GURU NANAK COLLEGE (Autonomous)
VELACHERY ROAD, CHENNAI – 600042
(Re-accredited at 'A' grade by NAAC)


# MASTER OF SCIENCE

## DEPARTMENT OF ADVANCED ZOOLOGY & BIOTECHNOLOGY

## (SEMESTER SYSTEM WITH CREDITS)

## SYLLABUS

# GURU NANAK COLLEGE
# (AUTONOMOUS)

## RULES AND REGULATIONS

### 1. CHOICE BASED CREDIT SYSTEM (CBCS) WITH GRADING

The College follows the CBCS with grades under the semester pattern. Every course paper is provided with a credit point based on the quantum of subject matter, complexity of the content and the hours of teaching allotment. This is done after a thorough analysis of the content of each subject paper by the members of the Board of studies and with the approval of the Academic Council. Students are also offered with a choice of a variety of Job-oriented courses, Elective courses and courses involving Soft-skills. Students are permitted to choose any course of their interest during the study period and earn extra credits and certificates in addition to the regular hardcore (compulsory) subjects.

The evaluation method under CBCS involves a more acceptable grading system that reflects the personality of the student. This is represented as Cumulative Grade Point Average (CGPA) and Grade Point Average (GPA) which are indicators of Academic Performance of the student. It provides students scope for horizontal mobility as well as empowers them with the flexibility of learning at their convenience.

### 2. ELEGIBILITY FOR ADMISSION

A candidate who has passed the B.Sc degree examination in branch VI Zoology or Advanced Zoology & Biotechnolgy Main of the University of Madras or an examination accepted as equivalent thereof by the Syndicate of the University of Madras shall be admitted to appear and qualify for the M.Sc Degree examination after a course of two academic year (4 semesters).

### 3. DURATION OF THE COURSE

The UG course is of three year duration with six semesters and the PG course is of two year duration with four semesters. The odd semester include the period from June to November and the even semester from December to April. There shall not be less than 90 working days for each semester.

### 4. COURSE OF STUDY

1. The PG course has 14-17 core papers with 4 credits, 3-4 elective papers with 3-4 credits and a project work

2. Internship training forms a compulsory component for the PG courses.

The details of the course structure is given in the following table :

**(Effective for the batch of Candidates admitted in 2016-2018 and thereafter)**

**M.Sc. DEGREE Course in ZOOLOGY**

| Sem | Part | Subjects | Cdt | Hr | Exam hrs | CIA | ESE | Total |
|---|---|---|---|---|---|---|---|---|
| I | Core-1 | Functional Morphology and Phylogeny of Invertebrata | 4 | 4 | 3 | 50 | 50 | 100 |
| | Core-2 | Cell and Molecular Biology | 4 | 4 | 3 | 50 | 50 | 100 |
| | Core-3 | Genetics- A Molecular approach | 4 | 4 | 3 | 50 | 50 | 100 |
| | Elective I | Fish biology & Fisheries | 4 | 5 | 3 | 50 | 50 | 100 |
| | Core practical-1 | Invertebrata ,Chordata, and Fishery Biology | * | 6 | * | * | * | * |
| | Core practical-2 | Cell &MolBiol, Biophysics, Biotech, Genetics, Biostatistics and Microbiology | * | 6 | * | * | * | * |
| | Soft skill | Language and communication skill | 2 | 1 | 3 | - | 100 | 100 |
| II | Core-4 | Functional Morphology and Phylogeny of Chordates | 4 | 4 | 3 | 50 | 50 | 100 |
| | Core-5 | Biophysics and Biostatistics | 4 | 4 | 3 | 50 | 50 | 100 |
| | Core-6 | Microbiology | 4 | 4 | 3 | 50 | 50 | 100 |
| | Elective II | (IDP) Aquarium Fishes | 4 | 5 | 3 | 50 | 50 | 100 |
| | Core practical-1 | Invertebrata,Chordata, and Fishery Biology | 4 | 6 | 4 | 50 | 50 | 100 |
| | Core practical-2 | Cell &MolBiol, Biophysics, Biotech, Genetics, Biostatistics and Microbiology | 4 | 6 | 4 | 50 | 50 | 100 |
| | Soft skill | Computing skills | 2 | 1 | 3 | - | 100 | 100 |
| | | Internship | 2 | * | - | - | 100 | 100 |
| III | Core-7 | Bioinformatics and Computer Applications | 4 | 4 | 3 | 50 | 50 | 100 |
| | Core-8 | Developmental and Stem Cell Biology | 4 | 4 | 3 | 50 | 50 | 100 |
| | Core-9 | Environmental Biology and Evolution | 4 | 4 | 3 | 50 | 50 | 100 |
| | Elective III | Entomology | 4 | 5 | 3 | 50 | 50 | 100 |
| | Core practical-3 | Animal Physiology, Environmental Biology and Biochemistry | * | 6 | * | * | * | * |
| | Core practical-4 | Developmental Biology, Bioinformatics, Computer Applications, and Entomology | * | 6 | * | * | * | * |
| | Soft skill | Managerial skills | 2 | 1 | 3 | - | 100 | 100 |
| IV | Core-10 | Animal Physiology | 4 | 4 | 3 | 50 | 50 | 100 |
| | Core-11 | Biochemistry | 4 | 4 | 3 | 50 | 50 | 100 |
| | Core-12 | Biotechnology | 4 | 4 | 3 | 50 | 50 | 100 |
| | Core practical-3 | Animal Physiology, Environmental Biology and Biochemistry | 4 | 6 | 4 | 50 | 50 | 100 |
| | Core Practical-4 | Developmental Biology, Bioinformatics, Computer Applications, and Entomology | 4 | 6 | 4 | 50 | 50 | 100 |
| | Soft Skill | Spoken and presentation skills | 2 | 1 | 3 | | 100 | 100 |
| | | Project | 4 | 5 | - | 50 | 50 | 100 |

## 5. EXAMINATIONS

Continuous Internal Assessment (CIA) and End Semester Examination (ESE), each carrying 50% marks, will form the basis for grading student performance in each paper.

**CONTINUOUS INTERNAL ASSESSMENT**

Continuous assessment will be made by teachers responsible for the course they teach on dates centrally fixed by the college. Every semester has two centralized CIA examinations and one model examination for each paper. The Continuous Assessment Tests (CAT) of one and a half hour duration would be held on completion of 30 and 60 working days each semester. Students who fail to write one or more CATs will have to register for a re-test after obtaining clearance from the HOD and Dean Academics. Re-test is generally not allowed except in the case of students who miss CA tests because they were away on those days representing college in sports or cultural activities or for any justifiable reason acceptable to the Principal/Dean. Principal/Dean may grant special permission to such candidates for taking just one additional paper of three hour duration covering the entire syllabus of that paper. This test should be taken before the commencement of the End of Semester Examination of that semester. A Model exam of three hours duration will be held at the end of each semester. The schedule for these tests is as follows:

| C.I.A. Test | Schedule | Syllabus Coverage |
|---|---|---|
| I | After 30 working days from the commencement of the semester | 40% |
| II | After 60 working days of the semester | 80% |
| III (model) | After 80 working days of the semester | 95% |

The components for the CIA are as follows:

| Internal Components | | | |
|---|---|---|---|
| **Assessment Type** | **Nature** | **Maximum marks** | **% of Weightage** |
| CIA | Written test I | 50 | 5 |
| | Written test II | 50 | 5 |
| | Model examination | 100 | 10 |
| | Assignment | | 10 |
| | Class activities | | 15 |
| | Attendance | | 5 |
| | **Total** | | **50** |

The class activity relates to a programme of accepted innovative techniques such as seminars, quiz, port folio creation, MCQ, power point presentation, objective tests, role play etc. This class activity for evaluation will be fixed before the commencement of the semester with the approval of the HOD.

A student should attend at least one test in order to declare him/her as pass in the internal assessment tests even though he/she has got pass marks in the overall internal components. Candidates who fail in a paper for want of sufficient marks in CIA will have to seek improvement by coming back to the semester for CA exams or repeating it after the completion of the course at the time of regular CIA.

A record of all such assessment procedures will be maintained by the department and is open for clarification by the students. Students will have the right to appeal to the Principal in case of glaring disparities in marking.

CIA marks for practical subjects will be awarded by the respective faculty based on the performance of the student in the model practical examination, observation notebook, submission of record books, regularity and attendance to the practical classes. The attendance particulars for practical classes will be maintained by the concerned faculty.

Marks for attendance will be awarded as per the following:

| Percentage of General Attendance | Marks awarded |
|---|---|
| 90-100 | 5 |
| 75-89 | 4 |
| 60-75 | 3 |
| <60 | 0 |

**END OF SEMESTER EXAMINATIONS (ESE)**

- Examinations will be conducted during each semester after the completion of a minimum of 90 working days. Examinations will be held for all papers of the course in Nov/Dec and April/May for all UG and PG courses. Practical examinations will be conducted only during the end of the even semester either before the commencement of the theory exam or after the theory exams. The schedule for ESE Practical will be notified by the Controller of Examinations in consultation with the Dean of Sciences.
- A candidate will be permitted to appear for the End of Semester examinations for any semester if:
  - ❖ He / She secures not less than 75% of attendance in the working days during the semester.
  - ❖ His / Her conduct has been satisfactory
  - ❖ He / She should have applied for the examination
  - ❖ He / She should have paid the requisite examination fee

  .
- The attendance requirements to appear for the ESE is as follows:
  - Students must have **75%** of attendance in each part of the course of study to appear for the examination.

- Students who have **65% to 74.9%** of attendance shall apply for condonation in the prescribed form along with the prescribed fee after obtaining permission from the Dean. Students cannot claim condonation as a matter of right. Submission of medical certificate is normally not accepted to condone shortage of attendance.
- Students who have **50% to 64.9%** of attendance will fall under the "Withheld" category. Such students cannot take the ESE exams. They should apply to the Principal for permission to write the next supplementary examination and pay the requisite fee for this purpose.
- Students who have less than **50%** of attendance fall under the "detained" category and **<u>are not</u>** permitted to appear for the examination. **They shall redo the semesters after completion of the course and appear for the examination after securing the required percentage of attendance.** The decision of **Principal** remains final and binding in all respects.

- Students who do not get the minimum marks to pass in the ESE shall compulsorily re-appear for the paper in the subsequent semester after paying the required fee.
- Candidates who fail in any of the papers in the UG and PG End of Semester examinations shall complete the paper concerned within 5 years from the date of admission to the particular course. If they fail to do so, they shall re-register their names and take the examination in the revised regulations/syllabus of the paper in force at the time of their reappearance. In the event of removal of that paper consequent to change of regulation and/or curriculum after 5-year period, the candidate shall have to take up an equivalent paper in the revised syllabus as suggested by the Chairman, Board of Studies concerned.

**Instant Examinations. (Special Supplementary Examination)**

In order to provide an opportunity to the final UG and PG students to obtain the degree in the same year itself and to facilitate vertical mobility, special supplementary End of Semester examinations will be conducted in about 20 days from the date of publication of results every year for the final semester theory papers and also for the candidates who fail in only one theory paper of the previous semesters. Students, who wish to apply for special supplementary End of Semester examinations, can do so within 7 days from the date of publication of results.

**Malpractice cases, if any, will not be permitted to appear for <u>Supplementary Examination</u>**

The details of the ESE is as follows:

| **External Component** | | | |
|---|---|---|---|
| **Assessment type** | **Comprehensive** | **Maximum mark** | **% of Weightage** |
| External Exam | 3 hours examination | 100 | 50 |
| | **Grand total (CIA+ESE)** | | **100** |

**The following procedure to be followed for project marks:**

Internal marks (Best 2 out of 3 presentations : 20 marks
Viva : 30 marks
Project report : 50 marks

## 6. CONDUCT OF EXAMINATION

- Chief Superintendent of exams will be the Principal or a person appointed by him. The conduct of end of semester examination lies with the team headed by the Chief Superintendent.
- Time-table for examinations will be finalized the office of the Controller of Examinations and will be displayed well in advance i.e., 20 days prior to the commencement of examination.
- The Hall tickets for eligible students will be issued **5** days prior to the commencement of examination.
- For Subjects like Environmental Studies, Value Education etc. End Semester Examinations may be conducted on-line or along with the regular ESE.

## 7. VALUATION

- Valuation of the answer scripts are undertaken at the central valuation camp lead by the Controller of Examination or the Camp Officer appointed by the Controller of Examinations.
- Single valuation of answer scripts by external examiners is adopted for both UG and PG courses.

## 8. PUBLICATION OF RESULTS

The Examination results will be published on the web during the second / third week of May for the II, IV and VI semester examinations and during the second / third week of December for the I, III and V semester examinations

PROVISION FOR OBTAINING PHOTOCOPY AND REVALUATION OF VALUED ANSWER SCRIPTS

- A student can request the Principal for a photocopy of the answer book within seven days from the announcement of the results. Such requests should be endorsed by the HOD and submitted along with the prescribed fees for forward transcription to the COE.
- Students intending to go for revaluation after obtaining the photocopy of the answer script, shall apply to the COE in the prescribed format along with fees duly endorsed by the HOD and Principal. The application should reach the COE within 7 days from receipt of the photocopy of the answer script.
- Revaluation /obtaining photocopy of answer scripts is permissible only for the current semester papers and not for any arrear paper.
- For re-valuation, the answer papers will be valued by two external examiners separately and the average mark of the valuations will be taken into account.
- The revaluation results will be forwarded to the Principal within 15 working days.
- Revised mark statement will be issued after withdrawing the previous one, if the marks obtained in revaluation are higher than the marks obtained earlier. In other cases, the original marks obtained earlier will be retained and the matter will be intimated to the student concerned as 'No change'.

## 9.CLASSIFICATION OF PERFORMANCE – GRADING SYSTEM FOR THE SEMESTER

A candidate shall be declared to have qualified for the award of the Degree provided the candidate has successfully completed the Programme requirements and has passed all the prescribed subjects of study in all the semesters.

**Conversion of Marks to Grade Points and Letter Grade (Performance in a paper/course)**

| **Range of Marks** | | **Grade Points** | | **Letter Grade** | | **Description** | |
|---|---|---|---|---|---|---|---|
| **PG & UG** | | **PG & UG** | | **PG & UG** | | **PG & UG** | |
| 90-100 | | 9.0-10.0 | | O | | Outstanding | |
| 80-89 | | 8.0-8.9 | | D+ | | Excellent | |
| 75-79 | | 7.5-7.9 | | D | | Distinction | |
| 70-74 | | 7.0-7.4 | | A+ | | Very Good | |
| 60-69 | | 6.0-6.9 | | A | | Good | |
| 50-59 | | 5.0-5.9 | | B | | Average | |
| **PG** | **UG** | **PG** | **UG** | **PG** | **UG** | **PG** | UG |
| 00-49 | 40-49 | 0.0 | 4.0-4.9 | U | C | Re-appear | Satisfactory |
| | 00-39 | | 0.0 | | U | | Re-appear |
| ABSENT | | 0.0 | | AAA | | ABSENT | |
| **B.Com (Hons)** | | **B.Com (Hons)** | | **B.Com (Hons)** | | **B.Com (Hons)** | |
| 00-59 | | 0.0 | | U | | Reappear | |

**Classification of Grades**

| **CGPA** | | **GRADE** | | **CLASSIFICATION OF FINAL RESULT** | |
|---|---|---|---|---|---|
| **PG & UG** | | **PG & UG** | | **PG & UG** | |
| 9.5-10.0 | | O+ | | First Class – Exemplary* | |
| 9.0 and above but below 9.5 | | O | | First class- outstanding* | |
| 8.5 and above but below 9.0 | | D++ | | First Class with Distinction* | |
| 8.0 and above but below 8.5 | | D+ | | | |
| 7.5 and above but below 8.0 | | D | | | |
| 7.0 and above but below 7.5 | | A++ | | First Class | |
| 6.5 and above but below 7.0 | | A+ | | | |
| 6.0 and above but below 6.5 | | A | | | |
| 5.5 and above but below 6.0 | | B+ | | Second Class | |
| 5.0 and above but below 5.5 | | B | | | |
| **PG** | **UG** | **PG** | **UG** | **PG** | **UG** |
| 0.0 and above but below 5.0 | 4.5 and above but below 5.0 | U | C+ | Re – appear | Third Class |
| | 4.0 and above but below 4.5 | | C | | |
| | 0.0 and above but below 4.0 | | U | | Re- appear |

*** The candidates who have passed in the first appearance and within the prescribed semester of the UG/PG Programme (Core, Allied, Elective, Project and Internship courses) alone are eligible.**

**Grading For a Semester/Year:**

GRADE POINT AVERAGE [GP] = $\sum_i C_i G_i / \sum_i C_i$

$$\text{GPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the courses}}{\text{Sum of the credits of the courses (passed) in a semester/year}}$$

**For the entire programme:**

CUMULATIVE GRADE POINT AVERAGE [CGPA] = $\sum_n \sum_i C_{ni} G_i / \sum_n \sum_i C_{ni}$

$$\text{CGPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the entire programme}}{\text{Sum of the credits of the courses of the entire programme}}$$

(CGPA is calculated only if the candidate has passed in all the courses in the entire programme)

$C_1$ = Credits earned for course *i* in any semester / year.
$G_1$ = Grade Point obtained for course *i* in any semester / year.
*n* refers to the semester/year in which such courses were credited.
$C_i$ = Credits earned for course i in any semester.
$G_n$ = Grade Points obtained for course i in any semester.
n refers to the semester in which such courses were credited

**Passing Minimum**

- Passing minimum of each subject/course under PG Programme is 50% in CIA, 50% in ESE and 50% in aggregate i.e., CIA + ESE
- Passing minimum of each subject under Career Oriented Programmes, Certificate Courses and Diploma courses is 40% in CIA and ESE and 40% in aggregate i.e., CIA + ESE. Both UG and PG students are at liberty to study these courses jointly
- Passing minimum for each PG Diploma course offered by a PG Department as a part of the curriculum to its students is 50% in ESE and 50% in aggregate i.e., CIA + ESE, since graduates alone are admitted to these Courses

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10. **REQUIREMENT FOR PROCEEDING TO SUBSEQUENT SEMESTER**

(a) Candidates shall register their names for the first semester examination after admission in the UG courses.

(b) Candidates shall be permitted to proceed from the first semester up to final semester irrespective of their failure in any of the semester examinations subject to the condition that the candidate should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects

## 11. ISSUE OF CERTIFICATES

### 1. Marksheet

Mark sheets will be issued every semester to all students who have taken the examination.

### 2. Consolidated Mark Sheet

Consolidated mark sheets will be given to final year students along with total credits earned only to those who have passed all the papers prescribed for the respective degree.

### 3. Transcript

Students who are desirous to obtain any other certificates like Transcript certificates for joining courses of study in other Universities in India or abroad or for obtaining scholarships, can obtain these certificates from the office of the Controller of Examinations. A requisition letter duly signed by the Student and forwarded by the Principal along with fee challan is to be submitted to the office of the Controller of Examinations. The certificates will be provided within 15 working days.

### 4. Provisional Certificate

A copy of the results of the successful final year students will be sent to the University of Madras in the prescribed format in July/August and the University will issue a Provisional Certificate through the College. This may take around 2 months.

### 5. Corrections in the Certificates

Any corrections like name, date of birth etc., can also be made in the certificate. A letter of request duly signed by the student, HOD and Principal along with the prescribed fee paid challan is to be forwarded to the office of the Controller of Examinations. The time line to update will be 15 working days. The amount once paid will not be refunded under any circumstances.

### 6. Issue of Duplicate Mark Sheet

In case of loss of mark sheet / certificate, a duplicate may provided after submitting a non-traceable certificate issued from the Police station duly signed by an Inspector or Sub Inspector. A requisition letter duly signed by the Principal along with the requisite fees should also be submitted to the office of the Controller of Examinations. Certificates which are torn will not be replaced.

### a. Duplicate Provisional Certificate / Degree Certificate :

Students have to apply directly to the University of Madras for duplicate provisional certificate and degree certificate.

### b. Verification of Qualification

The agencies who requests for verification of educational qualifications of students under autonomous mode of this college and students who opt for higher studies / employment and who

requires verification of educational qualification, shall apply to the Principal to this effect along with the prescribed fees. The letter of request has to be forwarded to the OCOE. The relevant certificate will be issued within 15 working days from the office of the Principal.

## 12. CONVOCATION AND NOTICE

### *1. Convocation*

Students must apply for their Degree certificates along with copy of the provisional certificates in the application form issued by University of Madras and submit the same in the college office on or before the last date fixed by the college. Every year after the Convocation held by University of Madras, the college will hold a Graduation day / convocation in which the Degree certificates will be distributed to the students who are present. For others it will be issued through the college admin office.

### *2. Notice*

Candidates who have completed the duration of the course and left the College, can get information regarding Supplementary Examinations, issue of examination application forms, certificates and application for Graduation day through the college web site and general notice board. Regular students will however be informed of the examinations by circulation, in addition to the modes mentioned above**.**

**No candidate will be communicated individually.**

**The liability lies on the candidates for their certificates. The College shall not be liable for whatever lapse that occurs due to the ignorance of the candidates**.

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN FOR THEORY PAPERS**

| | |
|---|---|
| **QUESTION ALLOTMENT** | **MAXIMUM 100 MARKS**<br>**PASSING MINIMUM 50 MARKS**<br>**THREE HOURS DURATION** |
| **QUESTION 1-12**<br>**Answer any 10 questions** | **PART-A (10X2=20 MARKS)**<br>**ANSWER ANY 10 QUESTIONS**<br>**EACH QUESTION CARRIES 2 MARK** |
| **QUESTION 13-20**<br>**Answer any FIVE out of 8** | **PART-B (5X 8=40)**<br>**ANSWER ANY FIVE QUESTIONS**<br>**EACH QUESTION CARRIES 8 MARKS** |
| **QUESTION 21 TO 24**<br>**Answer any TWO out of 4** | **PART-C (2X 20=40 MARKS)**<br>**ANSWER ANY TWO QUESTIONS**<br>**EACH QUESTION CARRIES 20 MARKS** |

## I M.Sc. ZOOLOGY

## SEMESTER - I

## FUNCTIONAL MORPHOLOGY AND PHYLOGENY OF INVERTEBRATES

**Core – Paper - I** **Course Code -**
**Teaching Hours: 75 hrs** **Credits: 4**

**Objective:** To relate the morphological adaptations with phylogenetic study.

**UNIT I** **15 hrs**

**Protozoa**: Economic importance- Parasitic protozoa-Reproduction in Protozoa. Origin and Evolution of Metazoa-theories. Symmetry and its significance in animal organisation. Neuromotor system in ciliates.

**Porifera**: Reproduction in sponges- Economic importance of Sponges.

**UNIT II** **20 hrs**

**Coelenterata**: Structural Pecularities of Metridium. Polymorphism; Coral and Coral Reefs and their Theories. Origin of Bilateria; Origin and Types of Coelom; Origin of Metamerism.

**Platyhelminthes**: Parasitism in Platyhelminthes; Reproduction in Platyhelminthes.

**UNIT III** **10 hrs**

**Annelida**: Trocophore larva and its Significance – Nephridia and Coelomoducts-Adaptive Radiation in Polychaetes.

**Arthropoda**: Polymorphism; Crustacean Larvae and their Significance; Pheromones in insects-Endocrine organs in Crustacea.

**UNIT IV** **10 hrs**

**Mollusca**: Filter Feeding in Mollusca; Advanced features of Cephalopods; Torsion in Gastropoda; Adaptive Radiation in Mollusca.

**Echinodermata**: Larval forms and their Evolutionary Significance.

**UNIT V** **20 hrs**

**Minor Phyla:** Rotifera, Gastrotricha ,Acanthocephala, Ectoprocta, Entoprocta, Phoronida, Brachiopoda, Chaetognatha. Invertebrate fossils. Trilobites and cephalopods. Regeneration in invertebrates- Sedentary invertebrates.

**TEXT BOOK:**


1. Barrington, E.J. W. 1969. Invertebrate Structure and Functions. English Language, Book Society.


**REFERENCE BOOKS:**


1. Barnes: Invertebrate Zoology – Toppan International Co.,
2. Hyman L. H. The Invertebrata, Vol. I to IV.
3. Carter, G. S. A General Zoology of Invertebrates, (Sidewick and Jackson Ltd., London).
4. Borradile, L. A. The Invertebrata. Cambridge University Press.
5. Gardinar, M. S. 1972 Biology of the Invertebrates, Mc Graw Hill Book Co., New York.
6. R. L. Kotpal: Protozoa, Porifera, Coelenterata, Helminthes, Annelida, Arthropoda, Mollusca, Echinodermata and Minor Phyla. Rastogi Publilcations.
7. Moore, R. C. Lalilcker, C.G. and Fisher, A. G. Invertebrate Fossils, Mc. Graw Hill Book Co., New York.

**I M.Sc. ZOOLOGY**
**I - SEMESTER**

**TITLE OF THE PAPER: CELL AND MOLECULAR BIOLOGY**

**Core – Paper II** **Course Code -**

**Teaching Hours: 75 hrs** **Credits: 4**

**Objective:** To impart knowledge of genome, cancer and signaling concepts in cell and molecular biology.

**UNIT I** **10 hrs**

**Cell structure and Genome structure:** Brief account of eukaryotic animal cell. Chromatin, Euchromatin, Heterochromatin, Chromosomes, Centromere, Telomere.

**UNIT II** **15hrs**

**Cancer:** Cancer cell- Characteristics, Differences between normal and cancer cell, Membrane and Biochemical changes in cancer cells, Nuclear and Chromosome changes, Carcinogenesis - Tumor viruses, Oncogenes, Tumor Suppressor Genes, Hormones in relation to cancer, Treatment of cancer at molecular level.

**UNIT III** **20 hrs**

**Informational macromolecules:** Chemistry of DNA, Polymorphism of DNA, Mechanism and Enzymology of DNA Replication- Role of Helicases, Primases, Nucleases, Ligases, and Telomerases. Chemistry of RNA, Different types of RNA - mRNA, tRNA, rRNA and their functions- Mechanism and Enzymology of RNA Replication.

**UNIT IV** **20 hrs**

**Information transfer:** Genetic code and its characteristic features. Information transfer in prokaryotes and eukaryotes. Transcription – promoters, initiators and terminators. RNA processing – trimming of introns, splicing of exons, Ribozyme.

**UNIT V** **10 hrs**

**Cell Signalling:** Signalling molecules and their receptors – Functions of cell surface receptors – Pathways of intracellular signal transduction.

**TEXT BOOK:**

1. Cooper: The Cell A Molecular approach.

**REFERENCE BOOKS:**

1. David Frifielder: Molecular Biology.
2. Gerald Karp: Cell Biology- Mc Graw Hill.
3. Lodish, Berk, Zipursky, Matsudaria and Baltimore, Molecular cell biology – IV edition. W.H.Freeman and Company.
4. Watson : Molecular Biology of the Gene

**I M.Sc., ZOOLOGY**
**I - SEMESTER**

**TITLE OF THE PAPER: GENETICS – A MOLECULAR APPROACH**

**Core - Paper - III** **Course Code -**

**Teaching Hours: 75 hrs** **Credits: 4**

**Objective:** To understand the modern concepts of gene, genome, mutation at the molecular level and its functions.

**UNIT I** **15 hrs**

**Gene Structure and Function:** Fine structure of the gene. The Cis-trans test, Phage T4, rII locus, gene-linear set of nucleotide pairs – Colinearity of gene. One gene – One enzyme hypothesis (Neurospora, Eye pigmentation in Drosophila) One gene – One polypeptide concept (Human haemoglobin). The Lactose Operon in E. coli. Induction and Repression – Activator and Repressor proteins and their control. Regulatory components of the lac system. Chemical modification of histones – DNA methylation and Genomic imprinting. X Chromosome inactivation in mammals.

**UNIT II** **10 hrs**

**Human Genetics:** Cytogenetic mapping Karyotype, Preparation, Banding techniques and importance. Idiogram. Variations in human karyotypes (autosomal and sex chromosomal, structural and numerical). Genetic counseling. Principles and methods of pedigree analysis (autosomal dominant, autosomal recessive ,x- linked and mitochondrial).

**Unit III** **15 hrs**

**Molecular basis of mutations:** Radiation induced mutation, chemically induced mutation, mutagens, mutable, mutator genes and mutation frequency - Transposons as mutational elements – Oligonucleotide - directed Mutagenesis – PCR – amplified oligonucleotide – directed mutagenesis. Biological repair mechanisms – Direct reversal of damaged DNA, Alkyltransferases and Photolyase. Excision repair, Post replication repair.

**Unit IV** **15 hrs**

**Gene Therapy:** Human diseases treated for gene therapy. Virus as vectors, non- viral DNA delivery systems. Embryo therapy, *Ex vivo* therapy. *In vivo* therapy, antisense gene therapy. Target tissue of choice for gene delivery systems. Somatic gene therapy for genetic and acquired diseases. Nanotechnology for drug targeting.

**Unit V** **20 hrs**

**Genomes and mapping:** Human genome project, Goals, Structure of eukaryotic nuclear genome – The repetitive DNA, Microsatellites, minisatellites, Interspersed repeats. Linkage map, Physical map – Restriction map, FISH map– Radiation map.

**TEXT BOOK:**


1. Peter J. Russel W.W. Genetics. Benjamin Cummings. 2002. Website **www.geneticsplace.com**


**REFERENCE BOOKS:**


1. Anna.C.Pai: Foundation Genetics, Mc Graw Hill Book Company.
2. Burns, G.W.- The Sciences of Genetics. Mac millan Publishing Co. New
3. Gardner: Principles of Genetics. 8TH Edition. John Wiley and sons
4. Ursula Goodenough: Genetics. Saunders College Publishing.
5. Benjamin Lewin Gene VII (2000). Oxford University press.
6. Griffiths,Gelbart, Lewontin and Miller.Modern Genetic Analysis. W.H. Freeman and Company.
7. P.K.Gupta. Biotechnology and Genomics. Rastogi publications.

# FISH BIOLOGY & FISHERIES

**ELECTIVE –I** **Credits: 4**

**Course Code:** **Teaching Hours: 80**

**Objective:** This subject gives the in depth knowledge about fishes and fish farming

**UNIT I: INTRODUCTION OF FISH** **16hrs**

Definition – salient features of the fishes-classification-Berg's classification-evolution and phylogeny of fishes-locomotion-locomotion due to the movement of appendages-general principles of locomotion-types of locomotion-special modes of locomotion-migration in fishes-types of migration-factors influencing fish migration-advantages of fish migration.

**UNIT II: DIGESTION, GILL RESPIRATION & RESPIRATORY ORGANS** **16hrs**

Food and feeding-food quality-alimentary canal-digestive glands-physiology of digestion-adaptive modifications in digestive tract of fishes-types of gills-structure of gill-specialized cells of gills of fishes-mechanism of gill respiration-air bladder and Weberian apparatus-function of air bladder-Weberian ossicles and their function.

**UNIT III: REPRODUCTION & GROWTH STUDIES** **16hrs**

Role of hormones in reproduction and induced breeding - maturity stages - morphological and histological observation of gonads – cryopreservation-growth-factors influencing growth -- length-weight relationship-condition factor- age determination

**UNIT IV: FISH GENETICS AND IMMUNOLOGY** **12hrs**

Sex determination in fish – monosex production - hormonal and chromosomal methods - hybridization techniques in aquaculture, androgenesis and gynogenesis- fish immune system.

**UNIT V: CULTURE & CAPTURE FISHERY OF INDIA** **20hrs**

Types of culture-fresh water-brackish water-mariculture-pond culture-extensive-semi-intensive & intensive-construction and maintenance of fish farm-composite fish culture of Indian major carps & exotic carps-hatchery techniques-integrated fish culture-paddy cum fish-paddy cum prawn-fresh water prawn culture.

Fishery zones of India and the type of fishery in these zones-fisheries of Oil-sardine, Indian mackerel, Bombay-duck and Hilsa-fishing crafts and gears-preservation and processing- by-products of fishery industry.

**REFERENCE/BOOKS:**


1. Gupta, S.M., 2010. Text book of fishery, Ann Backer, Mumbai.
2. Hanifa, M.A, 2011. Aquatic resources and aquaculture, Dominent, New Delhi.
3. Pandey.K and Shukla, J.P.2010. Fish and fisheries,Rastogi Publications,Meerut.
4. Parihar, R.P. 1996. A text book of fish biology and Indian fisheries,central publishing house, Allahabad, India.
5. Khanna, S.S., and Singh H.R.2012.A text book of fish biology & fisheries,Narendra publishing house.
6. Baluyut, E. A. (1989). Aquaculture systems and Practices. A selected review Publishing House, New Delhi.
7. Chondar. A (1970). Handbook of breeding of Indian major carps by pituitary harm one injection. Agra Satisdh Book Enterprise.
8. Day. F (1958). Fishes of India, Vol. I and Vol. II. William Sawson and Sons Ltd., Londan.
9. Jhingran, C. G. (1981). Fish and Fisheries of India. Hindustan Publilcating Co., India.

**I M.Sc., ZOOLOGY**

**II - SEMESTER**

**TITTLE OF THE PAPER : FUNCTIONAL MORPHOLOGY AND PHYLOGENY OF CHORDATES**

**Core – Paper - IV** **Course Code –**

**Teaching Hours: 75 hrs** **Credits : 4**

**Objectives:** To enhance knowledge of the chordates and their evolutionary significance.

**UNIT I** **15 hrs**

Geological time scale – Fossil records in the various strata. Origin of Chordates- Theories. Broad classification of Chordates – Phylogenetic Affinities of Cephalochordata and Urochordata.

**UNIT II** **20hrs**

Evolutionary and structural pecularities of Cyclostomata and affinities – Petromyzon – Myxine. Elasmobranch evolution –Dipnoi structural pecuilarities, Discontinuous distribution and their affinities. Coelocanth fishes. Economic importance of fishes. Parental care in fishes.

**UNIT III** **10 hrs**

Amphibia- Origin and evolution. Adaptive radiation in Amphibia.
Reptilia - Origin and evolution of reptiles. Adaptive radiation of modern reptiles; Dinosaurs-reasons for extinction.Sphenodon.

**UNIT IV** **10 hrs**

Aves - Origin and evolution - Origin and distribution Ratitae.
Mammals – Origin and evolution - critical account of Prototheria, Metatheria and Eutheria. Adaptive radiation in mammals.

**UNIT V** **20hrs**

Comparative anatomy – Comparative study of Integumental derivatives , Jaw suspension – Fate of visceral arches. Respiratory organs, Vertebrate Kidney , Urinogenital organs, Brain, Heart and Aortic arches.

**TEXT BOOK:**

1. Newman, The Phylum Chordata, Mac Millan and Co.

**REFERENCE BOOKS:**

1. Colbert, E.H. Evolution of Vertebrates. Wiley Eastern Limited.
2. Hyman, L.H – Comparative Vertebrate Zoology. University of Chicago Press
3. Romer, A.S. Vertebrate body. Saunder's company
4. Young, J.A- Life of Vertebrates. Oxford press.
5. Waterman, A.J – Chordate structure and Function. Mac Millian and co.

**I M.Sc., ZOOLOGY**

**II - SEMESTER**

## TITLE OF THE PAPER : BIOPHYSICS AND BIOSTATISTICS

**Core – Paper - V** **Course Code -**

**Teaching Hours: 75 hrs** **Credits: 4**

**Objective:** To highlight the statistical applications in biological sciences and to enhance the principles of physics in biology.

### BIOPHYSICS

**UNIT I** **15 hrs**

Principles of light Microscopy and Electron Microscopy and their applications; Principles and methods of Histology and Histochemistry, Freeze-drying, Freezing Microtome and Cryostat.

**UNIT II** **15hrs**

Electronic configuration of an atom ; Vander Waal's forces – Hydrophobic and hydrophilic interactions; Principles and different types of Chromatography and Electrophoresis; Principles and applications of Colorimetry, Spectroscopy, Ultra violet and Infra red Spectroscopy in Biological investigations.

**UNIT III** **15 hrs**

Phenomenon of Radioactivity: Isotopes and their use in biological investigations. Biological effects of radiation- Determination and measurement of radio activity-Geiger Muller and scintillation counter- Biological applications of radio isotopes and autoradiography.

### BIOSTATISTICS

**UNIT IV** **12 hrs**

Sampling and sample Designs- Definitions – Theoretical basis-Laws – Methods. Sampling and Non-sampling errors. Variables-Qualitative and Quantitative, Discrete and Continuous. Types of classification-Qualitative and Quantitative. Qualitative- chronological, geographical etc, Quantitative –Frequency distribution, Discrete and Continuous frequency distribution. Diagrammatic and Graphical representation of Data-Bar diagrams-Pie diagrams- Cartograms. Frequency distribution-Histograms, Frequency Polygon, Frequency Curve

**UNIT V** **18 hrs**

Measures of central tendency. Arithmetic Mean, Median and Mode. Definition and computation for different types of data (ungrouped, discrete and continuous frequency distribution). Measures of Dispersion: standard deviation. Definition-computation for different types of data (ungrouped data, discrete and continuous frequency distribution). Correlation- Definition and Types. Scatter diagram. Computations of Karl Pearsons coefficient of correlation. Students 't' test and Chi square analysis.

**TEXT BOOKS:**


1. Dr.S.P.Gupta, Statistical Methods. (1984) Sultan Chand and Sons, New Delhi
2. M.A Subramanian, Biophysics Principles and Techniques (2005), MJP Publishers.


**REFERENCE BOOKS:**


1. Pillai, R.S.N.and Bagawathi.V Statistical Theory and practice (1989).
2. Sokal, R.R and Roulf, F.J - Biometry. The Principles and Practice of Statistics in Biological Research. (1969).

**I M.Sc., ZOOLOGY**

**II – SEMESTER**

**TITLE OF THE PAPER: MICROBIOLOGY**

**Core - Paper VI** **Course Code -**

**Teaching Hours: 75 hrs** **Credits:4**

**Objective:** To understand the structural details of the microbes and correlate with microbial diseases. To understand the role of microbes in the environment and in the field of food production, biotechnology etc.

**UNIT I** **18 hrs**

**History and Scope:** Mile stones in microbiology - Microbial Taxonomy-Classification system- Phenetic – Numerical – Phylogenetic. Major characteristics- Classical and Molecular, Phylogenetic tree, Domain kingdom – DNA and Ribosomal RNA analysis Characterization and identification- Serological and Gene probe method.

**Morphology**-Ultra structure of Bacteria, Fungi and Viruses- Bacterial physiology-Growth and Nutrition-Nutritional requirements-Kinetics of growth.

**Enumeration of bacteria –** Viable plate count-MPN procedure.

**UNIT II** **18 hrs**

**Medical microbiology**- Pathogenic Microbes Bacterial –Tuberculosis, Whooping cough and Tetanus, Viral- Measles, Hepatitis, and HIV, Fungal –Candid. Protozoan Diseases – Amoebiasis and Malaria. Cure, Control and Prevention.

**UNIT III** **12 hrs**

**Microbial Ecology and Environmental Microbiology**-Role of micro organisms in carbon, nitrogen and sulphur cycle. Population interaction – commensalisms, co –metabolism, epiphyte, synergism, mutualism, competition, predation, and parasitism.

**UNIT IV** **12 hrs**

**Food and Dairy Microbiology**- Microbes in food, Role of micro organisms in food production, dairy and non-dairy-Fermented food and Alcoholic beverages. Micro organisms and Food spoilage.

**UNIT V** **15 hrs**

**Industrial Microbiology**- Industrial uses of microbes- Fermentation products. Production of Pencillin, Ethanol, Vinegar, Vitamin $B_{12}$, Citric acid and Protease. Methods of Immobilisation: Types of Reactors: Animal and Plant Cell Bioreactors.

**TEXT BOOK:**

1. Michael. J. Pelczar Jr, Chan. E.C.S, Kriej, Noel.R- Microbiology. Tata Mac Graw hill.

**REFERENCE BOOKS:**

1. Dubey, R.C. and Maheswari, D.K, A text book of Microbiology.
2. Lansing, M. Prescott, John P.Harley and Donald A. Klein. Microbiology Mc Graw Hill (1999):
3. Patel, A.H. - Industrial Microbiology (2001). MacMillan india Limited.
4. Powar and Daginwala: General Microbiology - Vol II Microbiology-fourth edition
5. Ronald, M. Atlas, Principles of Microbiology (1997)
6. Sharma. P.D, Microbiology- A text book for university students

## I M.Sc., ZOOLOGY

## II – SEMESTER

## Elective II - TITLE OF THE PAPER: AQUARIUM FISHES (IDP)

**Elective**

**Course Code**

**Teaching Hours: 80 hrs** **Credits : 4**

**ELECTIVE : Offered to other Department Students**

**Objective:** To provide basic information on common aquarium fishes of India and its export potential.

**UNIT I** **13hrs**

**Introduction:** Taxonomy and biology of some common Fresh water and Marine Ornamental Fishes.

**UNIT II** **18 hrs**

**Food and Feeding Management:** Live feed organisms (Daphnia, Tubifex, Cyclops, Brachionus, Chlorella., etc.) - Formulated feed (Freeze dried tubifex, liver, vegetable food, etc.) – Method of preparation of commercial feed and quality assessment of feed.

**UNIT III** **18 hrs**

**Aquarium Keeping and Management:** Setting up of an aquarium tank – Selection of stone and gravel – Decors - Aquarium plants – Water quality management – Aeration – Illumination devices - Salinity – pH - Temperature maintenance – Filtration (Mechanical and Biological filters). Safety measures and devices for maintenances.

**UNIT IV** **18 hrs**

**Breeding techniques and Health assessment:** Development of brood stocks – Selection of brood fishes - Breeding of Egg layers and Live bearers – Common diseases of aquarium fishes and their control – Microbial: Bacterial, Viral and Fungal diseases; Non – microbial – Protozoans, Trematodes, Cestodes, Nematodes and Crustaceans.

**UNIT V** **13 hrs**

**Prospects of ornamental fishes:** Export and industrial importance - Hobby and household industry – List of fresh water and marine ornamental fishes available in India for export with its indicative prices - Role of women in ornamental fish culture.

**TEXT BOOK:**

1. Donald Wilkie, Aquarium fish (1985). Pelhem Book, Ltd.

**REFERENCE BOOKS:**

1. Boulenger, E.G., Keep an Aquarium (1939).
2. Dey V.K., Ornamental fishes-MPEDA Hand book of Aquafarming
3. Harvey Jack Hims. Georg, F., A guide to fresh water Aquarium fishes. Hamylnn publications, 1973.
4. Gregory C. Bateman, Fresh water Aquaria - 7th edition. Revised by Jack Hen.
5. Hornell, J.Guide to Madras aquaria (1921).
6. John G. Shedd, Aquarium (1933).
7. Stephen Spotte, Marine Aquarium keeping. The Science, Animals and Art. (1973).John Wiley & Sons.
8. William T. Innes, The aquarium (1932).
9. Robert Goldstein, Diseases of aquarium fishes (1971). T.F.H. Publication.

**I M.Sc., ZOOLOGY**
**II - SEMESTER**

**TITLE OF THE PAPER : PRACTICAL I – INVERTEBRATA, CHORDATA AND FISHERY BIOLOGY**

**Core – Practical - I** **Course Code -**
**Teaching Hours: 60 hrs** **Credits: 4**

## INVERTEBRATA

1. Identification and study of selected Protozoans and Helminthes of medical importance.
2. Identification and study of sections of certain animals from Coelenterata, Aschelminthes and Annelida to understand the evolution of different types of coelom.
3. Identification and study of Larval Forms from all Major Phyla of Invertebrates.
4. Identification and study of Invertebrate Fossils (specimens).
5. Dissection and mounting of Digestive, Nervous and Reproductive Systems in
   1. Scorpion , 2. Gryllotalpa and 3. Grasshopper.
6. Dissection of the Nervous system in 1. Mytilus and 2. Sepia
7. Mounting of Pedicellariae and Aristotle lantern in Sea Urchin.

## CHORDATA

1. Dissection of internal ear in Shark.
2. Dissection of aortic arches in Shark
3. Dissection and Display of Arterial and Venous System, in Teleost fish

## DEMONSTRATION

4. Identification of important Prochordates, South Indian Fishes, Amphibians, Reptiles, Birds and Mammals.

## FISHERY BIOLOGY

1. Fish Morphology – Morphometric characters : Head Structure , Types of scales in fishes.
2. Identification of : a) Marine, fresh water and estuarine fishes up to species level.
   b) Cultivable prawns.
3. Commercially important invertebrates: Crab, Lobsters, Pearl oyster, Edible Oyster, Mytilus, Sepia and Loligo – their economic importance.
4. Age determination – Scale method.
5. Observation of maturity stages of gonads and determination of Gonadosomatic index and fecundity.
6. Gut content analysis of some important fishes in relation to feeding habits.
7. Observation of Gears and Crafts.
8. Observation of fish parasites.
9. Observation of Larvivorous fishes and Aquarium fishes.
10. Observation of seaweed species – their economic importance.
11. Observation of Live feed organisms.

**I M.Sc., ZOOLOGY**

**II - SEMESTER**

**TITLE OF THE PAPER : PRACTICAL II: CELL AND MOLECULAR BIOLOGY, BIOPHYSICS, BIOTECHNOLOGY, GENETICS, BIOSTATISTICS AND MICROBIOLOGY**

**Core – Practical - II** **Course Code -**

**Teaching Hours: 60 hrs** **Credits : 4**

## CELL AND MOLECULAR BIOLOGY

**1. Cytological techniques**

Micrometry: Microscopic caliberation and Measurements of cell size using ocular and stage micrometers.

**2. Study of different types of cells**

Blood cells –Differential count in man, fish**.**

**1. Histochemical techniques**

Demonstration: Fixation, Dehydration, Embedding, staining (vital staining) and Mounting.

Histochemical localisation of

a. DNA
b. Lipids
c. Proteins

## BIOPHYSICS

Demonstration :

1. Spectrophotometry: Principle and application
2. Electrophoresis: Description and applications.

## BIOTECHNOLOGY

Demonstration:

a. Isolation of genomic DNA.
b. Isolation of plasmid DNA from bacteria.
c. Agarose gel Electrophoresis of DNA.

## GENETICS

1. Preparation of culture medium and culture of Drosophila-methods of maintenance.
2. Identification of Drosophila species and mutants.
3. Identification of human blood groups and Rh typing.
4. Preparation of Human karyotypes – Analysis of Normal and abnormal karyotypes (Down's syndrome, Turner's syndrome, Klinefelter's syndrome).

## BIOSTATISTICS

1. Problems relating to mean, mode and median.
2. Problems relating to standard deviation.
3. Problems relating to standard error.
4. Problems relating to Chi- square method for testing genetic ratios.

## MICROBIOLOGY

1. Microscopic observation for identification and characterization of micro organisms relevant to theory syllabus.
    a. *Staphylococcus aureus*
    b. *Escherischia coli*
    c. *Rhizopus*
    d. *Aspergillus niger*
    e. *Aspergillus flavus*
    f. *Penicillium*
    g. *Nostoc*
    h. *Oscillatoria*
    i. *Volvox*
2. Culture medium and preparation.
    i. Preparation of peptone water
    ii. Preparation of nutrient broth
    iii. Preparation of solid media.
        1. Slant
        2. Stab
        3. Plate.
3. Simple and Differential staining of bacteria.

**II M.Sc., ZOOLOGY**
**III - SEMESTER**

**TITLE OF THE PAPER: BIOINFORMATICS AND COMPUTER APPLICATIONS**

**Core – Paper - VII** **Course Code -**

**Teaching Hours: 75 hrs** **Credits : 4**

**Objective:** To impart knowledge and techniques of computers and to provide biologically important predictions from annotated data and transformation of their for DNA analysis.

**UNIT I** **15hrs**

**Computer Hardware: Input Devices:** Punched cards, Punched papers , tape , key board, barcodes, magnetic ink character readers, light pen , mouse, optical mark reader.

Output Devices – Printers, visual display unit, memory devices- primary memory devices – ROM and RAM, secondary memory devices – magnetic tapes, floppy disk , hard disk , CD.

**UNIT II** **15 hrs**

**Computer Software:** Operating system –Windows. Ms Office - Ms Word, Power point, Ms Excel.

**UNIT III** **15hrs**

**Internet :** The concept of networking computers –LAN and WAN – Internet explorer - Use of the internet- Browsing and mailing –Multimedia.

**UNIT IV** **15hrs**

**Bioinformatics:** Genomics, Proteomics, Human Genome project , DNA arrays , the need for computers in biology.

**UNIT V** **15 hrs**

**Bioinformatics:** Computers in medical imaging- CAT and MRI. DNA Sequence Analysis, Protein Sequence Analysis and Structure determination. Computers in drug design.

**TEXT BOOK:**

1. V. Rajaraman, Fundamentals of computers (1985) Prentice Hall of India. Pvt,

**REFERENCE BOOKS:**

1. Alan Fielding, Computing for Biologists (1985) Benjamin Cuming Publishing Co.
2. D. Heams and M.P.Bakers, Computer graphics (1990) -Prentice Hall of India Pvt , Ltd.
3. J.P.Lamoitier, Basic exercises for the IBM personal computer (1985). Sybex Inc., Berkely, U.S.A..

**II M.Sc., ZOOLOGY**
**III – SEMESTER**

**TITLE OF THE PAPER: DEVELOPMENTAL AND STEM CELL BIOLOGY**

**Core – Paper - VIII** **Course Code -**

**Teaching Hours: 75 hrs** **Credits : 4**

**Objective:** To understand the use of " Cells as medicine " instead of drugs stem cells can alleviate the side effects of chemotherapy and repair the damaged organs, developmental biology helps to understand the ontogeny of animals.

**UNIT I** **15 hrs**

Definition – Explants- Balanced salt solution- Culture media – Maintenance of aseptic conditions – Culture of animal tissues – Isolated cells – Storage – Applications – Cryobanks – Breeding rare species – Test tube babies.

**UNIT II** **15 hrs**

Definition and measuring of stem cell- origin and functions of stem cells- Asymmetric division of stem cells – Types of stem cells-HSCS-MSCS-NSCS-ESCS-Adult stem cells vs embryonic stem cells-Migration- Therapeutic cloning- Ethical issues- Stem cell therapy.

**UNIT III** **15 hrs**

Chemodifferentiation- Nucleus of cleavage cells- Distribution of cytoplasmic substances in the egg during cleavage – Role of egg cortex – Role of maternal genes during early development.

**UNIT IV** **15 hrs**

Gene activity during gastrulation- Involvement of paternal genes in the control of development – Hybrid andromerogones- Exogastrulation- Arrested gastrulation- Amniotic and Allantoic fluids- Nucleocytoplasmic interactions- Control of differentiation by the intra organismic environment- Control of the reactive ability of tissues by the genotype.

**UNIT V** **15 hrs**

Determination of primary organ rudiments- Speemann's primary organiser- Analysis of the nature of induction- Gradients in the determination of the organ rudiments in vertebrates – Human cloning and its ethical applications- Ageing and developmental potential.

**TEXT BOOK:**

1. Balinsky B.I., An introduction to Embryology. (1981) Saunders,Philadelphia.

**REFERENCE BOOKS:**

1. M.J. Berrill–Developmental Biology. (1986) Tata Mc Graw Hill ,publications Ltd.
2. Raven : An outline of developmental physiology. Porgaman press.
3. Robert S.RughThe frog Reproduction. (1951) Tata Mc Graw Hill publications Ltd.
4. P.K.Gupa, Biotechnology and genomics.

**II M.Sc., ZOOLOGY**

**III – SEMESTER**

**TITLE OF THE PAPER : ENVIRONMENTAL BIOLOGY AND EVOLUTION**

**Core – Paper IX** **Course Code –**

**Teaching Hours: 75 hrs** **Credits : 4**

**Objective:** To study the interaction between living organism and the environment. The environmental biotechnology is an advanced branch of biology having application in environmental science.

**UNIT I** **15 hrs**

Habitat Ecology-Fresh water habitat- Lotic and lentic adaptations- Marine habitat- Zonation of sea –Plankton, Importance of planktons in productivity, as indicator organisms. Nekton and Benthos.

Estuarine adaptations and its role in productivity. Major Biomes with special reference to rain forest and high altitudes. Deserts and Mangrooves.

**UNIT II** **15 hrs**

Resources Ecology and Management –Renewable and Non-renewable Natural Resources. Aquatic and Animal resources, Wild life Conservation and Management. National Parks and Sanctuaries in India.

**UNIT III** **15 hrs**

Biodiversity-Types of Environmental Pollution and their Biological Effects –Air and Water, Industrial and Noise - Control measures. Laws Related to Environment. Space ecology and Radiation ecology and its effects on Biosphere.

**UNIT IV** **15 hrs**

Darwinism – Darwinian postulates – Natural selection – Define : Present status of the concept of natural selection: Types – Normalizing , Balancing and Directional Natural Selection. Group selection –Kin selection.

Evolutionary trend: Orthoselection . Genetic drift and Gene flow – Founder principle – Micro, Macro and Mega Evolution. Mimicry and Colouration .

**UNIT V** **15 hrs**

Molecular evolution- Amino acid substitution – Evolution of mammalian Antidiuretic hormone – Cytochrome –C – Haemoglobin regulating genes.

Phylogenetic analysis- chromosome phylogenies – Electrophoretic phylogenies-

**TEXT BOOKS:**


1. Anantha krishnan, T.N., Bioresources Ecology. (1982) Oxford- IBH Publishing Co, New Delhi.
2. Theodosis Dobzhansky , Francisco J .Ayala, G.Ledyard Stebbins, James W.Valentine, Evolution (1977) W.H.Freeman and Co.


**REFERENCE BOOKS:**

**ENVIRONMENTAL BIOLOGY**


1. Began M.J.L.Harper and C.R.Town Send (1990), Ecology, individuals, populations and communities. Blackwell Scientific Publication, London.
2. Clarke, G. L., Elements of Ecology (1954), John Wiley, New York.
3. Odum .E.P. Fundamentals of Ecology (1971) 3rd Edition, W.B.Saunder Co, Philadelphia.
4. Elton,C. Animal Ecology, (1971), Metheun company.
5. Rastogi, V.B. and Jayaraj, M. S., Animal ecology and distribution of animals, (1990) Kedra nath Ramnath, Merrut.
6. Chapman, R. N. 1931 Animal Ecology, Mc Graw Hill. New York.


**EVOLUTION**


1. Moody. P.A., Introduction to Evolution, (1978) Harper International .
2. Peter Volpe.E., Understanding and patterns in Evolution (1998), Oxford University Press.
3. Charlottee.J. Avers, Process and Pattern in Evolution (1989) Oxford University Press.

## II M.Sc., ZOOLOGY

## III – SEMESTER

## ELECTIVE III: ENTOMOLOGY

**Teaching hours 80** **Credits: 4**

**UNIT I:** **13 hrs**

Biology of an insect with special reference to the following: Nutrition, Development, Reproduction and Endocrinology. Insects and their interrelationships with environments (interspecific and intraspecific).

**UNIT II:** **13 hrs**

Insects as pollinators, predators, parasitoids, scavengers, weedkillers, etc.,

Biology of Honeybees, Lac insects and their management.

Prospects of Sericulture, Biology of Silkworm (Nutrition, Genetics, Endocrinology, Reproduction, Pest and Diseases).

**UNIT III:** **18 hrs**

Insects as crop pests: Types of injuries and loss caused to plants in general factors governing the outbreak of pests. Pests of rice, sugarcane, coconut, vegetables, stored products.

**UNIT IV:** **18 hrs**

Methods of pest control- Natural control-Applied or Artificial control- Prophylatic methods-Curative or Direct method- Cultural methods- Mechanical method, Physical method- Biological methods-Chemical methods- Attractants, Repellents, Antifeedants.

**UNIT V:** **18 hrs**

Pesticide – Classification of Insecticides- Inorganic compounds- Organic compounds, Synthetic organic compounds. Plant protection appliances- Dusters and Sprayers, Aircraft and Other equipments. Integrated Pest Management.

**REFERENCES:**


1. The Science of Entomology. William S. Romoser and John G. Stoffolano. Wm. C. Brown Publishers, England. 1994.
2. The Silkwonn. An important laboratory tool. By Yataro Tazima, Kodarsha, Scientific Book Ltd., Japan. 1978.
3. Sericulture Manual: FAD, Agril, Service Bulletin, Rome.
4. Applied Entomology: P. G. Fenemore, Allaprkash, Wiley Eastern Ltd., Delhi. 1992.
5. Park, J. E and K. Park. Textbook of social and preventive medicine. Publ. Mis. Banarasides Bharol. Jabalpur.
6. Nayar, K. K, Ananthakrishnan, T. Nand B. V. David. General and Applied Entomology. Tata McGraw Hill Publ., New Delhi. 1989.
7. Entomology and Pest Management. Larry, P. Pedigo Prentice Hall, New Jersey. 1989.

**II M.Sc., ZOOLOGY**
**IV - SEMESTER**

**TITLE OF THE PAPER: ANIMAL PHYSIOLOGY**

**Core – Paper - X** **Course Code**

**Teaching Hours: 60 hrs** **Credits : 4**

**Objective:** To enlighten the functional aspects of organ system in the body of animal and man towards internal equilibrium homeostasis.

**UNIT I** **15 hrs**

Enzyme action-Factors influencing enzyme action and its reversibility. Digestive enzymes - Mechanics of adsorption-Gastrointestinal hormones.

Exchange of gases-Transport of oxygen- Properties and Functions of Haemoglobin, Oxygen equilibrium curves. Carbon-di-oxide transport and Acid-base regulation-regulation of respiration. Life at high altitudes. Man as a deep sea diver.

**UNIT II** **10 hrs**

Haemodynamics in open and closed circulatory system: Electrical activity of heart muscle. Neurosecretion- Mechanisms of Hormonal Action. Physiology of Endocrine System. Sex hormones.

**UNIT III** **10 hrs**

Patterns of excretion in relation to environment. Renal regulation of acid-base balance. Osmo - ionic regulation in invertebrates and vertebrates. Physiology of hypertonic urine formation.

**UNIT IV** **15 hrs**

Muscle physiology-contractile proteins - Theories of muscle contraction. Isotonic and isometric contractions. Tetanus – Myoneural junction - Transducer mechanism in vertebrate chemoreceptors- Chemical sense and animal orientation. Theories of hearing - Echo-orientation-Photoreceptor pigments - Human eye retina-Phototropic, Scotopic and Arythmic eyes.

**UNIT V** **10 hrs**

Animal behaviour-Instincts-Learning –Physiological basis of learning-Circardian and Circannual rhythm-Photoperiodism. Role of pheromones – Communication.

**TEXT BOOK:**

1. Hoar, W.S. General and Comparative Physiology.

**REFERENCE BOOKS:**

1. David Saunders: An Introduction to Biological Rhythms.
2. K.Nagabushanam,M.S.Kodarkar and R.Sarojini: An Introduction to Animal Physiology
3. Prosser C.L.Comparative animal physiology.
4. Schmidt-Nielson: Animal physiology.

**II M.Sc., ZOOLOGY**
**IV - SEMESTER**

**TITLE OF THE PAPER: BIOCHEMISTRY**

**Core – Paper - XI** **Course Code -**

**Teaching Hours: 60 hrs** **Credits : 4**

**Objective:** To train the students to apply the principles for a better understanding of biological phenomena and to impart knowledge.

**UNIT I** **12 hrs**

Nature of living matter- Biomolecules, pH, Buffers. Enzymes –Mechanism of enzyme action, coenzymes, classification and functions. Isoenzymes, Apoenzymes, Holoenzymes –Enzyme kinetics.

**UNIT II** **13 hrs**

Clinical Biochemistry - Test for Liver function, Serum bilirubin, Classification of Jaundice, Bile acids and Bile salts, Tests based on the metabolic capacity of liver, Tests based on synthetic function of liver. Gastric function – Mechanism of HCl secretion.

**UNIT III** **13 hrs**

Proteins-Classification based on structure and solubility- Protein metabolism- Amino acid metabolism- Oxidative Deamination, Transamination, Decarboxylation, Demethylation Reaction, Structure of Haemoglobin, Haemoglobinopathies.

**UNIT IV** **10 hrs**

Lipids- Classification –Structure and Properties, Steroids-Cholesterol and Sex hormones. Lipid metabolism-Metabolism of fatty acids and glycerol, Coronary Artery Disease.

**UNIT V** **12 hrs**

Bioenergetics- Electron Transport Chain, Laws of Thermodynamics. Metabolism of Xenobiotics –Detoxification – Definition – Mechanism – Phase I Oxidation, Reduction, Hydrolysis –Phase II Conjugation Reaction - Glucuronic acid, Glutathione , Sulphate, Acetate and Methyl group.

**TEXT BOOK:**

1. Ambika Shanmugam: Fundamentals of Biochemistry for Medical Students.

**REFERENCE BOOKS:**

1. J.L.Jain:Fundamentals of biochemistry(1983).
2. Lehninger,A.L.(1970):Biochemistry, worth publishing co.,N.Y.
3. Lubert stryer: Biochemistry- (1975) Freeman and co.
4. D.W.Martin,P.A.Mayer and V.W.Redwell:Harper's Review of biochemistry 19th edition(1983).Maruyen Asian Edition.

**II M.Sc., ZOOLOGY**
**IV - SEMESTER**

**TITLE OF THE PAPER: BIOTECHNOLOGY**

**Core – Paper - XII** **Course Code -**

**Teaching Hours: 60 hrs** **Credits: 4**

**Objective :** To impart knowledge in understanding the principles of biotechnology and its applications.

**UNIT I** **15 hrs**

Introduction , origin and definition , scope and importance. Cloning strategies: Isolation of genomic DNA , Plasmid and Bacteriophage DNA . Introduction of r DNA into host cell. Identification of recombinants – Selection.

**UNIT II** **10 hrs**

Tools of Genetic Engineering : Enzymes in Gene cloning. E.coli vectors – Plasmid biology – PBR322 and its derivatives- Gene markers, Cloning Vectors and Phage Lambda, m13 Filamentous Phages – Cosmid – Phagemid. Expression vectors.

**UNIT III** **10 hrs**

Gene expression in prokaryotes and eukaryotes : cloning in yeast *Saccharomyces cerevisiae* genetics .Types of vectors - gene expression system . Eukaryotic vectors – SV 40 molecular genetics – markers system. Specialized cloning vectors for copy number – cloning promoters and terminators.

**UNIT IV** **15 hrs**

Gene cloning in health- care products: Insulin, Human growth hormone – Interferons, Tissue plasminogen activator, Recombinant vaccines – Types of recombinant vaccines - subunit vaccines, attenuated recombinant vaccines, vector recombinant vaccines, DNA vaccines.

**UNIT V**

Mining and metal biotechnology: Microbial enhancement of oil recovery –Biopolymers-surfactant and non-surfactant polymers. Biodegradation –Removal of metals from water. Xenobiotics and biomining

**10 hrs**

**TEXT BOOK:**

1. T.A. Brown – Gene cloning an Introduction (1995) , Third edition Stanley Thornes Publishers.

**REFERENCE BOOKS:**

1. Benjamin Lewin Gene VII (2000) Oxford university press.
2. Desmond S.T.Nicholl- An introduction to Genetic Engineering (1996) – Cambridge University press.
3. Purohit- Biotechnology.
4. Schlegel- Genetic Engineering .
5. R.W.Old and S.B.Primrose Principles of Gene Manipulation .(1994).V Edition . Blackwell Science.

**II.M.Sc., ZOOLOGY**
**IV - SEMESTER**

**TITLE OF THE PAPER: PRACTICALS III: ANIMAL PHYSIOLOGY, ENVIRONMENTAL BIOLOGY AND BIOCHEMISTRY**

**Core – Practical - III** **Course Code -**

**Teaching Hours: 60 hrs** **Credits : 4**

## ANIMAL PHYSIOLOGY

1. Estimation of RQ in fish with reference to temperature.
2. $O_2$ consumption in a terrestrial animal (cockroach).
3. Salt loss and salt gain in fish.
4. Estimation of carbohydrates in the tissues of meat.
5. Determination of aminoacids in the tissues (Liver/muscle) of fish / egg albumin (paper chromatography).
6. Principles and applications of the following instruments:- Kymograph, spectrophotometer, Sphygomanometer, Electrophoretic unit.

## ENVIRONMENTAL BIOLOGY

1. Identification of freshwater and marine planktons.
2. Study of rocky, sandy ,muddy shore fauna , Marine an Fresh water fauna and their adaptations.
3. Determination of hydrobiological features of different samples –(freshwater, brackishwater, seawater and polluted water)-pH, salinity, free- carbon dioxide dissolved oxygen and calcium.
4. Analysis of macro and micro organisms in soil, soil litter of The Ethiraj college campus.
5. Animal associations- parasitism , mutualism and commensalism
6. Study of termitarium(demonstration).
7. Earthworm population estimation.
8. Analysis of industrial effluent for TDS,TSS,BOD and COD.(demonstration)
9. Study of fauna in their natural habitats by visiting places of zoological interest.

## BIOCHEMISTRY

1. Blood : Clotting time, bleeding time,.
2. Estimation of haemoglobin.
3. Erythrocyte Sedimentation Rate (ESR) - Chick.

**II.M.Sc., ZOOLOGY**
**IV - SEMESTER**

**TITLE OF THE PAPER : PRACTICAL IV: DEVELOPMENTAL BIOLOGY, BIOINFORMATICS, COMPUTER APPLICATIONS, AND ENTOMOLOGY**

**Core – Practical - IV** **Course Code -**

**Teaching Hours: 60 hrs** **Credits: 4**

## DEVELOPMENTAL BIOLOGY

1. Oogenesis and spermatogenesis – Histological studies in a mammal.
2. Demonstration. Induced ovulation and fertilization in frog or fish.
3. Egg density in frog / fish.
4. Mounting of chick embryo.

## BIOINFORMATICS

1. Displaying any one web- page from Human Genome Project (Demonstration).

## COMPUTER APPLICATIONS

1. Ms Word, Ms Excel
2. Preparing a Power point presentation.
3. Graphic presentation : Bar diagram and Histogram.

## ENTOMOLOGY

1. **Taxonomy:** Identification of insects of orders Odonata, Orthoptera, Blattodea, Mantodea, Isoptera, Hemiptera, Thysanoptera, Neuroptera, Coleoptera, Diptera, Lepidoptera and Hymenoptera.
2. **Control**: Insecticide formulations and mixtures, common natural enemies of crop pests (parasitoids, predators, microbes)
3. **Storage entomology**: Collection, identification and familiarization with the stored grains/seed insect pests and nature of damage caused by them
4. **Plant protection appliances**: Dusters and sprayers.

**I M.Sc., ZOOLOGY**
**I - SEMESTER**

**TITLE OF THE PAPER: MATERNITY AND CHILD CARE**

**Elective: EDP**

**Teaching Hours: 80 hrs** **Credits: 5**

**ELECTIVE: Offered to other Department Students**

**Objective:** To create the awareness of reproductive physiology and its role in maternity and child care.

**Unit I** **18 hrs**

Structure and functions of Reproductive organs in male and female – Structure of a mammalian sperm – longevity – Morphology and cyclic changes of ovary – uterus – vagina and mammary glands during menstrual cycle – hormonal changes – puberty – menarche – menopause.

**Unit II** **14 hrs**

Formation of gametes – spermatogenesis– spermiogenesis – oogenesis – structure of human ovum – Ovulation – Role of hormones.

**Unit III** **16 hrs**

Fertilization – types – mechanism – chemotaxis – capacitation – Acrosomal reaction – activation of ovum – cortical reaction – amphimixis – monospermy, polyspermy – implantation – development of foetus – Birth of identical and non- identical twins-siamese twins.

**Unit IV** **16 hrs**

Pregnancy – maternal body changes –Test for pregnancy – parturition – Role of hormones – Birth control – necessity for birth control – contraceptive devices – Infertility – causes – Male and female infertility – Artificial insemination – test tube babies – amniocentesis

**Unit V** **16 hrs**

Prenatal – postnatal care – Rh factor – erythroblastosis foetalis – Immunoprophylaxis – immunization schedule - typhoid, cholera, diphtheria, tetanus, polio, plague, pertusis, Tuberculosis, MMR vaccine.

**TEXT BOOK :**

1. Inderbir Singh and Pal, G.P. 2005. Human Embryology, 7th Ed.

**REFERENCE BOOKS:**

1. Verma P.S., V.K.Agarwal and Tyagi 1995, Chordate Embryology, S .Chand & Co New Delhi 110 055, 420 pp.
2. Arumugam N. A Text book of Chordate Embryology – Saras Pub. - 420pp.
3. Gerard, J. Tortora and Sandra Reynolds Grabowski. Principles of Anatomy and Physiology, 10th Ed,.Mac Millan. John Wiley and Sons, IMC 2003.
4. K.V. Sastry and Dr. Vineeta Shukal Developmental Biology, Ist Ed. 2004 Rastogi publications.

**List of Courses on Soft-Skills for PG Course**

| S. No. | Course Title | Semester | Hrs per week | Credits |
|---|---|---|---|---|
| 1 | Language and Communication | I | 1 | 2 |
| 2 | Spoken and Presentation Skills | IV | 1 | 2 |
| 3 | Managerial Skills | III | 1 | 2 |
| 4 | Computing Skills | II | 1 | 2 |
| 5 | Quantitative Aptitude | | 1 | 2 |
| 6 | Group Discussion | | 1 | 2 |
| 7 | Content Writing | | 1 | 2 |
| 8 | Contemporary Awareness | | 1 | 2 |

## UOM S 002 LANGUAGE AND COMMUNICATION

**Objectives**

- *enable* students to convert the conceptual understanding of communication in to everyday practice.
- *train* students to ground concepts/ideas in their own experience.
- *create* a learner-language interface enabling students to exercise control over language use.
- *sensitise* students to the nuances of the four basic communication skills – Listening, Speaking, Reading and Writing.

**UNIT I:** Twinning Functions of Listening and Speaking.

**UNIT II:** Twinning Functions of Reading and Writing.

**UNIT III:** Individual Communication.

**UNIT IV:** Intermediary Communication.

**UNIT V:** Social Communication.

**Recommended Texts**


- Windshuttle, Keith and Elizabeth Elliot. 1999. *Writing, Researching and Communicating: Communication Skills for the Information Age*. 3rd Reprint. Tata McGraw-Hill. Australia.
- Dignen, Flinders and Sweeney. *English 365.* Cambridge University Press.
- Goleman, Daniel. 1998. *Working with Emotional intelligence.* Bantam Books. New York.
- Jones, Leo and Richard Alexander. 2003. *New International Business English.* Cambridge University Press.


**Websites**

www.tatamcgrawhill.com/sites/0070600988

http://www.skillsyouneed.com/ips/listening-skills.html

http://skillsyouneed.com/ips/social-skills.html

http://wikihow.com/Improve-social-skills

## UOM S 004 SPOKEN AND PRESENTATION SKILLS

**Objectives**

- *coach* students to identify, classify and apply relevant skill sets.
- *illustrate* role of skills in real-life situations with case studies, Role play, etc.
- *translate* performance of skills into efficient habits.
- *enable* students to perceive cultural codes involved in presentation and design language performance accordingly.

**UNIT I:** General Language Knowledge and Presentation.

**UNIT II:** Special Language Knowledge and Presentation.

**UNIT III:** General Communication Skills for Presentation.

**UNIT IV:** Professional Communication Skills for Presentation.

**UNIT V:** Social Communication Skills for Presentation.

**Prescribed Books:**

1. Raymond V Lesikar, John D petit, mary E Flatly. 2009. Lesikar's Basic
2. Business communication .11th ed. Tata Mcgraw-Hill, New Delhi.

**Recommended Texts**

- Cathcart, Robert. S. and Larry A. Samovar. 1970. *Small Group Communication: A Reader*. 5th Edition. Wm. C. Brown Publishers. Iowa.
- Goleman, Daniel. 1998 working with emotional intelligence. Banton Books. Newyork

- Tamblyn, Doni and Sharyn Weiss. 2000. *The Big Book of Humours Training Games.* 2004 Edition. Tata McGraw-Hill. New Delhi.
- Andrews, Sudhor. 1988. *How to succeed at Interviews.* 21st Reprint. Tata McGraw-Hill. New Delhi.
- Monippally, Matthukutty. M. 2001. *Business Communication Strategies.* 11th Reprint. Tata McGraw-Hill. New Delhi.

WEBSITES:

1. http://www.skillsyouneed.com/presentation-skills.html
2. http://www.presentationskills.ca/

## UOM S 006 MANAGERIAL SKILLS

**Objectives**

- To help students to understand the mechanism of stress particularly negative emotions such as anxiety, anger and depression for effective management.
- To introduce the basic concepts of body language for conflict management.
- To give inputs on some of the important interpersonal skills such as group decision-making, negotiation and leadership skills.
- To make students learn and practice the steps involved in time management.
- To impart training for empowerment thereby encouraging the students to become successful entrepreneurs.

**Unit I- Stress management**

- Definitions and Manifestations of stress.
- Stress coping ability and Stress inoculation training.
- Management of various forms of fear (examination fear, stage fear or public speaking anxiety), Depression and Anger.

**Unit II- Conflict Management skills**

- Types of conflict (intrapersonal, Intra group and inter group conflicts).
- Basic concepts, cues, signals, symbols and secrets of body language.
- Significance of body language in communication and assertiveness training.
- Conflict stimulation and conflict resolution techniques for effective management.

**Unit III- Interpersonal Skills**

- Group decision making (strengths and weaknesses).
- Developing characteristics of charismatic and transformational leadership.
- Emotional intelligence and leadership effectiveness- self awareness, self management, self motivation, empathy and social skills.
- Negotiation skills- preparation and planning, definition of ground rules, clarification and justification, bargaining and problem solving, closure and implementation.

**Unit IV- Time Management**

- Time wasters- Procrastination.
- Time management personality profile.
- Time management tips and strategies.
- Advantages of time management.

**Unit V- Towards Empowerment**

- Stimulating innovation and change- coping with "temporariness".
- Network culture.
- Power tactics and power in groups (coalitions).
- Managerial empowerment and entrepreneurship.
- Prevention of moral dwarfism especially terrorism.
- Altruism (prosocial behaviour/helping behaviour).
- Spirituality (clarifications with regard to spirituality)- strong sense of purpose- trust and respect- humanistic practices- toleration of fellow human beings expressions.

**PRACTICAL TRAINING**

Relaxation exercises- Western (Autogenic Relaxation) and Indian techniques (Shavasana).

Role-play.

Transactional Analysis.

**REFERENCES**


1. Swaminathan. V.D & Kaliappan. K.V. (2001). Psychology for Effective Living. Chennai. The Madras Psychology Society.
2. Robbins, S.B. (2005). Organizational Behaviour. New Delhi: Prentice Hall of India.
3. Smith, B. (2004). Body Language. Delhi: Rohan Book Company.
4. Hurlock, E.B. (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.

## UOM S 008 COMPUTING SKILLS

**Objective:** The major objective in introducing the Computer Skills course is to impart training for students in Microsoft Office which has different components like MS Word, MS Excel, MS Access, Power point etc., at two levels based on their knowledge and exposure. It provides essential skills for the user to get adapted to any work environment, as most of the systems in any6 work place have MS Office installed for their day to day activities. The course is highly practice oriented rather than regular class room teaching.

**Pre-requisite:** Pass in Level B or an equivalent course.

**Unit I:** *Word Processing* **–** Formatting – Paragraph and character styles, templates and wizards, table and contents and indexes, cross referencing; Tables and Columns – creating manipulating and formatting; Mail Merge, Labels and Envelopes.

**Unit II:** *Spreadsheets* – Workbook, Building, Modifying, navigating; worksheet- Autofiull, copying and moving cells, inserting and deleting rows, printing; Formulas and functions- Troubleshooting formulas, Functions and its forms like database, financial, logical, reference , mathematical and statistical – Databases – Creating, sorting, filtering and linking.

**Unit III:** *Presentations* – Power point – exploring, creating and editing slides, inserting tables and charts- special effects- Clip Art, creating and drawing shapes, inserting multimedia content – presentations – planning, animation, handouts, slideshow..

**Unit IV:** *Databases* – Access – Components, creating a database and project, import and exporting, customizing; Tables- creating and setting fields; Queries –Types, creating, wizard- Reports- creating and layout.

**Unit V:** *Information Management* – Outlook – Starting, closing, contacts, tool bars, file management; email-reading, composing, responding, attachments, signature, junk mail; tasks- screen, sorting, creating, deleting, assigning, updating; scheduling- calendar.

**Note**: All units need an approach through practical exposure.

**References**:


1. Working in Microsoft Office; Ron Mansfield, Tata McGraw Hill
2. Microsoft Excel 2007; Guy Hart Davis, Tata McGraw Hill.


***Examination*:**

1. Internal assessment could be based on Theory and/or practicals.
2. End semester is based on practicals.

**SOFT SKILL**

**GROUP DISCUSSION**

**CREDITS: 2** **NO.OF HOURS PER WEEK: 1**

**MARKS: 100**

**COURSE OBJECTIVES**:

To impart the skills of solving problems quickly, efficiently and to give practice of facing Aptitude Test conducted by IT industry confidently.

1. FDI in higher education: a boon or bane?
2. Is wiki leaks release of US diplomatic cables good for democracy and transparency?
3. Does India need a super regulatory body for higher education?
4. Role of government in monitoring the economy in relation to recession
5. Will a caste census help in bringing better development of depressed classes?
6. Is a little corruption acceptable in developing countries?
7. Your opinion on women reservation bill
8. Weather developing countries should control the emission of carbon?

**SOFT SKILL**

**CONTENT WRITING**

**CREDITS: 2** **NO.OF HOURS PER WEEK: 1**

**MARKS: 100**

**COURSE OBJECTIVES**:

Content writing enables the students to write documents in the software project and preparing the report of work done. Content writing gives a brief summary of unique ideas used to solve the given problem.

UNIT I: Introduction, Problem analysis

UNIT II: Design, Filter module

UNIT III: Stemming module, Parser module

UNIT IV: Testing documentation

UNIT V: Conclusion

**PRESCRIBED BOOKS:**

1. Thomas Jund, Andrew Mustun, Laurent Cohn, “Quaneko, Find the stuff on your local Harddisc”.

**SOFT SKILL**

**CONTEMPORARY AWARENESS**

**CREDITS: 2** **NO.OF HOURS PER WEEK: 1**

**MARKS: 100**

**COURSE OBJECTIVES**:

To enhance the knowledge of the students on current environmental issues and to keep them updated on the day to day happenings.

**Unit I**: Recent developments in science and technology including development in space, telecommunication and computers.

**Unit II**: Environmental issues, human resources and related issues etc., role of national institutions.

**Unit III**: International affairs and Institutions/Organizations related to it.

**Unit IV**: Indian politics and Economy

**Unit V**: Geographical facts about India and the world

**REFERENCE BOOKS**:

1. The Pearson objective- general knowledge, Pearson publication
2. Current affairs, Jagran josh, josh publications, 2014.

WEBSITES:

1. http:///top7bisiness.com/?Top-7-Tips-to-Improve-Your-Telecommunication-Skills&id=207
2. http://www.epw.in/

**SOFT SKILL**

**MANAGERIAL SKILLS**

**CREDITS: 2** **NO.OF HOURS PER WEEK: 1**

**MARKS: 100**

**COURSE OBJECTIVES**:

To provide the students with the basic knowledge in business management skills

UNIT I: Negotiation skills

UNIT II: Interpersonal and Persuading skills

UNIT III: Kinesics

UNIT IV: Business Etiquettes

UNIT V: Personal grooming and Interview skills

**PRESCRIBED BOOKS:**

1. Goleman, Daniel. 1998 Working with emotional intelligence. Bantam books, Newyork
2. Business communication.1 1th ed.Tata McGraw-Hill, New Delhi

**REFERNCE BOOKS:**

1. Jones. Leo and Richard Alexander.2003.New international business English.cambridge University press.

**WEBSITES:**

1. http://www.presentationskills.ca/
2. http://www.skillsyouneed.com/ips/social-skills.html
3. https://www.youtube.com/watch?v=VtvNanYXUBI

## SOFT SKILL-QUANTITATIVE APTITUDE

**CREDITS: 2** **NO.OF HOURS PER WEEK: 1**

**MARKS: 100**

**OBJECTIVE:**

Students are trained in aptitude which includes numerical problems.

At the end of the session they should be able to clear aptitude test.

**Unit I:** Numbers, HCF, LCM, Decimal fractions, simplification,square roots,cube roots,averages.

**Unit II**: problems in numbers and ages, surds, indices, percentages, profit and loss, ratio and propotion,partnership,chain rule.

**Unit III:** Time and work, pipes and distances. Time and distance, problems on trains.

**Unit IV:** Boats and streams, allegation, simple interest, compound interest, logarithms,area,volume and surface area.

**Unit V:** Races and games of skill,calendar,clocks,stocks and shares,permutation and combination, probability,true discount, banker's discount,height and distances,old manout and series, tabulation, bargraphs, pie charts, line graphs.

**PRESCRIBED BOOKS:**

1. R.S. Agarwal, "Quantitative aptitude for competitive examinations", seventh revised edition, S.Chand and Co. Ltd., New Delhi, 2005.

**REFERENCE BOOKS:**

1. Barron's guide for GMAT, Galgotia Publications, New Delhi, 2006.