect, Joule\(\theta\) coefficient, Boyle and inversion temperature; Principle of regenerative cooling and Cascade Cooling, Liquefaction of hydrogen and helium
Thermodynamic relationships- Thermodynamic Variables, Extensive and intensive, Maxwell\(\theta\) general relationship; application to Joule-Thomson cooling and adiabatic cooling in a general system. Clausius-clapeyron heat equation, thermodynamic Potentials and equilibrium of Thermodynamical systems, relation with thermodynamical variables.

UNIT-IV: Motion of Charged Particles in Electric and Magnetic fields:
(Note: The emphasis should be on Mechanical aspects, and not on the details of the apparatus mentioned which indicated as applications of principles involved.)
E as an accelerating field, electron gun, case of discharge tube, linear accelerator (linac), E as a deflecting field, Transverse magnetic field, Mass spectograph, velocity selector, curvatures of tracks for energy determination of nuclear particles, Principle of cyclotron. Mutually perpendicular E and B fields, velocity selector, its resolution. Numericals

UNIT-V: Network theorem: Thevenin\(\theta\) theorem, superposition theorem(mesh current analysis), Maximum power transfer theorem, some applications.
Ballistic galvanometer (theory, charge sensitivity, effect of damping), Application of B.G: Determination of capacitance and high resistance by method of leakage
Varying Currents: Steady currents, current density \(J\), non steady current and continuity equation, Kirchoff's laws and analysis of multi-loop circuits, Rise and decay of currents in LR, Rise and decay & charge in CR circuits, and in LCR circuit, resonating frequency. Numericals

UNIT-VI: Alternating Currents: A.C. currents, complex numbers and their applications in solving A.C. circuits using \(J\) operater, pure \(R, L, C\) and their combinations, reactance and impedance, series and parallel resonance, Q-factor, power consumed by A.C. circuit, power factor. Self and mutual inductance, theory of transformer and energy losses in transformer.
Numericals

Practical:
(Every student will have to perform at least 10 experiments from the following list. At the time of examination, each student will have to perform 1 (one) experiment.)
1. Heating efficiency of electrical Kettle with varying voltages.
2. Determination of \(\theta\)by Callendar and Barne\(\theta\) method.
3. \(C_p/C_v\) by Clement and Desorme\(\theta\) method.
4. Thermal conductivity of an insulator by Lee\(\theta\) disc method.
5. Determination of charge sensitivity of ballistic galvanometer.
10. Study of frequency resonance of series LCR circuit and determination of Q-factor.
11. To study behavior of R-C.circuit as a filter.
12. To determine high resistance by leakage method.
13. \(C_1 / C_2\) by De-Sauty's method.
14. Verification of laws of capacitances.
15. Study of transformer.
16. Verification of Kirchoff's law, using electrical network.
17. Verification of Maximum power transfer theorem.
18. Verification of Thevenin's theorem.
19. Verification of Norton's theorem.
20. Verification of Milliman\(\theta\) theorem.

Reference Books:
1. Heat and thermodynamics \(\tilde{D.S.}\) Mathur
2. Text book of Heat \(\tilde{J.B.}\) Rajam
3. Heat and thermodynamics \(\tilde{I.}\) Rajam & Arora
4. Heat \(\tilde{I.}\) Rajkumar & Sharma
5. Electricity & Magnetics \(\tilde{I.}\) Chakraborty P.
7. Electromagnetics \(\tilde{I.}\) Lau B.B.
8. Electromagnetic field & waves \(\tilde{I.}\) Sarwate V.V.
9. Electricity and Magnetism Vol. II ñ Berkley Physics Course
10. Electricity and Magnetism ñ D.N.Vasudeva
11. Electricity and Magnetism ñ Brijlal & Subramaniam
13. Electricity & Magnetism ñ Reitz & Millford
14. Electricity & Magnetism ñ A.S.Mahajan & A.A.Rangawala (TMH)
15. Principle of electricity & Magnetism ñ Panofsky & Philips
16. Electricity & Magnetism ñ S.S.Atwood
17. Electromagnetic waves & radiating systems ñ E.C. Jordan

9. CHEMISTRY
2S Chemistry

Total Lectures: 84
Marks: 80

Note: Figures to the right hand side indicate number of lectures.

Unit I
14L
B] Covalent bonding-Directional nature of covalent bond. Hybridisation, types of hybridisation to explain geometries of NH\textsubscript{4}\textsuperscript{+} ion, PCl\textsubscript{5}, SF\textsubscript{6} and IF\textsubscript{7}. [4]

Unit II
14L
A] P-Block Elements-Comparative study of 16\textsuperscript{th} and 17\textsuperscript{th} group elements with reference to electronic configuration, ionization energy and oxidation states. Oxidising properties of halogens with reference to oxidation potential. Interhalogen compounds, structure and bondings. Introduction to fluorocarbons. [6]
B] Noble Gases-Inertness of noble gases. Compounds of noble gases-only structure and bonding in XeF\textsubscript{2}, XeF\textsubscript{4}, XeF\textsubscript{6}, XeO\textsubscript{3} and XeO\textsubscript{4} [2]

Unit III
14L
C] Alcohols: Dihydric alcohols: Ethylene glycol- Preparation from ethylene, ethylene chloride and ethylene oxide. Reactions- with Na, PCl\textsubscript{5}, CH\textsubscript{3}COOH, ZnCl\textsubscript{2}, conc. H\textsubscript{2}SO\textsubscript{4} and dehydration with heat. Trihydric alcohols: Glycerol- Preparation from propylene, Reactions- with Na, HCl, PCl\textsubscript{5}, HNO\textsubscript{3} and KHSO\textsubscript{4}. Pinacol- pinacolone rearrangement (mechanism). [6]

Unit IV
14L
C] Epoxides: Synthesis of ethylene oxide from ethylene and styrene oxide from styrene. Ring opening reactions of both catalysed by acid and alkali. [4]

Unit V - Physical Properties and Molecular Structure
14L
A] Electrical Properties:
   (i) Polar and non-polar molecules. Dipole moment.
   (ii) Induced polarization and orientation polarization. Clausius-Mossotti equation (only qualitative treatment).
   (iii) Measurement of dipole moment by temperature and refractivity methods.
   (iv) Applications of dipole moment for the determination of molecular structure. i.e. percentage ionic character of covalent bonding, molecular geometry, cis-trans isomers, ortho, meta and para isomers of a disubstituted benzene. [7]
**B] Magnetic Properties:**

(i) Paramagnetic and diamagnetic substances, origin of paramagnetism, diamagnetism, ferromagnetism and antiferromagnetism.

(ii) Volume, specific, mass and molar susceptibility. Relationship between molar magnetic susceptibility and magnetic moment.

(iii) Relationship between magnetic moment and number of unpaired electrons.

(iv) Gouy’s balance method for determination of magnetic susceptibility.

(v) Application of magnetic moment in the determination of molecular structure.

(vi) Numericals.

**Unit VI - Chemical Kinetics**

Explanation of terms like rate of reaction, order of a reaction and molecularity. Definition with one example of zero, first and second order reaction. Half life period of a reaction. Derivation of rate equation for first and second order reaction with equal initial concentration and different initial concentration of a reactant. Characteristics of first and second order reaction. Examples of first and second order reaction and their kinetics study with modified rate equation viz. the reactions (i) decomposition of $H_2O_2$, (ii) reaction between $K_2S_2O_8$ and KI, (iii) hydrolysis of methyl acetate catalyzed by acid, (iv) saponification of ethyl acetate by NaOH and (v) inversion of canesugar.


**Semester II**

2S Chemistry Practicals

Total Laboratory Sessions: 26 Marks: 50

**Exercise I: Organic Qualitative Analysis**

16 Laboratory Sessions

Complete analysis of simple organic compounds containing one or two functional groups and involving following steps:

1) Preliminary examinations
2) Detection of the elements
3) Detection of functional groups
4) Determination of m.p./ b.p.
5) Preparation of derivative and its m.p./ b.p.
6) Performance of spot test if any.

1) Acids : Oxalic acid, Benzoic acid, Salicylic acid, Phthalic acid.
2) Phenols : Resorcinol, á-naphthol, á-naphthol.
3) Aldehydes : Benzaldehyde, Glucose.
4) Bases : Aniline, $p$-Toluidine
5) Nitro compounds: $m$-Dinitrobenzene.
6) Amides : Benzamide, Urea, Acetamide.
7) Hydrocarbons: Naphthalene, Anthracene.
8) Halogen compounds : Chloroform, Chlorobenzene.

**Exercise II: Physical Chemistry Experiments**

10 Laboratory Sessions

1) To determine surface tension of a given unknown liquid by Stalagmometer (Density measurement is must).
2) To determine coefficient of viscosity of unknown liquid by Ostwald’s viscometer (Density measurement is must).
3) To compare cleaning power of detergent samples by Stalagmometer.
4) To determine parachor value of -CH$_2$- group by Stalagmometer.
5) To determine unknown percentage composition of given ethanol-water mixture by viscometer.
6) To determine activation energy of a reaction between $K_2S_2O_8$ and KI.
7) To determine heat of solution of KNO$_3$.

**Distribution of Marks for Practical Examination**

Time: 6 hours (One Day Examination) Marks: 50

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<th>Exercise-I</th>
<th>Exercise-II</th>
<th>Viva-Voce</th>
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<th>Total</th>
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<td>18</td>
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<td>07</td>
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**Books Recommended:**

3. Selected Topics in Inorganic Chemistry by Malik, Tuli and Madan- S. Chand & Co.
6. Concise Inorganic Chemistry by J.D. Lee, ELBS.
10. Chemistry Facts, Patterns & Principles by Kneen, Rogers and Simpson, ELBS.
12. Inorganic complex compounds by Murmann, Chapman & Hall.
23. Stereochemistry and mechanism through solved problems by P.S. Kalsi.
30. Comparative Practical Organic Chemistry (Qualitative Analysis) by V.K. Ahluwalia and Sunita Dhingra, Orient Longman.
31. Comprehensive Practical Organic Chemistry (Preparation and Qualitative Analysis) by V.K. Ahluwalia and Renu Agrawal, Orient Longman.
34. Principles of Physical Chemistry: Maron and Prutton.
39. Practical Physical Chemistry: Palit and De.
40. Practical Physical Chemistry: Yadao.
41. Practical Physical Chemistry: Khosla.
42. Laboratory manual of Physical Chemistry: W.J. Popiel.
43. Practical Chemistry: Dr. S.B. Lohiya, Bajaj publ., Amravati.

**LIST OF EQUIPMENTS / APPARATUS REQUIRED FOR THE CHEMISTRY PRACTICALS FOR B.Sc.**

1. Abbe’s Refractometer 02 nos./batch
2. Viscometer 10 nos./batch
3. Stalagmometer 10 nos./batch
4. Melting Point Apparatus 10 nos./batch
5. Thermometer 0-360°C 20 nos./batch
6. Thermometer 0-110°C 20 nos./batch
7. Analytical balance 15 nos./batch
8. Weight box 15 nos./batch
9. Density Bottles 20 nos./batch
10. Kipp’s Apparatus 02 nos./batch
11. Quick fit Distillation Assembly/Multipurpose assembly 10 nos./batch
12. Sintered Glass Crucible 20 nos./batch
13. Silica Crucible 20 nos./batch
14. Vacuum Suction Pump 02 nos./Lab.
15. Potentiometer 02 nos./batch
16. Metzer Electronic one pan balance 01 nos./Lab.
17. Filtration flask with Buckner Funnels
   100ml 10 nos./batch
   250ml 05 nos./batch
   500ml 02 nos./batch
18. Desiccators 10 nos./batch
19. Magnetic Stirrer 10 nos./batch
20. Water Suction 10 nos./batch
21. Conductometer with Conductivity Cell 04 nos./batch
22. Colorimeter 02 nos./batch
23. pH Meter 02 nos./batch
24. Chromatographic Jar 05 nos./batch
25. Separating funnels 250ml, 500ml 05 ECH/batch
26. Hot Air Oven 02 nos./Lab.
27. Hot-Cold Air Blower 01 no./Lab.
28. Centrifuge machine (Electrically Operated) 02 nos./Lab.
29. Deioniser/Water Still (Electrically Operated) 01 no./Lab.
30. Hot Plate/Heating Mantle 05 nos./batch
31. Models of Elements (Seven Cryst, types and their symmetry)
32. Flame Photometer 01 no./batch
33. Spectrophotometer 02 nos./batch
34. Shaking Machine 01 no./batch
35. Polarimeter 02 nos./batch

10. INDUSTRIAL CHEMISTRY (REGULAR/VOCATIONAL)
2S Industrial Chemistry (Regular/Vocational)

Total Lectures: 84  Marks: 80

Note: Figures to the right hand side indicate number of lectures.

UNIT-I

A) Distillation: Introduction, Flash distillation, Differential distillation, Steam distillation, Azeotropic distillation, Continuous distillation with rectification and stripping, Plate column, Packed column, Overall material balance.


UNIT-II

A) Extraction: Introduction, Selection of solvent, Single stage and multistage extraction, Spray column, Packed column, Mixer settlers, Rotating disc column, Centrifugal extractor.

B) Leaching: Introduction, Single stage leaching, Percolation tank, Counter current multiple contact (Shank's system), Continuous counter current decantation, Agitated vessels, Rotocel, Kennedy extractor.

UNIT-III


B) Drying: Introduction, Free moisture, Bound moisture, Moisture content on wet and dry basis, Equilibrium moisture content, Critical moisture content, Constant rate period, Falling rate period, Drying Equipments-Tray dryer, Drum dryer, Fluid bed dryer, Spray dryer, Rotary dryer, Rate of drying, Heat transfer in dryers, Drying of porous solids.

UNIT-IV


B) Mechanical Separation: Screening-Types of screening equipments, Grizzly screens, Trammel screens, Ideal and actual screens, Capacity and effectiveness of screens.

Filtration-Types of filtration, Constant pressure filtration, Constant rate filtration, Filter media filter cake, Pressure filters, Plate and frame filter press, Rotary drum filter, Centrifugal filtration.

UNIT-V

Mixing and Agitation: Mixing of liquid with liquid, Mixing of gases with liquids, Mixing of solids with liquids, Impellers, Propellers, Turbines, Paddles, Flow pattern in agitated vessels, Unbaffled tanks, Prevention of swirling and portex formation, Baffling, Banbury mixer, Pung mill, Ribbon blenders, Tumbling mixer, Double arm kneader.
UNIT VI


Books Recommended:
1) Unit Operation II - K. A. Gavane
2) Unit Operations of Chemical Engineering - McCabe and Smith
3) Mass Transfer Operations - Robert E. Treybal
4) Unit Operations - George Granger Brown, CBS Publications.
5) Catalysis: Heterogeneous and Homogeneous - Delmon and Janner
6) Catalysis Science and Technology - Anderson J.
7) Surface Chemistry - J. J. Bikermann, Academic Press
8) Physical Chemistry - Puri and Sharma

2S Industrial Chemistry Practical

List of Experiments

UNIT I

1. Crystallization of Benzoic acid by using water as a solvent.
2. Determination of Benzoic acid by using mixture of water and alcohol as a solvent.
3. Determination of amount of oil in given oil seed sample.
4. To study the yield of crystallization with and without seeding for copper sulphate crystals.
5. Extraction and isolation of Nicotine from tobacco leaves.
6. To establish Freundlich and Langmuir isotherm for adsorption of Oxalic (or Acetic) acid on activated charcoal.
7. Separation of two-component mixture of miscible liquids by simple distillation.

UNIT II

1. Separation of three-component mixture of miscible liquids by fractional distillation.
2. Preparation of charcoal.

3. Coagulation of suspended solid particles in a given water sample by using alum.
4. Decolourization of Raw Sugar by using Charcoal.
5. To determine critical moisture content of a given material.
6. To construct ternary diagram for acetic acid - Water - Benzene System.
7. Determination of total acid content in lemon juice.

Distribution of Marks for Practical Examination.

Time: 6 – 8 hours (One Day Examination)          Marks: 50

UNIT I: Exercise No.1 (Numericals)         06
Exercise No.2 (Practical Expt.)         12
UNIT II: Exercise No.2 (Practical Expt.) 12
Viva-Voce                                 10
Record                                    10

Total: 50

11. PETROCHEMICAL SCIENCE

2S Petrochemical science

Total Lectures: 84          Marks: 80

Note: Figures to the right hand side indicate number of lectures.

UNIT I

Overview of Petrochemical industry
Definition of Petrochemical, World Petrochemical industry, History and Development of petrochemical industry in India, Role of MGCC, IPCL, HBJ gas line, TNC, Fertilizer in India.

UNIT II

Petrochemical feedstock
Feed stock for petrochemical from Natural gas and Petroleum, Most common impurities present in gases, Water vapor, Mechanical, Chemical, and other suspended impurities, how to remove them.

UNIT III

Separation of gases (From Natural gas and Petroleum) in to individual constituents
Various process: - Absorption Desorption, Compression Liquification, Low temperature fractionation, Adsorption, and special technique.
Introduction to separation techniques of Aromatic:- azeotropic separation, Extractive Distillation, Crystallization.

UNIT IV (14)
Steam reforming
Definition of reforming, Types of reforming, (Thermal and catalytic only introduction)
Steam reforming, various steam reforming reaction, Reactivity of hydrocarbons, Role of steam hydrocarbon ratio

UNIT V (14)
Production of synthesis gas
Various processes:- Natural gas steam reforming, Naphtha steam reforming, Partial oxidation hydrocarbon process, Scheme for CO and H2 production, Coal gasification process, Lurgi process

UNIT VI (14)
Uses of synthesis gas
Various uses of synthesis gas, Methanol production with physical properties, Chemical reaction, Process flow and uses. Oxo synthesis process, Production of propion aldehyde and propanol, Chemicals based on carbon monoxide

Semester – II
2S Petrochemical Science Practical

List of Experiment
1. Flash point and Fire point of petroleum sample by various method
2. API gravity of given petroleum sample
3. Smoke point of Given Petroleum sample
4. Aniline point of given petroleum sample
5. Diesel index of given petroleum sample
6. Viscosity by redwood viscometer
7. Melting point by melting point apparatus

Distribution of Marks for Practical Examination.

Time: 6 hours (One Day Examination) Marks: 50

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<thead>
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<th>Exercise No.1 (Practical Expt.)</th>
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<td>Pipette 10ml, 25ml</td>
<td>15</td>
</tr>
<tr>
<td>Mohr pipette2ml, 5ml</td>
<td>10</td>
</tr>
<tr>
<td>Conical flask with stopper</td>
<td>10</td>
</tr>
<tr>
<td>Standard volumetric flask</td>
<td>10</td>
</tr>
<tr>
<td>Density Bottle</td>
<td>10</td>
</tr>
<tr>
<td>Balance (Electronic/Digital)</td>
<td>10</td>
</tr>
<tr>
<td>Aniline Point Apparatus</td>
<td>10</td>
</tr>
<tr>
<td>U-tube viscometer of different capillary size</td>
<td>10</td>
</tr>
</tbody>
</table>

Total: 50

List of book:-
1) Petroleum Refining and Petrochemical. N.K. Sinha, Umesh Publication Delhi
2) Advance Petrochemical, Dr. G.N. Sarkar, Khanna Publication, Delhi
3) A text on Petrochemical, Dr. B.K. Bhaskararao, Khanna publication, Delhi
4) Introduction to petrochemical, Sukumar Maiti,
5) Fuels and Combustion, Samir Sarkar, Orient Longman Ltd. Hyderabad
6) Catalyst and Chemical Process, Ronald Pearce and William R. Patterson, Leonard Hill, Glasgow
7) Systematic Experimental Physical chemistry, S.W. Rajbhoj; Dr. T.K. Chondhekar; Anjali Pub. Aurangabad
8) Advance Petroleum Refining, G.N. Sarkar, Khanna pub. Delhi
9) Petroleum Refining Technology, Dr. Ram Prasad, Khanna pub. Delhi
10) Unit operation II, K.A. Gavhane,Nirali Prakashan, Pune
11) Modern Petroleum Refining Process, Dr. B.K. Bhaskararao
17) Chemical from Synthesis gas, R.A. Sheldon, B. Reidel publishing Company, Dordrecht

LIST OF APPARATUS AND EQUIPMENTS FOR A BATCH OF 20 STUDENTS FOR B.SC. I (Semester I & II)

PETROCHEMICAL SCIENCE

2. Pipette 10ml, 25ml, 20 Nos. each
3. Mohr pipette, 5ml, 10 Nos. each
4. Conical flask with stopper, 50 Nos.
7. Balance (Electronic/Digital), 02 Nos.
8. Aniline Point Apparatus, 01 No.
9. U-tube viscometer of different capillary size, 02 Nos.
10. Thermometer (0 to 110°C I P Grade) 10 Nos.
11. Thermometer (0 to 360°C I P Grade) 10 Nos.
12. Test tube (20 and 50 ml with rubber cork) 50 Nos.
13. Smoke Point Apparatus (I P Grade) 01 No.
14. Abel Flash Point apparatus (I P Grade) 01 No.
15. Pensky Marten's Flash Point apparatus 01 No.
16. Cleveland Open Cup Flash point Apparatus 01 No.
17. Porcelain dish 10 Nos.
18. Constant Temperature bath 02 Nos.
19. Hot Plate 01 No.
20. Air condenser 20 Nos.
21. Glass tubing 6mm, 10mm 20ft. Each
22. Glass rod 4mm, 8mm 20 ft. Each
23. Stop watches 04 Nos.
24. LPG Cylinder with regulator 01 No.
25. Refractometer 01 No.
26. Refrigerator 01 No.
27. Water Distillation Plant 01 No.
29. Beaker 50, 100, 500, 1000 ml 07 Nos.
30. Hot Air Oven 01 No.
31. Heating Furnace 01 No.
32. Karl Fisher Auto Titrator 01 No.
33. Dean and Stark Apparatus 01 No.
34. Flame Photometer 01 No.
35. Colorimeter 01 No.
36. Bomb Calorimeter 01 No.
37. Spectrophotometer 01
38. Oxygen Cylinder with pressure regulating valve 01 No.
39. Vacuum Pump 01 No.
40. Air source 01 No.
41. Air Flow meter 01 No.
42. Desiccators 06 Nos.
43. Water Suction 04 Nos.
44. Filtration Flask with Buckner Funnel 20 Nos.
40, 250ml, 500ml
45. Heating Mental 06 Nos.
46. ASTM Distillation apparatus 01 No.
47. Viscometer and Constant temperature bath 01 Set of viscometer
48. Apparatus for oil determination in given sample as per I P norm 01 No.
49. Reid Vapor Pressure Apparatus with const. temp. Bath 01 No.
50. Ductility measuring meter 01 No.
51. Penetrometer 01 No.
52. Copper Corrosion Test Apparatus 01 No.
53. Crankcase Oil Dilution Apparatus 01 No.
54. Redwood Viscometer No. I & II 01 No. each

12. GEOLOGY

UNIT-I: Optical Minerology - Nature of Light, Ordinary and plane polarized light, Reflection and Refraction, total internal reflection and critical angle, Double Refraction - Nicol prism.
PETROLOGICAL MICROSCOPE - Its parts & functioning, Optical properties under plane polarized light - Colour, Pleochromism. Relief, Refractive Index and Becke line, Twinkling, Form & Cleavage.
Properties under crossed Nicol - Isotropism & Anisotropism, Extinction, Interference Colours and Colour chart, Twinning.

UNIT-III: Mineralogy - Physical, Chemical, Optical Properties & Structure of following Mineral groups, Feldspar, Mica Pyroxene, Amphibole, Garnet & Olivine group

UNIT-IV: Igneous Petrology - Classification
a) Chemical, Silica based, Silica Saturation and CIPW.
b) Mineralogical Classification - Colour Index.
c) Tabular Classification:

UNIT-V: Sedimentary Petrology - Structure, Texture and Classification of Sedimentary rocks.

UNIT-V: Paleontology - Systematic Classification of organism, Morphological character, Classification, and geological history of Phylum Mollusca and Brachiopoda,
UNIT VI: Stratigraphy i Lithostratigraphic Classification of India.
Classification, geographic distribution, lithological characteristic, fossil content and economic importance of Archean Super group, Dharwar Super group, Vindhyan i Super group, and Cuddpah Super group. Stratigraphy of Maharashtra.

Practicals
(about 20-25)
1. Megascopic Identification of Mineral from the families as listed in Theory.
3. Study of about ten Minerals under thin section as listed in syllabus.
4. Study of about ten Rocks under thin section from Igeneous / Sedimentary/ Metamorphic.
5. Identification of about ten fossils from families as listed in Theory.

Semester – II
The Practical Examination will be of 4 hours duration & carries 50 Marks. The distribution of Marks for Practicals will be as follows.
A) I Megascopic Identification of Minerals 10 Marks
II Megascopic Identification of Rocks 12 Marks
III Optical Minerals 04 Marks
IV Rocks in thin Section 06 Marks
V Fossil 08 Marks
B) Record 05 Marks
C) Viva-Voce 05 Marks
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Total 50 Marks

Reference Books for Sem I & II :
12. H.F.Read: Rutleyâ€™s Elements of Mineralogy.

List of Equipments & Materials For B.Sc.

Perrology Practicals :
1. A set of 200, Rocks specimens for megascopic study (set should include all the types of rocks). As listed in practicals and their varieties.
2. A set of 100 rock slides for Microscopic study (Set should include all slides of all the rocks listed in practicals and their varieties.
3. A set of 50, rocks slides showing typical textures of Ingenous, Sedimentary and metamorphic rocks.

Mineralogy Practicals :
1. A Set of 200, Rock forming Minerals specimen for Magascopic study. (Set should include all the minerals as listed in syllabus and their varieties).
2. A Set of 100 Minerals slides (thin sections) for microscope study. (Set should include all the minerals listed in practical and the scheme in different directions.
3. A set of 25 Oriented Minerals slides to demonstrate axially, optic sign, pleochroism scheme Extinction etc.
4. Minerals sets demonstrating Hardness, Cleavage, Lusture, Streak and forms etc.

**Ore Minerals.**

A set of 100 one Minerals for megascopy study. (Set should be made with one Minerals as listed in Practicals an included in Indian Metallic deposit of Theory course).

A Part from this geological material following equipments are essential for megascopic and Microscope study.

1. Petrological slide, projector 1.No.
   (For Demonstration of this section) with screen
2. Magnifiers 10x or more 20 Nos.
   (Table/Hand model with large view for Magascopic Study)
3. Hand lens 10 x or 20 x 20Nos.
4. Pen knife 20 Nos.
5. Streak Plates 20 Nos.
6. Perrological ploarizing microscope 20 Nos.
7. Minocular microscope with point counter, 1 Nos.
   Camera Lucida and U. Stage fitting.

**Crystallography**

1. A set 150 wooden crystallography models belonging Normal class of six major crystal system.
2. A set 25 wooden models showing twinning and the type and laws.
3. Contact Goniometer 5 Nos.
4. Set of transparant, Crystal models demonstrating axes planes and centre of symmetry of different Normal class of major system.
5. A set of atomic structure models demonstrating basic types.

**Palaeontology**

1. A set of 100 fossil as included in the practical syllabus and the phylum mentioned in theory in course.
2. A set of 20 plant fossils as mentioned in practical course and their varieties.
3. A set of 25 Geomorphological models.
4. Index map of Survey of India.

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**Cermorphology**

1. Toposheet of survey of India on 1:50,000 scale covering Entire Vidarbha.
2. Degree sheets of survey of India on 1:25,000 scale covering entire, Vidarbha.
3. Rotarometer 5 Nos.
4. Planimeter 5 Nos.
5. Tracing table (large size) 1 Nos.

**Photogeology**

1. Lens Steroscope 10 Nos.
3. Aerial Photographs (Stereopairs) 10 Nos.
   a) A set of 10, demonstrating different types of Lithologies, Structure etc.
   b) Aerial photographs and Land sat imageries covering Vidarbha for geological & Geomorphological and ground water studies.
4. A set of about 50 Structural models demonstrating various types of Primary and Secondary geological structure.

**Structural Geology**

A) Every department should have adequate copies of outcrop maps and geological maps, so as to cover atleast 20 outcrop map and 20 section maps for every academic session, covering different geological situation from simplest to complex. In addition about 20-25 problems are to be taken on dip, strik, thickness, three points problem, borehole problem.

1. Large scale geological map in India.
2. Geological maps of various states or Geological sheet atlas of India.
3. Tectonic map of India.
4. Hydrogeological map in India.
5. Geological map of various geological systems and the type area.

**Charts**

As far as possible maximum no of charts should be present for demonstration of symmetry elements, crystallographic system. Morphology of various phylum, structural diagram, geodynamics, geological works performed by natural agencies. Mineralogical, petrological and optical variation in rocks and minerals etc. Minimum 100 charts of basic data should be available.
Field Work.
1. Geological Hammer 1000 gm. 10 Nos.
2. Harver Sack 20 Nos.
3. Field camera (Plntax) with zoom lens and flash guns 1 Nos.
5. Steel tapes 5 Mtr., 10 & 50 Metrs. 2 Each.
6. Clinometer campass 15 Nos.
7. Bruten campass 5 Nos.

In addition of these following additional equipments if kept will help to improve teaching and practical demonstration techniques related to course.
1. Overhead Projector 1 Nos.
2. Epidio Scope 1 Nos.
3. Any geophysical instrument Resistivity/Seismic 1 Nos.
4. Water analysis kit 1 Nos.

(Note: 1) Necessary arrangement should be made available to display these models so that students can observe them as and when they like.
2) As far as possible Geological Museum should be separate.)

13. BOTANY
2S – BOTANY

Gymnosperm, Morphology of Angiosperms and Utilization of Plants

UNIT-I : Palaeobotany
1.1 Process of plant fossilization and types of fossils
1.2 Geological Time Scale
1.3 Fossil Gymnosperms
  1.3.1. Pteridospermales: Lyginopteris oldhamia
  1.3.2. Bennettitales: Bennettites

UNIT-II : Gymnosperms
2.1 Classification according to D. D. Pant
2.2 General account: morphology, anatomy, life cycle and taxonomic position of Pinus and Gnetum
2.3 Affinities with pteridophytes and angiosperms
2.4 Economic importance of Gymnosperms

UNIT-III : Morphology
3.1 Diversity in Plants habits – Annual, biannual, perennials
3.2 Roots – Types of root: tap and adventitious, modification of root: for food storage, respiration, and supports.
3.3 Stem – Types of Stem, Characteristic features, branching, modification of Stem – Underground
3.4 Leaf – Parts of leaf, types of leaves – simple and compound: Phyllotaxy; Venation; Stipule. Modification of leaves

UNIT-IV : Morphology
4.1 Inflorescences – Types: Racemose, Cymose and Special.
4.2 Flower – Flower as modified shoot: Structure of flower – Calyx, Corolla, Androecium and Gynoecium. Placentation; Types of Pollination.

UNIT-V : Morphology and Utilization of Plants
5.1 Fruits – Morphological types
5.2 Utilization of Plants
  5.2.1 Food Plants – Wheat, Potato – Morphology, varieties and economic importance.
  5.2.2 Fiber Plant – Morphology, varieties and economic importance of Cotton.
  5.2.3 Oil yielding Plant – Morphology, Varieties and economic importance of Ground nut.

UNIT-VI : Utilization of Plants
6.1 Spices – General account and economic importance of Black pepper, Clove, Cinnamon and Cardamom
6.2 General account and sources of firewood, timber and Bamboos.
6.3 Essential oils – General account, economic importance of Eucalyptus.
6.4 Pharmacognosy and Phytochemistry with respect to following medicinal plants –
  6.4.1 Aloe vera
  6.4.2 Adathoda vasica
  6.4.3 Asparagus racemosa
  6.4.4 Azadirachta indica
  6.4.5 Catharanthus roseus
  6.4.6 Chlorophytum borivilianum
  6.4.7 Emblica officinalis
  6.4.8 Ocimum sanctum
  6.4.9 Rauwolfia serpentina
6.4.10. Vitex negundo
6.4.11. Withania somnifera

LABORATORY EXERCISE

I. Gymnosperms: Morphology and anatomy of the following members
   a. Pinus
   b. Gnetum

II. Preparation of double stained permanent mount of Pinus stem, needle
    and Gnetum stem and leaf.

III. Study of fossil slides of Lyginopteris and Bennettites

IV. Detailed morphological study of types of root, stem and leaf with its
    modifications

V. Forms of corolla

VI. Types of placentation

VII. Morphology of fruits

VIII. Morphology of plant parts used and medicinal plants prescribed in
      syllabi

IX. Utilization of plants: Spices, fiber yielding plants and food plants
    prescribed in syllabi

BOOKS RECOMMENDED

1) A.C. Dutta : Text Book of Botany.
11) Gangulee & Kar : College Botany Vol.II
12) Gangulee Das and Dutta : College Botany, Vol.I
22) S. Sundar Rajan : College Botany, Vol.II & Vol.III.
24) Sharma O.P. : Gymnosperms.
26) Singh and Jain : Taxonomy of Angiosperms.
34) Tyagi & Kshetrapal : Taxonomy of Angiosperms.
39) Modern Practical Botany, Volume-I, Dr.P.B.Pande, S.Chand Pub., N.W.
**Semester – II**

**Practical Schedule**

**Time : 4 hours**

**Marks : 50**

| Q1. | Preparation of double stained permanent mount of given Gymnospermic material and identification with reasons | 10 |
| Q2. | Comments on given Morphological specimens | 12 |
| i. Root | ii. Stem | iii. Leaf | iv. Inflorescence | v. Flower | vi. Fruit |
| Q3. | Comment on given medicinal plant with reference to morphology, part used and medicinal importance (Any two) | 10 |
| Q4. | Spotting (02 marks each) | 08 |
| a) Palaeobotany | b) Gymnosperms | c) Utilization of Plant (food, fibers, spices) (2 Materials) |
| Q5. | Practical record | 5 |
| Q6. | Viva voce and Excursion report | 5 |

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**UNIT I**

a) Introduction to Ecology- Definition, principles and scope of ecology. Ecological factors- climatic, biotic, topographic.

b) Biogeochemical cycles- Definition, types. Gaseous (carbon, oxygen, and nitrogen). Sedimentary (phosphorous and sulfur)

**UNIT II**

a) Population Ecology- Definition, characteristic (natality, mortality, age structure, growth curve, dispersal, population size and density, biotic potential and life tables.

b) Interspecific relationship- Positive and negative. Positive- mutualism and commensalism. Negative ð Parasitism and predation.

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**UNIT III**: Community Ecology: Definition, characteristics ð species diversity, growth form, structure and dominance. Characters used in community structures:

Analytical-a) Qualitative- frequency, abundance, density, basal area, dominace. b) Quantitative ð Physiognomic, phenology stratification abundance vitality, life form.

Synthetic- i) presence and Constance, ii) fidelity iii) Dominance and other synthetic characters.

Methods of study of community- Quadrat.

(Lectures-14)

**UNIT IV**

a) Ecosystem- Definition, components and structure, food chain, food web, ecological pyramids, energy flow in ecosystem, energy flow model (Y- shaped).

b) Ecosystem types: Terrestrial- forest, grassland, desert and cropland; Aquatic- marine and fresh water.

(Lectures-14)

**UNIT V**

a) Productivity of ecosystem- Concept of productivity, types (primary, secondary), net productivity. Biomass-concept, definition and study methods.

Methods of measurement of productivity- Chlorophyll, O₂, CO₂ and radioactive.


(Lectures-14)

**UNIT VI**

a) Biodiversity ð Definition, types., Biodiversity loss, global diversity. India as mega diversity nation. Indian Biodiversity hot spots.

b) Bio-indicators - climatic, soil and pollution and their role in environment.

(Lectures-14)

**NOTE** :- Should visit to different Environmental ecosystems for the study of various components, interactions and ecological indicators.

**BOOKS FOR REFERENCE:**

15. SEED TECHNOLOGY (VOCATIONAL)

2S-SEED TECHNOLOGY

PLANT BREEDING METHODS FOR CROP IMPROVEMENT AND
SEED PRODUCTION.


Pureline selection — Definition of pureline, Characters of pureline and its importance, Field techniques of pureline selection, Advantages and limitations.

UNIT II: Mass selection

Definition, Procedure of mass selection, Merits and demerits, Differences between pureline selection, clonal selection and mass selection.

Hybridization followed by selection in self pollinated crops - History, definition and types of hybridization, Application and objectives Hybridization techniques in self pollinated crops, Heterosis in self pollinated crops, Advantages and limitations, Handling of segregating population (Pedigree method, Bulk method mass pedigree backcross method, multiline varieties, F1 hybrids)

Hybridization procedure in cross pollinated crops - development of inbred lines, Effect of self pollination (selfing). Development of single cross and double cross hybrids, Development of synthetic and composite varieties, Achievement in field crops, vegetables and fruit crops.

Mutation in crop improvement

Definition of mutation, mutagen, mutant etc.

Classification of mutation (point mutation, chromosomal, somatic mutation, spontaneous and induced mutation macro and micro mutation).

Artificial induction of mutation, Mutagens (physical, chemical, radioactive isotopes).

Mechanism of action of mutagens. Dosimetry.

Procedure for mutation breeding, Significance of induced mutation in crop improvement

Achievements through induced mutations.

UNIT III: Polyploid breeding

Occurrence of polyploidy in crop plants, Classification of polyploidy, Effects of aneuploidy and euploidy, Techniques of production of haploids, aneuploids, triploids, tetruploids etc. Evolution of crop plants through polyploidy, Achievements through polyploidy breeding.


Distant hybridization Barriers in distant hybridization, Methods to overcome the barrier: Embryo rescue, Embryo culture. Methods used for hybridization: Protoplast fusion. Advance techniques in plant breeding: Anther culture, Tissue culture, Soma clonal variation.

Organisation for crop improvement in India History of systematic crop improvement in India, Setting up of council of Agricultural Research, Crop Research Institutes.

UNIT IV: General introduction

Seed definition - differences between seed and grain, Seed as a basic input in agriculture. Role of high quality seeds in increasing and sustaining crop production


Flowering and seed production Flowering in crop plants, its modification for hybrid seed production. Factors affecting seed set-temperature, relative humidity, day length, wind velocity and direction, duration of flowering, anthesis, pollen viability, stigma receptivity, nutrition and irrigation. Male sterility and self incompatibility--male sterility, its genetics and use in hybrid seed production. Self incompatibility, its genetics and use in hybrid seed production.

UNIT V: Pollination and seed production

Improvement of pollination in seed production of forage legumes, tripping process and vegetables. Improvement of pollination for hybrid seed production.

Hybrid seed production Feasibility of hybrid seed production by the use of hand emasculation and pollination, supplementary pollination detasseling - male sterility, gametocides and self incompatibility.

Areas of seed production Choice of area of seed production, Factors affecting the choice of area of seed production - soil type, climate, nutrition and weed status, insect pest and disease incidence.

Compact area approach in seed production. Seed village concept generation system of multiplication.

UNIT VI: Agronomic management in seed production - selection of land for seed production. Previous crop effect.
Effect of environment before and after harvest on seed quality.
Special agronomic management.
Benovalent, monovalent effect on germination quality.
Harvesting and threshing of seeds—factors affecting time of harvesting and threshing, precautions at these operations especially in high value seeds—care at post harvest handling of seeds.

Seed Production Systems and Management.
Systems of seed production in India. Agencies responsible for seed production. seed production planning. Indian and International seed industry. Planning, organizing and managing a seed production programme.

Seed production procedure—Detailed seed production procedure in following crops with reference to land and isolation requirement, special agronomic management, roguing, harvesting and threshing in wheat, Rice, Sorghum, Bajara, Maize, Chick pea, Cowpea, Mung, Urdbeans, Soybeans, Groundnut, Rapeseed, Mustard, Saza, Sunflower, Forages, Potato. seed plot technique of potato multiplication, production of hybrid Potato seeds.

PRACTICALS.
PLANT BREEDING METHODS FOR CROP IMPROVEMENT AND SEED PRODUCTION.

1. Preparation of slides for the study of mitosis and meiosis.
2. Hybridization techniques.
3. Studies on segregation using mixture of coloured seeds
4. Studies on independent assortment.
5. Studies on gene interactions.
6. Embryo rescue and media preparation for cultures
7. Visit to research farms.
8. Preparation of agroclimatic maps (India and States) for soil, crops and climatic conditions
9. Identification of different crop seeds.
10. Seed production planning—for hybrid and varieties. Computation of area and seed requirements for seed production of certified class.
11. Study of inflorescence and flower structure of self and cross pollinated crops.
12. Study of pollination and fertilization, insect pollinators—their identification, management of insect pollinators especially honey bee isolation distance.
13. Study of seed production practices of cereals, pulses, oilseed, and fibre crops in relation to planting, weed control, roguing, harvesting and threshing.
14. Visit of nucleus, breeder seed plots and study of maintenance of varieties.
15. Visit of foundation and certified seed plots and study of the techniques of seed production.
16. Seed planning—cost of seed production.

PRACTICAL EXAMINATION

Distribution of marks.

<table>
<thead>
<tr>
<th>Practical</th>
<th>Marks</th>
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<tbody>
<tr>
<td>1. Prepare temporary squash/smear of the given material and identify two stages.</td>
<td>7</td>
</tr>
<tr>
<td>2. Problem based on segregation/Independent assortment Gene interaction chi-square test using coloured seeds.</td>
<td>7</td>
</tr>
<tr>
<td>3. Identify and describe specimens A, B, C and D giving reasons (Inflorescence, Pollination, crop seeds)</td>
<td>8</td>
</tr>
<tr>
<td>4. Identification and classification of seeds on the basis of seed production practices (any two)</td>
<td>7</td>
</tr>
<tr>
<td>5. Submission of visit report.</td>
<td>7</td>
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<tr>
<td>6. Submission of seed specimens and viva voce.</td>
<td>7</td>
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<tr>
<td>7. Record book.</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total Marks</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

BOOKS RECOMMENDED

1. Seed Technology—R. L. Agrawal, Oxford IBH.
5. Strickberger N.W. 1985 Genetics, Mc Millan publishing co, Newyork.
16. ZOOLOGY

There shall be following paper and practical for B.Sc. Part-I Semester.

Two examination. The syllabus is based on 6 theory periods and six practical periods per week (Total 75-80 theory Sessions and 25 practical sessions during the complete semester). There shall be one compulsory paper of 3 hours duration, in theory as stated below and practical examination extending for four hours. Every examinee shall offer the following paper of 100 marks, (Out of which, 80 marks will be for written examination and 20 marks for internal assessments) and practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

Marks
1) Paper-II: Cell and Developmental Biology
   Theory (Written)   é é . 80
   Internal assessments é ... 20
2) Practical:       é é . 50

Total : 150 Marks

2S-ZOOLOGY

CELL AND DEVELOPMENTAL BIOLOGY

UNIT-I: 1. General organization of Prokaryote and Eukaryote Cell.
         2. Ultra structure and functions of, Plasma membrane
         3. Ultra structure types and functions of, Endoplasmic reticulum

UNIT-II: 1. Ultra structure and functions of, Golgi complex
         2. Ultra structure and functions of Ribosome
         3. Ultra structure and functions of Mitochondria.
         4. Ultra structure and functions of Lysosomes.

         2. Chromosome and its general organization.

UNIT-IV: 1. Mitosis and its significance
         3. Gametogenesis: Spermatogenesis and oogenesis
         4. Fertilization: Types of fertilization, Mechanism of fertilization,

UNIT-V: 1. Cleavage, and development up to coelome formation in amphioxus
         2. Cleavage, Blastulation and gastrulation up to the formation of three germ layers in Frog, Fate map.
         3. Cleavage, Blastulation and gastrulation up to the formation of three germ layers in chick.

UNIT-VI: 1. Placentation in mammals; Types and Functions of Placenta.
         2. Parthenogenesis: Types and, Significance.
         3. Regeneration in invertebrates and vertebrates.
         4. Elementary idea of, sources, types and use of Stem cells.

CELL AND DEVELOPMENTAL BIOLOGY

I) Cell Biology:-
1. Use, care and maintenance of microscope.
2. Bacterial Culture, Gram staining.
3. Permeability tests using erythrocytes.
4. Preparation of Polytenic chromosome in Chirnous or Drosophila larva.
5. Preparation of various stages of mitosis in Onion root tip.
6. Preparation of various stages of meiosis in insecta (testis).

II) Developmental Biology.
1. Study of stages of Gametogenesis in rat/frog. (Permanent Stained Slides)
2. Study of different types animal eggs
3. Study of developmental stages (Life Cycle) of Cockroach, Housefly, mosquito, Butterfly, Moth, Frog (Any Four).
4. Sperm in physiological saline using phase contrast optics.
5. Demonstration of developing chick through available resources.
6. Developmental stages of frog: Cleavage, blastula, gastrula, neurula, and tadpoles through available resources.
7. Permanent slides of chick embryos at 24, 48, 72 hrs of incubation.
8. Study of different types of placenta with suitable histological slides or visual diagrams.
Distribution of Marks during Practical Examination: Time: 4 hrs.

i) Identification and comments on spots (1-8)
   - 4 Cytological, 4 Embryological: 16 Marks

ii) Cytological Preparation: 10 Marks

iii) Comments on given Life Cycle: 10 Marks

iv) Certified class record: 05 Marks

v) Submission of photographs of any three crop pests: 04 Marks

viii) Viva-voce: 05 Marks

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Total: 50 Marks

Reference Books Recommended (All latest editions):
1) C.B. Pawar: Cell Biology
2) Alberts Bray, Lewis, Raff, Roberts and Watman: Molecular Biology of the Cell (Garland)
3) Balinsky: An Introduction to Embryology (CBS College Publishers)
4) Grant: Biology of developing system (Halt, Reihart and Winston)
5) Gilbert: Developmental Biology (Sinauer)
8) Tyagi, Verma and Agrawal: Chordate embryology
11) De Robertis Cell and Molecular Biology

List of necessary Equipments/Apparatus required for the Zoology Practical:
1. Compound Microscope: 16
2. Dissecting Microscope: 16
3. Dissection Box: 02
4. Dissecting Trays: 25
5. Phase contrast microscope: 01
6. Computer set with LCD: 3
7. Glass aquarias: 3
8. Dissection Accessories: 1
9. Scale reader: 1

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11. Hot air oven.
12. Weighing Balance (Single Pan Balance)
13. Refrigerator

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17. INDUSTRIAL FISH AND FISHERIES (vocational)

There shall be a following paper and practical for B.Sc. Part-I Semester Two examination. The syllabus is based on 6 theory periods and six practical periods per week (Total 75-80 theory periods and 25 practical during the complete semester). There shall be one compulsory paper of 3 hours duration, in theory as stated below and practical examination extending for four hours. Every examinee shall offer the following paper of 100 marks, (Out of which 80 marks will be for written examination and 20 marks for internal assessments) and practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

Marks

1) Paper-II: CAPTURE FISHERIES
   Theory (Written) 80
   Internal assessments 20

2) Practical: 50

Total: 150 Marks

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2S- INDUSTRIAL FISH AND FISHERIES
CAPTURE FISHERIES

UNIT I
2. Biological aspects of fishery management.
4. Population dynamics

UNIT II
1. Concept of recruitment and yield
2. Problem of overfishing MSY, MEY and OSY.
3. Important river systems of India and their fisheries.
4. Cold water fisheries: Resources Development and Management

UNIT III
1. Fisheries of trout, Mahaseer and other cold water species.
2. Lacustrine fisheries.
3. Origin, distribution and classification of Lakes.
4. Salient physico-chemical features and fisheries of Kodaikanal lake, Yer caud Lake, Ooty lake, Logta Lake.

UNIT IV
1. Reservoir fisheries in India.
2. Marine fishery Resources in India.
3. Problem of inshore fishery.
4. Sampling technique adapting for estimating marine fish landing.
5. Pattern and growth of marine fishery exploitation. Under exploited and unexploited resources of the Exclusive Economic Zone (EEZ).

UNIT V.
1. Pelagic fishery Resources of India.
2. Fishery of oil sardine and other sardines mackerel, ribbon fish, Tunnies, seer fishes carangids and cephalopods.
3. Midwater and dimersal fisheries.

UNIT VI.
1. Estuarine fisheries; Definition, origin and classification of Estuarine fisheries.
3. Brackish water lakes and their fishery
4. Chilka Lake and Pulicat Lake
5. Indian backwater and their fisheries.

Practicals:
1. Study of food and feeding habits of fishes - Analysis of stomach content qualitative and quantitative methods.
2. Estimation of growth rate and ageing by indirect methods- (Using scales and otoliths, length weight relationship & ponderal index.)
3. Plankton analysis: qualitative and quantitative, permanent stained preparations of planktons.
4. Estimation of relative conditions factors, gonad somatic index and fecundity.
5. Study of spawning habits based on ova diameter polygons.
6. Identification of egg hatching spawn, fry and fingerlings of Indian major carps.
7. Study of larval stages of crustacean and molluscs.
8. Study of various types of external and internal fish tags.
9. Field visits - (1) Visit to fish catching, center to assess catch compositions species
    (2) Study of crafts and gears in inland water
    (3) Fish market statistical data.
    (4) Visit to a polluted water body to assess its impact on fishery.
    (5) Visit to fish farm.

PRACTICALS EXAMINATION

Distribution of Marks.
1. Identification and comments on given spots, 1 to 5 15 Marks
2. Identification of a given species of fish by morphometric study. 7 Marks.
3. Estimation experiment Plankton analysis or determination of feeding habit of fish by stomach content analysis 8 Marks.
4. Permanent stained micro preparation of Any planktonic organism. 6 Marks.
5. (a) Viva voce 5 Marks
    (b) Record book 5 Marks
    (c) Field dairy 4 Marks

Total 50 Marks

List of Equipments
1) Microscopes common and Inverted.
2) Fish measuring Boards.
3) Dissection sets.
4) Scale reader
5) Hot air oven.
6) Weighing Balance (Single Pan Balance)
7) Otolith cutter and grinder
8) Bone cutters.
9) Occulometer and stage micrometer
10) Microtome
11) Camera lucida
12) Projection microscope
13) Centrifuge (Electrically operated)
14) Sedgwick Rafter Cells.
15) Tissue homogenizer
16) Catheters
17) Refrigerator
18) Water analysis kit (Digital), Spectrophotometer, Colorimeter
19) pH meter, Oxygen analyzer.
20) Autoclave
21) Phage-Contrast microscope
22) Aluminum and wooden frames for fabrication of aquarium.
23) Acrylic and glass sheets.
Magnifying glasses.

Breeding Hapa, Hatching Hapa, drag net, hand net, plankton net, sieves for soil texture analysis.

Beakers, droppers.

Enamel trays.

Facility for tissue block making staining and mounting.

Glassware for analysis of CO2.

Petri dishes, test tubes etc.

Glass troughs.

Earthen ponds.

Cement customes.

Millipore filters.

Pressure cookers.

Drilling Machines.

**References for Fish Biology (Sem I and II)**

9. FAO Species Identifications Sheets for Fishery Purposes. Western India Ocean Fishing Area 51. Vol I to V and Eastern Indian Ocean Fishing Area 57 and Western Central Pacific Fishing Area 71. Vol I to III.

**18. Biological Techniques And Specimen Preparation (vocational)**

There shall be a following paper and practical for B.Sc. Part-I Semester Two examination. The syllabus is based on 6 theory periods and six practical periods per week (Total 75-80 theory periods and 25 practical during the complete semester). There shall be one compulsory paper of 3 hours duration, in theory as stated below and practical examination extending for four hours. Every examinee shall offer the following paper of 100 marks, (Out of which 80 marks will be for written examination and 20 marks for internal assessments) and practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

**Marks**

1) Paper-II: BTSP (Plant)
Theory (Written) é é . 80
Internal assessments é . . 20
2) Practical é é é é é é é é é é 50

**Total : ** 150 Marks

**2S- Biological Techniques and Specimen Preparation (Vocational)**

**BIOLOGICAL TECHNIQUES & SPECIMEN Preparation (Plant)**

**UNIT-I** Systems of classification, Classification of plants up to family by Bentham and Hooker's system. Broad idea about rules of plant nomenclature and Botanical names of plants which are locally available from following families and showing economical uses. Annonaceae, Papaveraceae, Cruciferae, Malvaceae, Rutaceae, Anacardiaceae, Papilionaceae, Mimosae, Cucurbitaceae, Umbelliferae, Compositae, Apocynaceae, Solanaceae, Liliaceae and Gramineae.

**UNIT-II** Plants used as cereals, Pulses, Fruits, vegetables, fiber plants, species of medicinal value. Ethno botanical plants of nearby locality.
Tissue system in Angiosperms and special features of anatomical sections commonly used in the classrooms. Preparation of stains and single and double staining methods.
Preparation of permanent slides & storage of slides. Methods of permanent staining e.g. Algae.

UNIT-III  

UNIT-IV  
Preparation and maintenance of plant herbarium. Where and How to collect the plants, Knowledge about instruments required for collection of plants and precautions during plant collection, Preparation of dry specimens of herbarium sheets. Processes of storage of herbarium and precautions during storage. Type of specimens, its importance.

UNIT-V  

UNIT-VI  

PRACTICALS
1. Preparation of herbarium sheet: 20 sheets.
3. Preparation of display boxes of dry plant., & Plant products.
4. Preparation of Botanical whole mounts.

7. Plate and colony counting. (Bacteria/fungi).
8. Taxidermy.
10. Preserving materials for class work use.
12. Study and use of Camera Lucida.
13. Microtomy: Preparation of Botanical permanent micro slides (Histological)

Practical Examination
Distribution of mark (50 Marks)
Q1. Microchemical/Phytochemical test 10 marks
Q2. Permanent stained micro preparation
   Or
   Double stained preparation 10 marks
Q3. Squash/smear of root tip/anther 8 marks
   Or
   Mounting of bacteria/fungi/algae.
Q4. Camera Lucida drawing of the given slide/material 7 marks
Q5. Submission of herbarium, Botanical museum specimens Models, charts, Alizarine stained preparation;
   Doubled stained preparation, stuffing of animals
   (At least 3 different types) are to be submitted
   At the time of examination.
   5 marks
Q6. Practical record 5 marks
Q7. Viva voce 5 marks
Total: ........................ 50 Marks

Books recommended for Paper PAPER-1S and 2S-BTSP
4. Text book of Microtechniques and Environmental Biology: Dr. R.R.
Statistics

The examination in Statistics of First & Second semester will comprise of one theory paper each, internal assessment and practical examination. Theory paper will be of 3 Hrs. duration and carry 80 marks. The internal assessment will carry 20 marks. The practical examination will be of 4 hours duration and carry 50 marks.

The Distribution of marks for practical will be as follows:
1. Practical record ------------------------------ 08 Marks
2. Practical Viva Voce-------------------------- 12 Marks
3. Practical problems--------------------------- 30 Marks

The following syllabi is prescribed on the basis of six lectures per week and six practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question in every unit with internal choice for each of 12 marks & one compulsory question covering all the syllabus of Semester-I (8 marks).

The college imparting instructions in Statistics should provide 12 digit desk model electronic calculators to the every student for practical work.

UNIT I: Correlation and Regression Analysis:
1.1 Concept of correlation, scatter diagram and positive and negative correlation.
1.2 Karl Pearson’s coefficient of correlation and its derivation, properties of correlation coefficient, coefficient of determination.
1.3 Rank correlation – Spearman’s and Kendall’s rank correlation coefficient.
1.4 Intraclass correlation coefficient.

UNIT II: Regression Theory:
2.1 Concept of regression, lines of regression, two lines of regressions.
2.2 Coefficient of regression and its derivation, properties of regression coefficients.
2.3 Principle of least square, fitting of linear regression, polynomial and exponential curve.
2.4 Concept of Multiple regression, equation of plane of regression of three variables.
2.5 Definition of Partial regression.

UNIT III: Theory of Attributes:
3.1 Definition of attribute, notations, classes and class frequencies, order of class and class frequencies.
3.2 Consistency of data, conditions for consistency of data, simple numerical problems.
3.3 Independence of attributes, criteria for independence.
3.4 Association of attributes, Yule's coefficient of association, coefficient of colligation, relation between coefficient of association and colligation.

UNIT IV: Discrete Probability Distributions-I :
4.1 Discrete uniform distribution - its definition, mean, variance.
4.2 Bernoulli distribution - its definition, mean variance.
4.3 Binomial Distribution - its definition and derivation, mean variance, coefficient of skewness and kurtosis, moments and m.g.f., fitting of binomial distribution.
4.4 Negative Binomial Distribution - its definition, derivation, mean, variance, moments and m.g.f.

UNIT V: Discrete, Probability Distributions-II :
5.1 Poisson Distribution - its definition and derivation, mean variance, coefficient of skewness and kurtosis, moments and m.g.f., fitting Poisson distribution.
5.2 Hyper geometric Distribution - its definition and derivation, mean variance.
5.3 Geometric Distribution - its definition, mean variance, coefficient of skewness and kurtosis, moments and m.g.f.

UNIT VI: Continuous Probability Distribution :
6.1 Continuous Uniform Distribution - its definition, mean variance, moments and moment generating function.
6.2 Exponential Distribution - its definition, mean & variance through moment generating function.
6.3 Normal Distribution - its definition, mean, variance, median, mode & m.g.f., area property, chief characteristics and importance of normal distribution.
6.4 Beta & Gamma Distributions - Definition, mean, variance.

List of Practicals : (2S – Statistics) :-
1. Problems on Correlation Coefficient.
2. Problems on Rank Correlation by Spearman's and Kendall's formulae.
3. Fitting of straight line and second degree parabola by least square method.
4. Fitting of exponential curve.
5. Problems on regression of two variables.
6. Problems on multiple and partial correlation coefficients in three variables.
7. Testing association of attributes by all four methods.
8. Calculation of mean, variance, coefficient of Skewness and Kurtosis for Binomial distribution.
9. Calculation of mean, variance, coefficient of Skewness and Kurtosis for Poisson distribution.
11. Fitting of Binomial Distribution.
12. Fitting of Poisson Distribution.
13. Fitting of Normal Distribution.
14. Problems on Area property of normal distribution.

Note: The practicals numbered 1, 3 and 6 may be performed on MSEXCEL.

References for 1S and 2S (Statistics) :-
(1) Brase and Brase : Understandable Statistics.
(2) J.Medhi : Statistical methods, an introductory text.
(6) D.N.Elhance : Fundamentals of Statistics

List of Equipments and Instruments required for a Batch of Students in U.G. Statistics Laboratory :-
(1) Twelve digit desk model electronic calculators 20
(2) Biometriac tables Vol.-I & II 02
(3) Seven figure logarithmic tables 10
(4) Statistical tables (compiled) 10
(5) Random Number Tables 10
(6) Personal Computer with Printer 05
(7) Statistical Poster and chart. 02
20. COMPUTER SCIENCE
OR
20. COMPUTER APPLICATION
OR
20. INFORMATION TECHNOLOGY

The examination in Computer Science will comprise One theory Paper and Practical examination for each semester. The theory paper will be of 3 Hours Duration and carry 80 marks. The Practical examination will be of 4 Hrs duration and carry 50 marks.

The distribution of marks in Practical examination is given as:

1) Program writing / execution (on group A & B) : 30 marks
2) Practical / Record : 10 marks
3) Viva-voce : 10 marks

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Total 50 marks
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2S : Computer Science or
Computer Application or
Information Technology

Data Structure and Advance C

UNIT-I : Introduction to Data structure, type of data structures, list, array, stack and Queue; Algorithms of traversing, insertion and deletion operation on it.

UNIT-II : Linked list & its implementation, traversing, insertion, deletion algorithms, circular Queue.


UNIT-IV : Function : Definition, prototype, local & global variable, function parameter, function calling and return, return values and their types, function recursion Arrays : Declaration and initialization of one and two dimensional arrays, function with array.

UNIT-V : String Handling : Declaring and initialization of string variable, operations on string : String copy comparison, concatenation, Pointers : Declaration and initialization, pointer and address arithmetic, Pointer comparison, Pointer and array.

UNIT-VI : Structure : Definition and declaration, initialization, array of structure, nested structure Union

File Handling : Definition and opening a file, closing a file, I/O Operations on file:

fgetc(), fputc(), fputs(), fprintf(), fread(), fwrite().

Practical : Minimum 16 Practical based on
A. Data structure using C Language
B. C language covering aspectus of syllabus.

Study Tour : Study tour may be arranged to computer industry or software development organisation or software technology Park or IT park

Hardware :

I) List of Equipment :
   a) No. of Computers 10 Nos. Desirable configuration
   b) Printer - Minimum 2 Nos.

   2) Printer Ribbon / Tonner
   3) Stabilizer / UPS
   4) Internet facility

   • Legal Software for the syllabus.
   • List of books.

1) Introduction to Data structure : Tremble, Sorenson.
2) Introduction to Data structure : Bhagat Singh, Mops.
4) Introduction to Data Structure in C : Pearson.
7) Programming in ANSIC : Ramkumar and Rakesh Agrwal
8) Programming with C : Byson Gottfried, Schaum Series Publication.

21. COMPUTER APPLICATION (VOCATIONAL)

The examinations in vocational subject Computer Application will comprise of one theory papers and practical examination for each semester. The theory paper will be of 3 hours duration and carry 80 marks. The practical examination will be of 4 hours duration and carry 50 marks.

The distribution of marks in the practical examination will be as follows

1) Practical based on computer lab I 15 Marks
2) Practical based on computer lab II 15 Marks
3) Viva Voce (based on lab I & II) 10 Marks
4) Record/Practical Journal 10 Marks

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Total 50 Marks
Each unit of theory paper will carry two questions with internal options to solve any one question. Candidates are required to pass separately in theory and practical. The following syllabus is based in 8 theory periods and 4 practical periods (of 2 terms of 2 periods) per week.

**2S -Computer Application (Vocational)**

**Html and ‘C’ Programming.**

**UNIT-I :** Introduction to HTML: HTML History, Hypertext and Hypertext Markup Language, Microsoft Front Page, HTML tags and attributes: Adding tags, include attributes `<HTML>`, `<HEAD>`, `<TITLE>`, `<BODY>`, `<P>`, `<BR>`, `<HR>`, Heading tags, table tags, `<A>`, `<LINK>`, `<IMG>`, `<ROWSPEAN>`, `<COLSPAN>`, `<MARQUEE>`, `<BLOCKQUOTE>`, list tag. Attributes: alignment, background colour, text colour.

**UNIT-II :** Basic text: paragraphs, line breaks, headings, strong and emphasized text. Typography: changing the font size, colour. Lists: numbered lists, bulleted lists, and definition lists.

**UNIT-III:** Images: using graphics on Web pages, uploading graphics, adding photos, making them small. Links: creating and using links, both internal (bookmarks) and external. Plus image maps and how to create them.

**UNIT-IV :** Arrays & Strings: Arrays - Declaration and initialisation of one and two dimensional array. String - String functions, string operations Structure - Definition, declaration, initialisation, array of structure, nested structure, union. Pointers - Declaration, initialisation, pointers and address arithmetic.

**UNIT-V :** Functions in C: Introduction, definition of function, function prototype, function calling, call by value, call by reference, return value and their types, function parameters, local and global variable, functions with array, pointers and functions, pointers as function argument, pointer to functions, function returning, pointers, function recursion.

**UNIT-VI :** File Handling: Prototype of file, opening and closing of file, I/O Operations on file: fgetc(), fputs(), fgets(), fputs(), fscanf(), fprintf(), fread(), fwrite() and simple programs on these function. Random Access: fseek(), ftell(), rewind() Error Handling: feof(), ferror().

**Books Recommended :**
1) HTML 4 for DummiesMastering by Ed Tittel, IDG Publications.
2) HTML 4 Unleashed, Professional Reference Edition by Rick Darnell
3) Instant HTML Programmer's Reference, 2nd Edition, HTML 4.0 version by Steve Wright
4) XML unleashed, BPB Publications.
5) Teach yourself XML in 24 hours, BPB Publications.
6) C Programming - Byron Gottfried - Schaum Outline Series
7) Let Us C - Y.P. Kanetkar - BPB
8) Programming in C - E.Balagurusami
9) C-Dennis Ritchie
10) Programming in C - V.Rajaraman
11) Programming in ANSI C - Ramkumar and Rakesh Agrawal - TMH

**PRACTICALS**

Computer Lab.-I : Minimum 8 practical based on Unit-I,II and III

Computer Lab.-II : Minimum 8 practical based on Unit-IV,V and VI.

Study tour: Study tour may be arranged to computer industry, software development organisations, institute, software technology park, I.T. park.

List of equipments— (Minimum requirement) For Vocational Computer Application for B.Sc. Part I, II, III

**I. Hardware**

- **a)** Computer/Laptop -10 Nos.
  - Desirable configurations: Pentium-V, 128MB RAM, 40GB HDD, colour monitor, KBD, modem

- **b)** Printer -2nos.

- **c)** Inkjet Printer -1no.

- **d)** Multimedia kit -1no.

**II. Accessories:-**

- **1)** Pen Drives, CD,DVD
- **2)** Printer ribbon(Cartridge)
- **3)** Printer stationary-5000sheet
- **4)** Stabilizer/UPS
- **5)** Internet facility

**III. Legal Software required as per syllabus.**

**IV. Other accessories be available based on syllabus.**
22. ELECTRONICS

The examination in Electronics of Second semester shall comprise of one theory paper of 80 Marks of three hour duration and internal assessment of 20 mark.

The Practical examination of 50 marks will be held at the end of second semester of four hours duration.

At the time of practical examination every student has to perform one experiment.

Distribution of marks is as under:

1. Experiment (Construction, testing and performance) ------- 30 Marks
2. Practical record --------------------------------------- 10 Marks
3. Viva Voce---------------------------------------------- 10 Marks

Semester II

2S-ELECTRONICS

Digital Electronics

Unit I: Binary Arithmetic & Logic gates:
Binary, Octal & Hexadecimal number system and their interconversion, Binary arithmetic (addition and subtraction using 1's & 2's compliment), multiplication & division. Binary codes: 8421 BCD, Excess-3 & Gray code.
NOT, OR, AND, NAND, NOR gates (definition and truth table), EXNOR & EXOR gates, Half adder, full adder, 4 bit binary full adder.

Unit II: Boolean Algebra & Logic families:
Boolean laws, De-morgans theorem, Simplification of Boolean equations using Boolean algebra, Fundamental products & sum terms, K-map (K-map upto 4 variable).
Classification of logic families, characteristics (Fan-in, Fan-out,Noise immunity, Propagation delay, Power dissipation), DTL, TTL & CMOS logic.

Unit III: Multivibrators and Flip Flops:
Construction & working of Astable, monostable and Bistable transistorised multivibrators, RS, CK-RS, D, JK, JKMS and T Flip Flops (Logic diagram, Truth table, construction & working), Concept of edge trigger Flip-Flop, Concept of preset & clear terminal.

Unit IV: Counters and Shift registers:
Asynchronous & synchronous Counter, Up-down counters (up to 4-bits), modified asynchronous counter (Mod -7 , Mod-10,and Mod-13).
Types of shift registers, SISO, SIPO, PISO & PIPO, IC version of Mod -10 shift registers (Construction & working), IC version of shift register 7495, Application of shift register. Ring counter, Johnsonâ€”counter.

UNIT V: Combinational logic circuit:
Encoder: Binary to BCD, Decimal to BCD, IC 74147, Decoder: 2 to 4 line, BCD to decimal, BCD to 7 segment, IC 7447, Multiplexer: 4X1, 8X1, De multiplexer: 1X4, 1X8, (Definition, construction, operation and application of above)

Unit VI: Semiconductor Memories:
Concept of memory, primary and secondary memory, classification of memories, volatile and non volatile memories, memory Hierarchy, semiconductor memory: RAM, ROM, PROM, EPROM, EEPROM, flash memory.

Books Recommended:
1. Digital and analog technique by Navneet, Kale and Gokhale (Kitab mahal prakashan)
2. Introduction to digital electronics by Mohinder Singh
3. Digital principle and application by Malvino and Leach
4. Modern digital electronics by R. P. Jain
5. Pulse, digital and switching waveforms by Millman and Taub

Practicals: Minimum Ten experiments at least one on each of the following aspects.
1. Half adder, full adder, code converter, Identification and verification of logic gates, 4-bit binary full adder(IC versions)
2. DeMorganâ€”theorems, K-map, TTL and CMOS logic, knowing characteristics of logic families.
3. Transistorized Astable, Bistable and monostable multivibrator, JK and JKMS flipflops, Data Flipflop, RS , CK RS Flipflop.
4. 4-bit binary counter, modifying counter, ring and Johnsonâ€”Counters (Using ICs), SISO, SIPO, PISO and PIPO.
5. Decoder, multiplexer, IC74147 mounting and testing.
6. Study of memories.
List of optimum apparatus required to perform the practicals for a batch of 16 students for the subject electronics for B.Sc. –Semester I/II/III/IV/V/VI/VII/VIII.

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Name of Apparatus</th>
<th>Minimum Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>VTVM/FET VOM</td>
<td>05</td>
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<tr>
<td>2.</td>
<td>CRO Single Trace</td>
<td>05</td>
</tr>
<tr>
<td>3.</td>
<td>CRO DUAL TRACE</td>
<td>02</td>
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<tr>
<td>4.</td>
<td>Function Generators</td>
<td>10</td>
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<tr>
<td>5.</td>
<td>Frequency Counter</td>
<td>01</td>
</tr>
<tr>
<td>6.</td>
<td>RF Generator</td>
<td>01</td>
</tr>
<tr>
<td>7.</td>
<td>Digital Multimeter</td>
<td>05</td>
</tr>
<tr>
<td>8.</td>
<td>Multimeters</td>
<td>15</td>
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<tr>
<td>9.</td>
<td>AC Millivoltmeter</td>
<td>01</td>
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<tr>
<td>10.</td>
<td>Voltmeters</td>
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<td>a)</td>
<td>0 - 1 V</td>
<td>02</td>
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<td>b)</td>
<td>0 - 5 V</td>
<td>06</td>
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<td>c)</td>
<td>0 - 10 V</td>
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<td>d)</td>
<td>0 - 15 V</td>
<td>06</td>
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<td>e)</td>
<td>0 - 30 V</td>
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<td>11.</td>
<td>Ammeters</td>
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<td>a)</td>
<td>0 - 100 mA</td>
<td>02</td>
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<td>b)</td>
<td>0 - 250 mA</td>
<td>04</td>
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<td>c)</td>
<td>0 - 500 mA</td>
<td>04</td>
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<td>d)</td>
<td>0 - 1 mA</td>
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<td>e)</td>
<td>0 - 5 mA</td>
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<td>f)</td>
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<td>g)</td>
<td>0 - 20 mA</td>
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<td>0 - 50 mA</td>
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<td>i)</td>
<td>0 - 100 mA</td>
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<td>j)</td>
<td>0 - 250 mA</td>
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<td>k)</td>
<td>0 - 500 mA</td>
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<td>l)</td>
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<td>12.</td>
<td>Stabilised D.C. Power Supply - 1A</td>
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<td>a)</td>
<td>0 - 9 V</td>
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<td>b)</td>
<td>0 - 12 V</td>
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<td>c)</td>
<td>0 - 30 V</td>
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<td>d)</td>
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<td>e)</td>
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<td>13.</td>
<td>Dimmerstat</td>
<td>02</td>
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<td>14.</td>
<td>Table Lamp</td>
<td>02</td>
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<tr>
<td>15.</td>
<td>Resistance Boxes</td>
<td>10</td>
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<tr>
<td>16.</td>
<td>Rheostates</td>
<td>05</td>
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<tr>
<td>17.</td>
<td>Soldering Gun &amp; Desoldering pump</td>
<td>08</td>
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<tr>
<td>18.</td>
<td>Wire metal and paste</td>
<td>500 gm &amp; 1 pack each.</td>
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<tr>
<td>19.</td>
<td>Stop watch, Continuity Tester</td>
<td>03</td>
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<tr>
<td>20.</td>
<td>Microprocessor kits</td>
<td>10</td>
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<tr>
<td>21.</td>
<td>PC (Pentium-4 with Printer)</td>
<td>01</td>
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<tr>
<td>22.</td>
<td>Microprocessor unit 8086</td>
<td>01</td>
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<tr>
<td>23.</td>
<td>Experimental boards of each expt. as per sullabus</td>
<td>01 each.</td>
</tr>
<tr>
<td>24.</td>
<td>All electrical &amp; electronic tools each</td>
<td>01 of each type.</td>
</tr>
<tr>
<td>25.</td>
<td>bread boards</td>
<td>12</td>
</tr>
<tr>
<td>26.</td>
<td>Patch chords &amp; sockets as per req.</td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>Wires, buttons, fuses &amp; other materials</td>
<td>-5</td>
</tr>
<tr>
<td>28.</td>
<td>Linear &amp; digital IC tester boards each</td>
<td>01</td>
</tr>
</tbody>
</table>

**LIST OF LOOSE COMPONENTS**

| 1.     | Registers - 1W (Mixed)                                | 50 (pieces of each) |
| 2.     | Capacitors - 30V (Mixed)                              | 10 (pieces of each) |
| 3.     | Inductors - (Mixed)                                   | 2 (pieces of each)  |
| 4.     | Transistors                                          |                  |
|   a)  | AC 127/128                                           |                  |
|   b)  | BC 147/148                                           |                  |
|   c)  | SL/HL 100                                            |                  |
|   d)  | BC 107/108                                           | 15 pieces of each |
|   e)  | others if necessary                                  |                  |
| 5.     | Diodes (Mixed)                                       | 15 pieces of each.|
| 6.     | UJT/SCR/Diac/Triae                                    | 05 pieces of each.|
| 7.     | Potentiometers (Linear and non linear)                |                  |
|   a)  | 0 - 500                                              | 05               |
|   b)  | 0 - 1K                                               | 10               |
|   c)  | 0 - 2K                                               | 10               |
|   d)  | 0 - 5K                                               | 08               |
|   e)  | 0 - 10K                                              | 05               |
| 8.     | Step down transformers                                | 03 pieces each.   |
| 9.     | ICs 741/3085/555                                     | 05 each 555       |
|        | 723/78XX/79XX 74XX series                           |                  |
| 10.    | Other Missalaneous components as per requirements.   |                  |
|        | for designing & construction                         |                  |
23. BIOCHEMISTRY

Biophysical and Biochemical techniques.

UNIT-I : Concept of Bioenergetics:
Principles of thermodynamics & their applications in biochemistry, introduction, thermodynamic systems, Laws of thermodynamics, concept of free energy, standard free energy, determination of \( \Delta G \) of reaction, relation between equilibrium constant & standard free energy changes, standard free energy change in coupled reactions. Biological oxidation-reduction reactions-introduction, redox potentials, relation between standard redox potentials & free energy change (derivation & numericals involved).

UNIT-II: Acids, bases, buffers & biomembranes:
B) Biomembranes: Structure & characteristics of biological membranes, active & passive transport, Donnan membrane equilibrium, Dialysis & osmosis, Sedimentation velocity, preparative & analytical ultra centrifugation.

UNIT III: Chromatography:
General Principles & applications of
1. Adsorption chromatography.
2. Ion Exchange chromatography.
3. Thin layer chromatography.
4. Molecular sieve
5. Gas liquid chromatography.
6. HPLC
7. Affinity chromatography.

UNIT-IV: Electrophoresis:
Basic principles of agarose & paper electrophoresis, PAGE, SDS-PAGE, 2-D electrophoresis & its importance, isoelectric focusing, western, southern & northern blotting techniques.

UNIT-V: Spectroscopic techniques:
Beers Lambert's law, Light absorption & its transmittance, determination & application of extinction coefficient principles & application of visible & UV spectroscopic techniques. Principles & application of NMR, ESR, Mass spectroscopy, Fluorometry & flame photometry.

UNIT VI: Immunological techniques & other analytical techniques:
A) Immunological techniques: Immunodiffusions, immunoelectrophoresis, RIA, ELISA, Immuno fluorescence.
B) Isotopic tracer techniques, autoradiography, biological hazards of radiations, PCR.

2S PRACTICAL (SEMESTER-II):
Section I: Colorimetry
a) Estimation of Carbohydrate by Anthron method.
b) Estimation of RNA by Orcinol method.
c) Estimation of DNA by Diphenylamine method.

Section II: Isolation of biomolecules from natural sources.
a) Starch from potato/sweet potato.
b) Casein from milk.
c) Glycogen from liver.
d) Total lipid from egg yolk by Folch method.

Section III: Demonstration of Analytical Techniques.
a) Amino acid separation by Paper Chromatography.
b) Separation of Sugars by Paper/Thin Layer Chromatography.
c) Flame photometry for estimation of Na & K.
d) Separation of serum proteins by Paper Electrophoresis.

Distribution of Marks for Practical Examination:
A) Any one experiment from Section-I 10
B) Isolation of any one compound from Section-II 10
C) Performance of any one Technique from Section-III 15
D) Viva voce 08
E) Class work and practical record 07

Total 50 Marks

BOOKS RECOMMENDED: (Common for Semester-I & II)
24. MICROBIOLOGY

2S MICROBIOLOGY

Microbiology, Biochemistry, Biostatistics & Computers

UNIT I : VIRUSES
i) Discovery of viruses
ii) Structure of viruses
iii) Classification of viruses (LHT System)
iv) Replication of viruses - Lytic cycle (T4), Lysogeny (Lambda phage)
v) Cultivation of viruses - Embryo culture, Tissue culture method
vi) Interferon

UNIT-II : MICROBIAL CONTROL
i) Definition and Terms - Sterilization, disinfection, Antiseptic, Sanitizer, Germicide, Microbiostatis, Antimicrobial agent.

ii) Mechanism of cell injury - Damage of cell wall, cell membrane, Inhibition of metabolic reactions.

iii) Physical control - Temperature, osmotic pressure, Radiation, filtration.

iv) Chemical control - Chemistry and mode of action of halogens, heavy metals and their derivatives, Alcohols, Detergents and Gaseous sterilization.

v) Chemotherapeutic agents - Definition and mode of action of penicillin, tetracycline, Norfloxacin

UNIT-III APPLIED ASPECTS OF MICROORGANISMS IN -
i) Agriculture - Biofertilizers & Biopesticides.

ii) Human and Animal Health - Antibiotics, Vaccines

iii) Industry (Food, Chemical & Pharmaceutical) - List of Microbial products (and producing organisms)

iv) Environmental - Biodegradation and Bioleaching.

UNIT-IV BASIC BIOCHEMISTRY -
i) Carbohydrates - Classification, different types of Glycosidic linkages eg - Maltose, sucrose, Lactose, starch

ii) Lipids - Classification, concept of saturated and unsaturated fatty acids, outline of conjugated & derived lipids

iii) Proteins - Classification of Amino acids, concept of peptide bond, elementary concept of protein structure.

iv) Nucleic acid - Purine & pyrimidine bases, nucleotides, nucleosides, structure of DNA, structure of RNA (mRNA, tRNA, rRNA)

UNIT-V : BIOSTATISTICS
i) Importance & application - Tabulation & Classification of data, Frequency distribution & graphical distribution of data.

ii) Measures of central tendancies - Mean, Mode, Median & their Properties

iii) Co relation & their Linear regression - Coefficient of correlation, linear least square fit method of regression.

iv) Hypothesis testing - (chi square test) x2 test, t-test

v) Different models of data presentation with special reference to Biological samples.

UNIT-VI COMPUTER CONCEPTS -
i) Components of computer system - Hardware, input devices, CPU, output devices, Monitor, software.

ii) Memory concept - Computer memory primary & second-
ary memory in computers

Window Operating systems: Introduction to graphical user interface systems, desktop menus, launching a program through start menu.

MS-Word: creating, saving operating editing, closing a document, entering & editing texts.

Using Internet explorer, MS power point, creating e-mails.

Microbiology Practicals
1) Demonstration of viruses by plaque formation / chick embryo cultivation.
2) Effect of salt & sugar concentration, PH & Temperature on bacterial growth.
3) Demonstration of oligodynamic action (copper, silver).
4) Anaerobic culture method by Anaerobic Jar method / RCMM.
5) Slide culture techniques for fungi.
6) Determination of antibiotic resistance of bacteria.
7) Industrial utilization of yeast for fermentation activity.
8) Word processing.
9) Use of MS- Excel.
10) Creating e-mail.
11) Use of Internet.
12) Statistical data processing.
13) Microbiological study tour to visit Research centre, Institutions / Industries.

Distribution of Marks

<table>
<thead>
<tr>
<th>IInd Semester Microbiology Practicals</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Major Experiment</td>
<td>15 Marks</td>
</tr>
<tr>
<td>2. Minor Experiment</td>
<td>10 Marks</td>
</tr>
<tr>
<td>3. Viva Voce</td>
<td>08 Marks</td>
</tr>
<tr>
<td>4. Spotting</td>
<td>07 Marks</td>
</tr>
<tr>
<td>5. Laboratory Journal</td>
<td>05 Marks</td>
</tr>
<tr>
<td>6. Study Tour Report</td>
<td>05 Marks</td>
</tr>
</tbody>
</table>

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Total 50 Marks

Note: List of books same as Semester-I.

25. FOOD SCIENCE

NUTRITIONAL BIOCHEMISTRY OF FOODS

Maximum Marks 80

UNIT – I Nutritional Aspects of Protein.
Digestion and Absorption of Protein.
Biological Function of Protein.
Types of Protein.
Evaluation of Protein Quality.
Effects of Deficiency of Proteins.
Oxidation of amino acid.
Conversion of amino acid to carbohydrates and fat.

UNIT – II Nutritional Aspect of Carbohydrates:
Utilization of Absorbed Carbohydrates in the body.
Oxidation of Carbohydrates (TCA cycle).
Effects of Deficiency and Excess Intake of Carbohydrates.
Study of Digestive System of Carbohydrates.
Energy yielding from Glycolysis.
Conversion of carbohydrates to fat and amino acids.

UNIT – III Enzymes: Introduction of Enzymes,
Classification of Enzyme.
Characteristics of enzymes.
Enzymatic activity: name and functions.
Factor Affecting Enzymes Action.
Enzyme specificity.
Role of Enzymes in Digestion and Absorption of Nutrient.
Role of enzymes in various organs and digestive system: - digestion in mouth (salivary secretion, composition of saliva, function of saliva), digestion in stomach (activity of gastric secretion- hydrochloric acid, hypo & hyper acidity), intestinal digestion (amylases).

UNIT – IV Classification of Lipids
Function of Fats, Fatty Acids.
Nutritional Aspects of Lipids
Effect of Deficiency Fatty Acids.
Effect of Excess of Fats and Lipids in Digestion and Absorptions Process.
Role of Fat in the Body.
Oxidation of Fatty Acid.
UNIT-V  Vitamins and Minerals.
Functions and general function of Vitamins and Minerals.
Role of Vitamin and Minerals in Digestion and Absorption Process.
Deficiency Symptoms of Vitamins and Minerals.
Requirements of Vitamins and Minerals in all Age.

UNIT–VI  Water
Importance of Water in body.
Role of Water in body.

Practical
1. Estimation of Starch.
2. Estimation of Protein by Biuret methods.
3. Estimation of Protein by Kjeldhal's methods.
4. Chromatographic separation of Amino Acid in Food Stuff.
5. Estimation of Ascorbic Acids
8. To determine Saponification value of Oil.
9. To determine Iodine value of Oil.
11. Determination of Achoronic point of salivary amylase.
12. Estimation of glycine by formal titration.

List of Books (Common for Semester-I & II)
3. Food and Nutrition Volume I & II; Dr. M. Swaminathan; Bappco.
4. Nutrition Science; B. Srilakshmi; New Age International Publisher.
5. Fundamental of Biochemistry; Dr. A. C. Deb; Center Book Agency.
7. Textbook of Biochemistry; Dr. Mn Chatterjee, Dr. Rana Shinde; Jaypee Brothers.
8. Analytical Chemistry of Foods ; C. S. James; Blackie Academic & Professional.

11. Food Science & Nutrition; Sunetra Roday; Oxford University Press.
13. Laboratory Techniques in Food Analysis; D. Pearson; Butterworths.
17. Food Science; N. N. Potter.
20. Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad.
22. Introduction to biochemistry, second edition; John, W. Suttie, pub., Holt-Saunders publication.

26. INDUSTRIAL MICROBIOLOGY
  2S Indsutrial Microbiology

Fermentation Equipment and Techniques

UNIT-I : 1. Basic Fermentor design:
Parts and their functions of Conventionalstirred tank fermentor

2. Fermentor Configurations
(a) Tubular Fermentor
(b) Fluidised bed fermentor
(c) Bubble Cap fermentor

UNIT-II: Instrumentation and control:

a) Basic concepts of control systems
b) Designs and working principles of instruments and systems for control of temperature, pressure, foam, pH, redox potential, oxygen tension (DO), exit gas analysis, medium composition analysis
UNIT-III: Instrumentation in Industrial Laboratory:

(1) Principle, Working and Applications of Instruments in Industry:
   a. pH meter
   b. Colorimeter/Spectrophotometer
   c. Polarimeter
   d. Chromatography

(2) Computerisation in Industries-
   (i) Introduction
   (ii) Applications of computers in fermentation technology - data logging, data analysis, process control
   (iii) Practical implementation of basic computer control strategies for enzyme production.

UNIT-IV: Methods of recovery and purification of fermentation products
   a) Precipitation, filtration and centrifugation
   b) Cell disruption
   c) Liquid-liquid extraction and solvent recovery
   e) Chromatography - adsorption, ion exchange, gel, affinity.
   f) Distillation
   g) Crystallisation

UNIT-V: Detection and Assay of fermentation products-
   a) Physical and Chemical assays
   b) Biological assay of Vitamins and Antibiotics

UNIT-VI: Fermentation Economics-
   Fermentation economics with respect to raw material, production process, recovery process and product economics, product patenting

Practicals :- Semester-II
1. Primary screening of:
   a) Amylase producers  b) Protease producers  c) Antibiotic producers
2. Demonstration of antimicrobial activity of actinomycetes by the Giant Colony technique
3. Separation of amino acids, sugars, organic acids by paper and thin layer chromatography.
4. Demonstration of basic fermentation process :- Yoghurt, bread and idli.
5. Industrial Study tour.

The distribution of marks in practical shall be as follows:
A) Two short experiment -20 marks (10 Each)
B) One long experiment -15 marks
C) Viva voce -10 marks
D) Industrial Study Tour Report -03 marks
E) Practical Record -02 marks

List of Reference Books:
4. Industrial Microbiology by A.H.Patel

27. BIOTECHNOLOGY (Regular / Vocational)
   2S-BIOTECHNOLOGY (Microbiology)

UNIT I: Scope and importance of Microbiology:-
   Size, shape and arrangement of bacteria, Typical bacterial cell. Microscopy : Resolving power, Numerical aperture, Optical, TEM and SEM.
   Staining techniques : Simple, Gram, Negative, Acid fast and Endospore staining.
   Sterilization methods : Physical and chemical.

UNIT II: Microbial cell Structure:
   Cell wall, Cytoplasmic membrane, and flagella.
   Nutritional classification of microorganisms on the basis of carbon and energy source (Autotrophs, Heterotrophs, Phototrophs and chemotrophs)
   Classification of bacteria according to Bergey's Manual of Sys-
UNIT III:Microbial Metabolism:
Energy production by aerobic and anaerobic processes, (Glycolysis, Kreb's cycle, Electron transport chain, Fermentation, and Photosynthesis)
Microbial Associations: Symbiosis (Rhizobium, Mycorrhiza), and Antibiosis,
Nitrogen fixing microorganisms in agriculture : (Azotobacter, Rhizobium, Cyanobacteria)

UNIT IV: Industrially useful Microorganisms:
Fermentation industry : (Saccharomyces cerevisiae, and Lactobacillus)
Antibiotic Industry : (Penicillium and Streptomyces)
Enzyme Industry : (Aspergillus)
Food Industry: Cheese production ( Penicillun roquefortii)
Biofertilizers : (Azotobacter, Rhizobium, and PSB)
Single cell protein : (spirullina)

UNIT V: Pathogenic microorganisms:
Elementary knowledge of diseases caused by bacteria (Typhoid, Tuberculosis, Cholera), viruses (AIDS, Polio, Hepatitis) and fungi (Dermatophytes)
Mycoplasma: structure, pathogenicity and laboratory diagnosis.
Host parasite relationship.
Host defense mechanisms against microorganisms (Non specific and specific)

UNIT VI: Basic techniques in Microbiology:
Spectroscopy (Beer Lambert's law, Components, working and applications of Colorimeter, and UV-VIS Spectrophotometer)
Chromatography; (Paper, and Thin layer)
Electrophoresis; (Paper and Gel)
Role of Radioactive isotopes in Biotechnology

Practicals
2. Isolation of microbes from different environments (water, soil, air, human body and plants)
3. Enumeration of microorganisms by Standard plate count.
4. Identification of isolated bacteria : (Simple, Gram , Endospore, and Negative staining)
5. Biochemical characterization of microorganisms (Sugar fermentation and IMViC test)
6. Growth curve of microorganisms.
8. One step growth of bacteriophage.
10. Isolation of microorganisms from leaf.
11. Isolation of Rhizobium from root nodules.
12. Study tour / Visit to laboratories /Industries

Distribution of Practical Marks :
(1) Major Experiment 12 Marks
(2) Minor Experiment 08 Marks
(3) Spotting 10 Marks
(4) Viva 10 Marks
(5) Practical Record 05 Marks
(6) Study Tour/Visit 05 Marks

Total 50 Marks

Reference Books (For Sem-II)
1) Microbiology-Pelczar
2) General Microbiology Í Stanier
3) General Microbiology. Vol.I and II-Powar and Daginawala
4) General Microbiology- Sulia
5) Textbook of Microbiology-Ananthanarayan
6) Text book of Microbiology- Dubey and Maheshwari
7) Elementary Microbiology Vol. I and II Í H.A. Modi
8) Stains and staining Procedures-Desai and Desai
9) Experimental Microbiology-Rakesh Patel
10) Experimental Microbiology-Dubey and Maheshwari
UNIT I:
Introduction to Computers: Characteristics, classification of computer block diagram of computer, Memory: Types of memory, RAM, ROM, PROM, EPROM, I/O devices: keyboard, mouse, floppy disk, monitor, compact disk.
Introduction to Number System: Decimal, binary, octal, hexadecimal codes ASCII, EBCDIC.

UNIT II:
Windows: Introduction, features, desktop: Background screensaver, Customizing desktop, creating, moving, deleting icons.
Windows Explorer: Copying, renaming, moving, deleting, operations on files and folders.
My computer, My documents, control panel: Mouse, printer, date and time.
MS-Word: Introduction to word, features, page setup, views, text formatting, Auto correct, spell check, grammar, table, tabs, indentation mail merge, print preview, printing of document, hyperlink.

UNIT III:
MS-EXCEL: Introduction, features, creating and formatting worksheet, Inserting data, entering mathematical formulas and functions, autofill, graphs: Type of charts, creating, moving charts, (column, bar, & pie)
Introduction to Internet: Types of Internet connection: Direct, dial-up, Protocol: TCP/IP, FTP, HTTP. Domain name, electronic mail address, word Wide web, search engines, browser: Internet explorer.

UNIT IV:
Based on Unix operating system: Overview of unix O.S., Unix file system, Data structure for process and memory management, process states and state Transition diagram, process scheduling, memory management, executing and terminating program in unix. Unix commands: pwd, cd, ls, mv, ln, cp, mkdir, rm, rmdir, du

UNIT V:
Based on Linux operating system: Design principal, kernel modules, Process management, scheduling, memory management, file system, Inter Process communication, security.

UNIT VI:
Topologies: Bus, Tree, Ring, Star, Hybrid, WAN, MAN.

Practical-II: Computer Fundamentals and Operating Systems:
1. Use of Windows operating system (Notepad, WordPad, Calculator, Paint)
2. Use of Linux (basic commands)
3. Creating word file by using paragraphs, alignments
4. Create and print file using mail merge.
5. Working with spreadsheet (all operations on cell like merging.)
6. Using function wizard.
7. Calculate regression and correlation use excel.
8. Using different distribution.
9. Creation of presentation.
10. Practicals on Unix basic commands.
11. Practicals based on internet.

Distribution of Practical Marks:
(1) Two Program Writing/Execution 30 Marks
(2) Practical Record 10 Marks
(3) Viva-voce 10 Marks

Total 50 Marks

Books Recommended
11. Practicals based on internet.
1. Computer fundamentals: B. Ram, Nas Age publication.
2. A first course in computer: Sanjay saxena
3. PC Software: Taxali R.K.
6. IT Tool and Application: Alexie and Mathews, Vijay Nikole Publication.
7. Operating system by: Achut S. Godbole Tata megrow Hill publication.
8. Operating system concept, sixth edition by silberschutz, Galvin, Gagne Wiley publication.
10. ABC of LAN – Michel Dopreport (BPB)
11. Local Area Network – Keiser - TMH

List of Equipments : (For Sem I & Sem II)

<table>
<thead>
<tr>
<th>Quantity</th>
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<tbody>
<tr>
<td>PCs Pentium IV (1 PC for 2 students)</td>
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<tr>
<td>Legal Software Windows-XP.</td>
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<tr>
<td>Legal Software Visual Studio</td>
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<tr>
<td>PC based Unix O.S. Legal Software</td>
</tr>
<tr>
<td>Printers</td>
</tr>
<tr>
<td>(i) 80 Column Dot Matrix</td>
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<tr>
<td>(ii) Inkjet Printer</td>
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<tr>
<td>LCD Projector</td>
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<tr>
<td>Broad Band Connection</td>
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</table>

29. APICULTURE

The examination in Apiculture will comprise of one theory paper to each semester of 100 marks each which include 80 marks for theory and 20 marks for internal assessment and practical of 50 marks. Each theory paper shall be of 3 hours duration and practical of 6 hours duration. The syllabi is based on 6 theory periods and 6 practical periods per week.

2S-APICULTURE
(Bee Botany, Pollination, & Melato Palynology)


UNIT-II: Bee Plants: Functional Classification of local bee, plants flora, wild, cultivated, annuals, permanent agricultural, horticultural, crops ornamental, road side avenue trees relative evaluation of bee plants, major & minor species, nectar & pollen species.

UNIT-III: Floral Calender: Flowering sequence, succession, formulation of local floral calender, period of major honey flow, floral gaps during annual cycles, plant poison toxic to bee, poison honey, important bee plants of India.


UNIT-V: Bee Pollination: Definition, Self and cross pollination, pollinating agents.

UNIT-VI: (A) Methods of collecting bee pollination, migration of honey bee colonies for pollination, placement in farm & orchids, management of colonies during pollination, farmer bee keeper relationship. Effect of insecticide on honey bee, preventive measures to be taken. Economics of planed pollination by honey bees. Wild bees used for pollination.

(B) Nector to Honey: How bees make honey, general compotion of honey.

B.Sc. Part-I (Appiculture) Semester-II

Practical-II

Practicals:
1. To study the structure of flower.
2. Study of selected bee plants.
4. Preparation of pollen slides.
5. Study of nector.
6. Study of plant toxic to bees.

Field Study: -
1. Preparation of floral calender.

Distribution of Marks: -

<table>
<thead>
<tr>
<th>Distribution of Marks:</th>
<th>Duration: 4 Hours</th>
</tr>
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<tbody>
<tr>
<td>Identification and comments on important bee plants (four)</td>
<td>16</td>
</tr>
<tr>
<td>Study of structure of flower</td>
<td>10</td>
</tr>
<tr>
<td>Pollen slide preparation</td>
<td>05</td>
</tr>
<tr>
<td>Floral Calender</td>
<td>05</td>
</tr>
<tr>
<td>Field Diary</td>
<td>05</td>
</tr>
<tr>
<td>Practical Record</td>
<td>05</td>
</tr>
<tr>
<td>Viva-voce</td>
<td>04</td>
</tr>
</tbody>
</table>

Total 50

List of Reference Books: - Semester-I & II

3. Value added products for Beekeeping- Food and Agriculture
30. Forensic Science

2S Forensic Science (Forensic Chemistry)

The examination in Forensic Science of Second semester shall comprise of one theory paper, internal assessment and practical examination. Theory paper will be of 3 Hrs. duration and carry 80 marks. The internal assessment will carry 20 marks. The practical examination will be of 4 to 6 hours duration and carry 50 marks.

The following syllabus is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question in every unit with internal choice for each of 12 marks & one compulsory question covering all the syllabus of Semester-I (8 marks).

Total Lectures: 84
Total Marks: 80

Note: Figures to the right hand side indicate number of lectures.

Unit I 14L

A) Qualitative-Quantitative Analysis 5L
Organic - inorganic products - oils, paints, petroleum products, cement.

B) Forensic Chemistry 5L
Screening, sampling-methods type (collection), statistical method, different standard methods, Inorganic analysis, Micro-chemical methods for forensic analysis.

C) Miscellaneous 4L
Characteristics/examination/act/organic-inorganic products-Gold, silver, tobacco, milk, coffee, tea, sugar, salts, fertilizers, dyes, drugs, paints, fats, various acts (legal aspects).

Unit II: Separation and detection technique 14L

Gas chromatography: Theoretical principles, instrumentations and technique, columns, stationary phases, detectors, Forensic applications. HPLC: Review of theory, Instrumentation, Technique, column, detectors, LC-MS, Forensic applications. Atomic Absorption Spectroscopy and Flame spectrometry - Theory and Forensic applications.

Unit III: Forensic Toxicology 14L

Introduction and concept of forensic toxicological examination and its significance. Poisons: (Plant Poison, Animal Poison, Metallic Poison) classification of poisons, types of poisoning, collection and preservation of toxicological exhibits in fatal and survival cases, signs and symptoms of poisoning, mode of action and its effect on vital functions, medico-legal and post mortem examination report/finding studies, specific analysis plan/approach to toxicological
examination of poisoning samples, excretion of poisons, detection of poisons on the basis of their metabolic studies, interpretation of analytical data and forming of opinion.

**Unit IV: Narcotic Drugs and Psychotropic Substances 14L**


**Unit V: Study of Analysis of Beverages 14L**

Introduction, Definition of alcohol and illicit liquor, Alcoholic and non-alcoholic beverages and their composition, Proof spirit, absorption, de-toxication and excretions of alcohol, problems in alcohol cases and difficulties in diagnosis, Alcohol and prohibition, Consequences of drunken driving. Analytical techniques in the analysis of alcohol and other articles. Case study.

**UNIT VI: Miscellaneous Topics 14L**


**Semester- II**

2S Forensic Science (Forensic Chemistry)

**Total Laboratory sessions: 21 Marks: 50**

**List of Practicals:**

1. Identification of food adulteration - vegetable oil, Cold drinks etc. (2nos).
2. Quantitative or qualitative study of drug opiates. (2 nos).
3. Examination of fire arson cases by GC, TLC. (1 nos).
4. Detection and determination of various adulterants in alcohol, by colour tests. (Qualitative analysis) (2 nos.).
5. Analysis of Jaggery samples.
6. Qualitative Test for Examination of Ethyl Alcohol in Human Blood.
7. Detection of Inorganic Poison As, Hg, Cu, Ba, PO\(_4\)\(^{-3}\) etc.
9. Plant, animal, Metallic poison analysis. (2 nos.).
11. Separation of Sampling Material by TLC (drugs, poison etc.) (2nos).
12. Study of Steroids (separation by TLC).
13. Examination of chemicals used in Trap cases by UV-visible spectroscopy. (2 nos)
15. Analysis of Medicinal and Toilet preparation samples.
17. Analysis of Ammonium Chloride and Sodium Chloride Mixture Samples.
19. Analysis of Diesel.

**Distribution of Marks for Practical Examination:**

**Time: 4 – 6 hours Marks: 50**

<table>
<thead>
<tr>
<th>Exercise-I</th>
<th>****</th>
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<tbody>
<tr>
<td>Exercise-II</td>
<td>****</td>
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<tr>
<td>Exercise-III</td>
<td>***</td>
<td>12</td>
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<tr>
<td>Viva-Voce</td>
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**Books Recommended:**

1. Instrumental Analysis by Skoog, Holler and Crouch.
3. Advance in Chromatography by Brown P. R.
4. Introduction of Forensic Science in Crime Investigation by Dr. (Mrs.) R. Krishnamurthy.
5. Howard: Forensics Analysis by Gas Chromatography.
7. The basic Science of Poisons Casarett & Doll Toxicology.
12. Qualitative Analysis by Vogel.

31. Renewable Energy
3.1 Renewable Energy Fundamentals of Electricity

Unit I: Electric Network: Network elements: branch, junction, node, mesh. Network Laws: Kirchoff’s laws, Thevenin’s theorem, Power in electric circuit, unit of power, power in pure resistive circuit, Maximum power transfer theorem.


Unit VI: Primary and Secondary Batteries, Classification of Secondary Batteries based on their Uses, Classification of Lead Storage Batteries, Parts of a Lead-acid Battery, Electrical Characteristics of the Lead-acid Cell, Application of Lead-acid Batteries, Battery Ratings, Indications of a Fully Charged Cells.

Reference Book:
2. "Electrical Machines" by P. S. Bhimbra.
3. Energy Demand and Supply, (Stathis) Michaelides, Efstatios E. Springer Germany, 2012

Practical
1. Simulation of Hysteresis Loop on the CRO
2. Characteristics of LVDT
3. Characteristics of Current Transformers and Potential Transformers
4. Power measurement using current transformer & potential transformer
5. Power factor improvement with capacitor banks
6. Testing of energy meters
32. Animation
2S : Animation

Fundamentals of Graphics

Unit-I : Adobe Photoshop: concepts of graphics, file menu basic of layers, selection, move, lasso, magic wand, crop, etc. (study of all tools expected).

Unit-II: All types of paint tools like air brush, custom shapes, quick mask, notes, audio annotation tools, masking, path, etc.

Unit-III: Working with layers, applications of masking to matting (study of all menus related to layers); image menu, color correction, scanning, filters, creating backgrounds & textures for website, slice tools, web related concepts. Creation of a simple web and presentation graphics, file automate options, video editing techniques.

Unit-IV : Adobe illustrator: Concepts of graphics designing, interface, basic shapes, all types of menus like file menu, edit, view, select, group/ungroup, lock, hide/show, etc.; File/outline, gradients, patterns, symbols, styles, swatches, mesh tool, paint brush. Creating a greeting card, etc.

Unit-V: Deformation tools, symbols tools, redrawing or cartoon making, type tools and type menus.

Unit-VI : Use of different tools like path, envelop, clipping and crop mask, etc; filters and effect menus, exporting document, idea of printing, setting bleed, idea of PDF technology.

Practicals : Minimum eight experiments based on above contents are to be performed.

Recommended Books :
1. Recommended Text Books: Digital fashion illustration with Photoshop and Illustrator by Kevin Tallon; Published by Batsford 2008.
2. Reference books: Real word Adobe Illustrator CS4 by Mordy Golding; Published by Pretence-Hall of India, 2008.
3. Creative Suite 3 integration: Photoshop, Illustrator by Keith Martin; Published by Pretence-Hall of India, 2008.
4. Special edition using Adobe Photoshop 7 by Peter Bauer, Jeff Foster; Published by Pretence-Hall of India, 2008.

The Concerning teachers are also suggested to use other relevant material available on the net, to update the knowledge of the students.

Following are the recommended links, for further search-
1) www.tatamcgrawhill.com
2) www.books.google.co.in
3) www.penguinbooksindia.com
4) www.bookcafe.in
5) www.newindianbooks.com
6) www.newasiabooks.org