



PSGR KRISHNAMMAL COLLEGE FOR WOMEN

College of Excellence

(An Autonomous Institution, Affiliated to Bharathiar University)
(Reaccredited with 'A' Grade by NAAC, An ISO 9001:2008 Certified
Institution)
Peelamedu, Coimbatore-641004



DEPARTMENT OF ZOOLOGY

CHOICE BASED CREDIT SYSTEM & OUTCOME BASED EDUCATION SYLLABUS

BACHELOR OF ZOOLOGY (B. Sc Zoology)

2017 - 2020

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PROGRAMME OUTCOMES

After completion of the programme, the student will be able to

- PO1:** Impart quality life science education to women students and to develop young women as outstanding scholars/ teachers/ career women/ entrepreneurs and responsible citizens.
- PO2:** Appreciate the complexities of biological organisation and address scientifically controversial issues in a rational way.
- PO3:** Assess the scope of animal biology and select particular areas for further study.
- PO4:** Inculcate transformational impact on the quality of education and to inspire the students to adopt scientific temper and live with scientific values.
- PO5:** Make the students aware of applications of Zoology and to highlight the potential of various branches to become an entrepreneur.

PROGRAMME SPECIFIC OUTCOME

The students at the time of graduation will

- PSO1:** Gain the knowledge of Zoology through theory and practicals.
- PSO2:** Analyse the relationships among animals with their ecosystems.
- PSO3:** Learn to classify the major groups of organisms under different phyla, understanding the functioning of organisms, compare and contrast anatomical and physiological characteristics of animals.
- PSO4:** Understand good laboratory practices as per laboratory standards, handling the sophisticated instruments/equipment to develop technical skills, research oriented skills about research methodologies, effective communication and skills of problem solving methods.
- PSO5:** Understand the applications of zoological knowledge in Agriculture, Medical and daily life and apply the knowledge for employment- Indian Forest Service, Sericulture, Fisheries, Veterinary, Clinical Laboratory, Museum Curator, departments and Entrepreneurship. They can go for Indian Forest Service and other competitive examinations.

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DEPARTMENT OF ZOOLOGY

CHOICE BASED CREDIT SYSTEM & OUTCOME BASED EDUCATION SYLLABUS & SCHEME OF EXAMINATION

2017 - 2020

| Sem | Part | Subject code | Title of the Paper | Instruction Hours/Week | Contact Hours | Tutorial | Duration of Examination | Examination Marks | | | Credits |
|-----|-------|--|---|------------------------|------------------|-----------|-------------------------|-------------------|-------------|---------------------|---------|
| | | | | | | | | CA | ESE | Total | |
| I | I | TAM1701/ HIN1701/ FRE1701 | Language T/H/F Paper I | 6 | 86 | 4 | 3 | 40 | 60 | 100 | 3 |
| | II | ENG1701/ ENG17F1 | English Paper-I/ Functional English Paper -I | 6 | 86 | 4 | 3 | 40 | 60 | 100 | 3 |
| | III A | AS17C01 | Invertebrata Paper I | 6 | 86 | 4 | 3 | 40 | 60 | 100 | 5 |
| | III A | AS16CP1 | Zoology Practical I | 3 | 45 | | - | - | - | - | - |
| | III A | CE17A01 | Allied Chemistry Paper I | 4 | 56 | 4 | 3 | 20 | 55 | 75 | 4 |
| | III A | CE17AP1 | Allied Chemistry Practical | 3 | 45 | | - | - | - | - | - |
| | IV | NME16B1/ NME16A1/ NME12W/ NME12AS/ NME12GS | Basic Tamil / Advanced Tamil / Women Studies/ Ambedhkar Studies/ Gandhian Studies | 2/2 / 2 | 28/2 6/ 26 | 2/4/ 4 | -/2/- | 50/ 50/ 100 | 50/ 50/- | 100/ 100/ 100 | 2 |
| II | II | TAM1702/ HIN1702/ FRE1702 | Language T/H/F Paper – II | 6 | 86 | 4 | 3 | 40 | 60 | 100 | 3 |

| | | | | | | | | | | | | | |
|-----|-------|---------------------------------|---|---------------------|----|---|---|----|----|-----|---|--|-------|
| | II | ENG1702/ ENG17F2 | English Paper-II / Functional English Paper -II | 6 | 86 | 4 | 3 | 40 | 60 | 100 | 3 | | |
| | III A | AS17C02 | Chordata Paper II | 5 | 71 | 4 | 3 | 40 | 60 | 100 | 5 | | |
| | III A | AS16CP1 | Zoology Practical I | 3 | 45 | | 3 | 40 | 60 | 100 | 4 | | |
| | III A | CE17A02 | Allied Chemistry Paper II | 5 | 71 | 4 | 3 | 20 | 55 | 75 | 4 | | |
| | III A | CE17AP1 | Allied Chemistry Practical I | 3 | 45 | | 3 | 20 | 30 | 50 | 2 | | |
| | IV | | Open Course - Self Study Online Courses | - | - | - | - | - | - | - | - | | |
| | IV | NME16B2/ A2 | Basic Tamil/Advanced Tamil** | - | - | - | - | - | - | - | - | | |
| | VI | | Personality Development Programme | - | - | | | | | - | - | | |
| | III B | NM12GAW | Foundation Course –1 (General Awareness) | Self-study (Online) | | | | | | | | | Grade |
| | V | REG16EE | Effective English Communication | 2 | 27 | 3 | | 50 | 50 | 100 | 2 | | |
| III | I | TAM1603/ HIN1703/ FRE1703 | Language T/H/F Paper III | 6 | 86 | 4 | 3 | 40 | 60 | 100 | 3 | | |
| | II | ENG1603/ ENG16F3 | English Paper III / Functional English Paper III | 5 | 71 | 4 | 3 | 40 | 60 | 100 | 3 | | |
| | III A | AS16C03 | Ecology and Embryology Paper III | 4 | 56 | 4 | 3 | 40 | 60 | 100 | 4 | | |
| | III A | AS16CP2 | Zoology Practical II | 3 | 45 | | - | - | - | - | - | | |
| | III A | AS16A01 PL17A01 | Invertebrata and Chordata Allied Botany Paper I | 5 | 71 | 4 | 3 | 20 | 55 | 75 | 4 | | |
| | III A | AS16AP1 PL17AP1 | Allied Zoology Practical Allied Botany Practical I | 2 | 30 | | - | - | - | - | - | | |
| | IV | SB17SC01 | Skill Based Subject- Sericulture I | 3 | 29 | 1 | 2 | - | - | - | - | | |
| | IV | SB17SCP1 | Skill Based Subject Practical-Sericulture Practical-I | | 15 | - | - | - | - | - | - | | |
| | III B | NM10EVS | Foundation Course-II (Environmental Studies) | Self study | - | - | - | - | - | - | - | | |

| | | | | | | | | | | | |
|----|-------|---------------------------------|--|---|------------------------------|---|---|----|-----------------|-----|---|
| | III B | NM14VHR | Foundation Course-III (Value Education and Human Rights) | 2 | 26 | 4 | - | - | - | 100 | 2 |
| | VI | JOB0409 | Job Oriented Course | | After 12.30 PM 60 h | | | | GR AD E** | | |
| IV | I | TAM1604/ HIN1604/ FRE1704 | Language T/H/F Paper – IV | 5 | 71 | 4 | 3 | 40 | 60 | 100 | 3 |
| | II | ENG1604/ ENG16F4 | English Paper IV/ Functional English Paper IV | 6 | 86 | 4 | 3 | 40 | 60 | 100 | 3 |
| | IIIA | AS16C04 | Cell Biology and Biochemistry Paper IV | 4 | 56 | 4 | 3 | 40 | 60 | 100 | 4 |
| | IIIA | AS17CP2 | Zoology Practical II | 3 | 45 | | 3 | 40 | 60 | 100 | 4 |
| | IIIA | AS16A02 PL17A02 | General Principles in Zoology Allied Botany Paper- II | 5 | 71 | 4 | 3 | 20 | 55 | 75 | 4 |
| | IIIA | AS16AP1 PL17AP1 | Allied Zoology Practical Allied Botany Practical | 2 | 30 | | 3 | 20 | 30 | 50 | 2 |
| | IV | SB17SC01 | Skill Based - Sericulture I | 3 | 29 | 1 | 2 | 25 | 75 | 100 | 4 |
| | IV | SB17SCP1 | Skill Based Subject Practical-Sericulture Practical-I | | 15 | - | | 40 | 60 | 100 | 2 |
| | III B | NM10EVS | Foundation Course-IV (Environmental Studies) | 2 | 26 | 4 | 2 | - | - | 100 | 2 |
| | | | NSS/NCC/YRC/SPO RTS & GAMES | - | | | - | - | 100 | 100 | 1 |
| V | IIIA | AS16C05 | Paper – V Genetics and Evolution | 4 | 56 | 4 | 3 | 40 | 60 | 100 | 5 |
| | IIIA | AS16C06 | Paper - VI Biophysics, Biostatistics & Bioinformatics | 4 | 56 | 4 | 3 | 40 | 60 | 100 | 4 |
| | IIIA | AS16C07 | Paper - VII Biotechnology | 4 | 56 | 4 | 3 | 40 | 60 | 100 | 4 |
| | III A | AS16E01 | AOS – I Pathology and Medical Laboratory | 4 | 56 | 4 | 3 | 40 | 60 | 100 | 4 |

| | | | | | | | | | | | |
|----|-------|----------|--|------------------|----|----------------|-------------------|----|-----|-------|-------|
| | | | technology | | | | | | | | |
| | IIIA | AS17E02 | AOS – II Optional Wild Life Biology | | | | | | | | |
| | III A | AS16AC1 | ALC I - Optional Microbiology | Self Study | - | - | 3 | 25 | 75 | 100* | 5* |
| | III A | AS16AC2 | ALC II - Optional Public Health and Hygiene | Self Study | - | - | 3 | 25 | 75 | 100* | 5* |
| | IIIA | AS16CP3 | Zoology Practical III | 6 | 90 | | - | - | - | - | - |
| | III A | AS05PROJ | Group Project | 3 | 75 | | Viva - voce | 50 | 50 | 100 | 5 |
| | VI | NM13IS1 | Information Security | 2 | 26 | 4 | - | - | - | Grade | - |
| | IV | SB17SC02 | Skill Based - Sericulture II | | 29 | 1 | 2 | - | - | - | - |
| | IV | SB17SCP2 | Skill Based Subject Practical-Sericulture Practical-II | 3 | 15 | - | - | - | - | - | - |
| | III A | | Comprehensive Examination | - | - | - | 1 | - | - | - | Grade |
| | VI | | Supportive Course | After 3 pm | | | | | | | |
| | VI | | Personality Development | - | - | - | - | - | - | - | Grade |
| | VI | | Field Training | - | - | 2 we eks | | | 100 | 100 | 2 |
| VI | III A | AS16C08 | Paper- VIII Physiology and Endocrinology | 6 | 86 | 4 | 3 | 40 | 60 | 100 | 5 |
| | III A | AS16C09 | Paper - IX Immunology | 5 | 71 | 4 | 3 | 40 | 60 | 100 | 5 |
| | III A | AS16C10 | Paper - X Human Genetics and counselling | 5 | 71 | 4 | 3 | 40 | 60 | 100 | 5 |
| | III A | AS16E03 | AOS – III Applied Fishery Biology | 5 | 71 | 4 | 3 | 40 | 60 | 100 | 5 |
| | IIIA | AS17E04 | AOS – IV Optional Dairy Science | | | | | | | | |

| | | | | | | | | | | | |
|--|-------|----------|--|------------|----|----|---|----|------|------|-----|
| | | | | | | | | | | | |
| | III A | AS16AC3 | ALC III - Optional Industrial Biotechnology | Self Study | | | 3 | | 100 | 100* | *5 |
| | III A | AS16AC4 | ALC IV - Optional Applied Zoology | | | | | | | | |
| | III A | AS16CP3 | Zoology Practical III | 6 | 90 | | 3 | 40 | 60 | 100 | 5 |
| | IV | SB17SC02 | Skill Based - Sericulture II | 3 | - | - | 3 | 25 | 75** | 100 | 4 |
| | IV | SB17SCP2 | Skill Based Subject Practical-Sericulture Practical-II | | - | 30 | - | 3 | 40 | 60 | 100 |
| | | | | | | | | | | 3800 | 140 |

*Not considered for Grand Total and CGPA

**outside regular class hours

QUESTION PAPER PATTERN**CORE & ALLIED PAPERS****Continuous Internal Assessment: 50 Marks**

| SECTION | MARKS | TOTAL |
|--------------------|-------|-------|
| A – 5 × 2 Marks | 10 | 50 |
| B – 4 × 5 Marks | 20 | |
| C - 2/3 × 10 Marks | 20 | |

End Semester Examination: 100 Marks

| SECTION | WORD LIMIT | MARKS | TOTAL |
|--------------------|----------------------|-------|-------|
| A-12/15 × 2 Marks | One or two sentences | 24 | 100 |
| B - 6/8 × 6 Marks | 250 | 36 | |
| C - 4/6 × 10 Marks | 500 | 40 | |

SKILL BASED SUBJECT**Continuous Internal Assessment: 25 Marks**

| SECTION | MARKS | TOTAL |
|---------------------|-------|-------|
| A – 4 / 6 × 4 Marks | 16 | 25 |
| B – 1 / 2 × 9 Marks | 9 | |

End Semester Examination: 50 Marks

| SECTION | MARKS | TOTAL |
|----------------------|-------|-------|
| A- 4 / 6 × 5 Marks | 20 | 50 |
| B – 2 / 3 × 15 Marks | 30 | |

ADVANCED LEARNERS COURSE (ALC)

Continuous Internal Assessment: 25 Marks

| SECTION | MARKS | TOTAL |
|---------------------|--------------|--------------|
| A – 4 / 6 × 4 Marks | 16 | 25 |
| B – 1 / 2 × 9 Marks | 9 | |

End Semester Examination: 75 Marks

| SECTION | MARKS | TOTAL |
|-----------------------|--------------|--------------|
| A- 5/8 × 5=25 Marks | 25 | 75 |
| B – 5/8 × 10=50 Marks | 50 | |

**VALUE EDUCATION AND HUMAN RIGHTS / WOMEN STUDIES / AMBEDKAR
STUDIES / GANDHIAN STUDIES / ENTREPRENEURSHIP / ENVIRONMENTAL
STUDIES**

Continuous Internal Assessment: 50 Marks

| SECTION | MARKS | TOTAL |
|----------------------|-------|-------|
| A – 4 / 6 × 5 Marks | 20 | 50 |
| B – 2 / 3 × 15 Marks | 30 | |

Value Education and Human Rights & Environmental Studies two internal tests will be conducted for 50 marks each and the total marks secured will be equated to a maximum of 75 marks and 25 marks is allotted for project / group discussion / presentation of a report.

INFORMATION SECURITY

Continuous Internal Assessment: 40 Marks

| SECTION | MARKS | TOTAL |
|---------------------|-------|-------|
| A – 5 / 8 × 2 Marks | 10 | 40 |
| B – 6 / 8 × 5 Marks | 30 | |

FIELD TRAINING: 100 Marks

The students have the option to select any organization – Government / private like industry, R & D organizations, scientific companies, etc., in consultation with the staff co-ordinator & HoD. The students are to undergo training for a period of two weeks at the end of semester IV during vacation. The students must maintain a work diary and prepare report of the training undergone and submit the same to the HoD. On a stipulated date, there will be a viva-voce with internal examiners at the beginning of the semester V

| MODE OF EVALUATION | MARKS | TOTAL |
|--------------------|-------|-------|
| Attendance | 10 | 100 |
| Work Diary | 15 | |
| Report | 50 | |
| Viva-voce | 25 | |

PROJECT

Group Project and Viva Voce

Each faculty will be allotted 5 students. A specific problem will be assigned to the students. The topic/area of work will be finalized at the end of IV semester, allowing scope for the students to gather relevant literature during the vacation. The research work will be carried out based on the objective of the project and viva voce/presentation will be conducted by a panel comprising of HOD, internal examiners. A power point presentation by the student group will be evaluated on the basis of students' response to the questions.

Area of Work

Limnology, Pollution studies, Clinical studies, Molecular Biology, Fish Toxicology, Microbiology, Entomology, Environmental Science.

Methodology

Each project should contain the following details:

- Brief introduction on the topic
- Review of Literature
- Materials and Methods
- Results and Discussions – evidences in the form of figures, tables and photographs
- Conclusion / Summary
- Bibliography

The above contents should not exceed 50 pages

Internal Assessment: 20 Marks

| Review | Mode of Evaluation | Marks | Total |
|---------------|--|--------------|--------------|
| I | Selection of the field of study, Topic & Literature Collection | 5 | 20 |
| II | Research Design and Data Collection | 10 | |
| III | Analysis & Conclusion, Preparation of rough draft | 5 | |

External Assessment: 80 Marks

| Mode of Evaluation | Marks | Total |
|--|--------------|--------------|
| Project Report | | |
| Relevance of the topic to academic / society | 10 | 60 |
| Objectives | 10 | |
| Experimental Design | 20 | |
| Expression of Results and Discussion | 20 | |
| Viva Voce | | |
| Presentation | 10 | 20 |
| Discussion | 10 | |

**WEIGHTAGE ASSIGNED TO VARIOUS COMPONENTS OF
CONTINUOUS INTERNAL ASSESSMENT**

Theory

| | CIA I | CIA II | Model Exam | Assignment/ Class Notes | Seminar | Quiz | Class Participation | Library Usage | Attendance | Max. Marks |
|-------------------------|----------|-----------|---------------|----------------------------|---------|------|------------------------|------------------|------------|---------------|
| Core / Allied | 5 | 5 | 6 | 4 | 5 | 4 | 5 | 3 | 3 | 40 |
| SBS | 5 | 5 | 15 | - | - | - | - | - | - | 25 |
| ALC | | 10 | 15 | - | - | - | - | - | - | 25 |
| Information Security | 40 | 40 | | 10 | | 10 | | | | 100 |

Practical

| | Model Exam | Lab Performance | Regularity in Record Submission | Attendance | Maximum Marks |
|------------------------|-------------------|----------------------------|--|-------------------|--------------------------|
| Core / Allied / SBS | 12 | 20 | 5 | 3 | 40 |

RUBRICS

Assignment/ Seminar

Maximum - 20 Marks (converted to 4 marks)

| Criteria | 4 Marks | 3 Marks | 2 Marks | 1 Mark |
|------------------------------------|---|--|---|--------------------------|
| Focus Purpose | Clear | Shows awareness | Shows little awareness | No awareness |
| Main idea | Clearly presents a main idea. | Main idea supported throughout | Vague sense | No main idea |
| Organisation: Overall | Well planned | Good overall organization | There is a sense of organization | No sense of organization |
| Content | Exceptionally well presented | Well presented | Content is sound | Not good |
| Style: Details and Examples | Large amounts of specific examples and detailed description | Some use of examples and detailed descriptions | Little use of specific examples and details | No use of examples |

CLASS PARTICIPATION

Maximum - 20 Marks (converted to 5 marks)

| Criteria | 5 Marks | 4 Marks | 3 Marks | 2 Marks | 1 Mark |
|-------------------------------------|---|--|--|---|--|
| Level of Engagement in Class | Student proactively contributes to class by offering ideas and asks questions more than once per class. | Student proactively contributes to class by offering ideas and asks questions once per class | Student contributes to class and asks questions occasionally | Student rarely contributes to class by offering ideas and asking no questions | Student never contributes to class by offering ideas |
| Listening Skills | Student listens when others talk, both in groups and in class. Student incorporates or builds off of the ideas of others. | Student listens when others talk, both in groups and in class. | Student listens when others talk in groups and in class occasionally | Student does not listen when others talk, both in groups and in class. | Student does not listen when others talk, both in groups and in class. Student often interrupts when others speak. |
| Behavior | Student almost never displays disruptive behavior during class | Student rarely displays disruptive behavior during class | Student occasionally displays disruptive behavior during class | Student often displays disruptive behavior during class | Student almost always displays disruptive behavior during class |
| Preparation | Student is almost always prepared for class with required class materials | Student is usually prepared for class with required class materials | Student is occasionally prepared for class with required class materials | Student is rarely prepared for class with required class materials | Student is almost never prepared for class. |

MAPPING OF POs WITH COs

| COURSE | PROGRAMME OUTCOMES | | | | |
|-------------------------|--------------------|-----|-----|-----|-----|
| | PO1 | PO2 | PO3 | PO4 | PO5 |
| COURSE - AS17C01 | | | | | |
| CO1 | S | S | M | M | M |
| CO2 | L | S | M | M | S |
| CO3 | L | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | M | S |
| COURSE - AS17C02 | | | | | |
| CO1 | L | S | M | M | M |
| CO2 | L | S | M | M | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |
| COURSE - AS16CP1 | | | | | |
| CO1 | S | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| COURSE - AS16C03 | | | | | |
| CO1 | S | S | S | M | M |
| CO2 | S | S | S | M | M |
| CO3 | S | S | S | S | S |
| CO4 | L | S | S | S | S |
| CO5 | S | S | S | S | S |

| COURSE - AS16A01 | | | | | |
|-------------------------|---|---|---|---|---|
| CO1 | L | L | L | M | M |
| CO2 | S | S | M | M | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | M | S |
| COURSE - AS16C04 | | | | | |
| CO1 | S | S | S | M | M |
| CO2 | S | S | S | M | M |
| CO3 | S | S | S | S | S |
| CO4 | L | S | S | S | S |
| CO5 | S | S | S | S | S |
| COURSE - AS16A02 | | | | | |
| CO1 | L | L | L | M | M |
| CO2 | S | S | M | M | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | M | S |
| COURSE - AS16CP2 | | | | | |
| CO1 | S | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |
| COURSE - AS16AP1 | | | | | |
| CO1 | S | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | M | M |

| | | | | | |
|--------------------------|---|---|---|---|---|
| CO4 | S | S | S | M | M |
| CO5 | S | S | S | S | M |
| COURSE - SB17SC01 | | | | | |
| CO1 | S | S | S | M | M |
| CO2 | S | S | S | M | M |
| CO3 | S | S | S | S | S |
| CO4 | L | S | S | S | S |
| CO5 | S | S | S | S | S |
| COURSE - SB17SCP1 | | | | | |
| CO1 | S | S | S | M | M |
| CO2 | S | S | S | M | M |
| CO3 | S | S | S | S | S |
| CO4 | L | S | S | S | S |
| CO5 | S | S | S | S | S |
| COURSE - AS16CO5 | | | | | |
| CO1 | L | S | M | M | M |
| CO2 | S | S | M | M | S |
| CO3 | L | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | M | S |
| COURSE - AS16C06 | | | | | |
| CO1 | S | S | M | M | L |
| CO2 | S | S | M | M | M |
| CO3 | S | S | S | S | M |
| CO4 | S | S | S | S | M |
| CO5 | S | S | S | S | M |
| COURSE- AS16C07 | | | | | |
| CO1 | L | L | S | S | S |
| CO2 | M | S | S | S | S |

| | | | | | |
|-------------------------|---|---|---|---|---|
| CO3 | M | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |
| COURSE - AS16E01 | | | | | |
| CO1 | S | S | S | M | M |
| CO2 | S | S | S | M | M |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |
| COURSE - AS17E02 | | | | | |
| CO1 | L | S | M | M | M |
| CO2 | S | S | M | M | S |
| CO3 | L | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | M | S |
| COURSE - AS16C08 | | | | | |
| CO1 | S | S | M | M | L |
| CO2 | S | S | M | M | M |
| CO3 | S | S | S | S | M |
| CO4 | S | S | S | S | M |
| CO5 | S | S | S | M | M |
| COURSE - AS16C09 | | | | | |
| CO1 | S | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | M | M |
| COURSE - AS16C10 | | | | | |

| | | | | | |
|-------------------------|---|---|---|---|---|
| CO1 | S | S | L | S | S |
| CO2 | L | S | S | M | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | M |
| CO5 | S | S | S | S | M |
| COURSE - AS16E03 | | | | | |
| CO1 | S | S | L | M | M |
| CO2 | S | S | S | M | M |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |
| COURSE- AS17E04 | | | | | |
| CO1 | S | L | L | S | M |
| CO2 | S | S | S | S | M |
| CO3 | S | S | S | S | M |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |
| COURSE - AS16CP3 | | | | | |
| CO1 | L | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | M | M |
| CO4 | S | S | S | M | M |
| CO5 | S | S | S | S | M |
| COURSE- SB17SC02 | | | | | |
| CO1 | L | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | M | M |
| CO4 | S | S | S | M | M |

| | | | | | |
|--------------------------|---|---|---|---|---|
| CO5 | S | S | S | S | M |
| COURSE - SB17SCP2 | | | | | |
| CO1 | L | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | M | M |
| CO4 | S | S | S | M | S |
| CO5 | S | S | S | S | S |

H- High; M-Medium; L-Low

| Course Number | Course Name | Category | L | T | P | Credit |
|---------------|--------------|----------|----|---|---|--------|
| AS17CO1 | INVERTEBRATA | Core | 86 | 4 | - | 5 |

Preamble

To understand the basic classification, structure and functional details of invertebrates and to appreciate the diversity of life on earth with respect to invertebrates.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|--|---|
| CO1. | Describe the distinguishing characteristics of the major taxa Explain the basic aspects of classification details of invertebrates Understand biodiversity, habitat, adaptation organization and taxonomic status of invertebrates | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2. | Recall certain morphological attributes and physiological processes that are distinct and significant to each Phyla | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3. | Understand the systemic and functional morphology of various groups of invertebrates. Explain the basic aspects of structural and functional details of Invertebrates | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4. | To compare and understand the general and specific characteristics within each Phyla | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5. | Interpret the affinities, evolutionary relationships and adaptation of the major taxa and to explain their economic importance with respect to Non-Chordates | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|------|-----|-----|-----|-----|-----|
| CO1. | S | S | M | M | L |
| CO2. | S | S | M | M | M |
| CO3. | S | S | S | S | M |
| CO4. | S | S | S | S | M |
| CO5. | S | S | S | M | M |

S- Strong; M-Medium; L-Low

Syllabus**UNIT I****(18 Hrs)****Phylum Protozoa**

Type Study: *Paramecium caudatum* –External features, Nutrition, Locomotion- effective stroke, recovery stroke, Metachronal rhythm, Reproduction-Asexual- Binary fission, Sexual reproduction – Conjugation, Autogamy, Endomixis, Hemimixis and Cytogamy.

General Essays: Locomotion in Protozoa, Protozoan human diseases

Phylum Porifera

Type Study: *Leucosolenia botryoides*- External features, Body wall, Spicules, Canal System, Nutrition, Reproduction.

General Essays: Canal System in sponges, Economic importance of sponges

UNIT II**(17 Hrs)****Phylum Coelenterata**

Type Study: *Obelia geniculata* - External features, Histology of the colony, Cnidoblast and its functions, Life History of Obelia, Metagenesis.

General Essays: Corals & coral reefs, Polymorphism in Coelenterates

Phylum Helminthes

Type Study: *Taenia solium*- External features, Body wall, Feeding, Respiratory system, Excretory system-flame cells, Nervous system, Reproductive system, Life cycle- Onchosphere and Cysticercus larvae.

General Essays: Brief account on a) *Wuchereria bancrofti* b) *Dracunculus medinensis*, c) *Ancylostoma duodenale*

Parasitic adaptation in Helminthes.

UNIT III**(17 Hrs)****Phylum Annelida**

Type Study: *Megascolex mauritii* - External features, Body wall, Coelom, Locomotion, Digestive system, Respiratory system, Excretory system-Meganephridia, Micronephridia, Pharyngeal nephridia, Nervous system, Reproductive system.

General Essays: Metamerism in annelids, A Brief Account on vermiculture.

UNIT IV**(17 Hrs)****Phylum Arthropoda**

Type study: *Periplaneta americana* - External features, Body wall, Mouthparts, Digestive system, Respiratory system, Circulatory system, Nervous system, Sense organs, Excretory system, Reproductive system.

General Essays: Peripatus- Affinities as a living fossil, A Brief Account on Apiculture.

UNIT V**(17 Hrs)****Phylum Mollusca**

Type Study: *Pila globosa* - External features, Shell, Digestive system, Respiratory system, Circulatory system, Nervous system, Sense organs- Eyes, Osphradium, Statocyst, Tentacles, Excretory system, Reproductive system.

General Essays: Torsion in Mollusca, A Brief Account on Pearl Culture.

Phylum Echinodermata

Type Study: *Asterias rubens* - External features, Pedicellaria-Structure and Function, Digestive system, Respiratory system, Water vascular system-Structure and Function, Circulatory system- Perihaemal and Haemal system, Nervous system, Sense organs, Excretory system, Reproductive system.

General Essays: Larval forms of Echinoderms and their evolutionary significance, Economic importance in Echinoderms.

TEXT BOOK

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|---|------------------------------|--------------------|---------------------|
| 1 | Jordan E.L and Verma P.S | Invertebrate Zoology | S.Chand and Co | 2014 |
| 2 | Nair N. C., Soundara Pandian N., Leelavathy S., Murugan., T | A Text book of Invertebrates | Saras Publications | 2013 |

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|--|--|-------------------------------|---------------------------------------|
| 1 | Jan A. Pechenik | Biology of the Invertebrates | Hill McGraw-Hill Companies | 2014, 7 th Revised Edition |
| 2 | Dhami P.S. and Dhami J.K | Invertebrate Zoology | S. Chand & Co | 2012, 5 th edition |
| 3 | Ekambaranatha Ayyar,M. & Ananthakrishnan,T.N | Manual of Zoology Vol-I (Invertebrata) Part I & II | Vishwanathan (p) Ltd. Chennai | 2010 |
| 4 | Fatik Baran Mandal | Invertebrate Zoology | Eastern Economy Edition | 2012, 1 st edition |
| 5 | Kotpal R.L., Agarwal S.K and Ketarpal R.P.R | Modern Text book of Zoology Invertebrates | Rastogi Publications | 2011 |
| 6 | Rober D. Barnes | Invertebrate Zoology | Brooks W.B. Saunders Company | 1994, 6 th edition |
| 7 | Barrington EJW | Invertebrate Structure and Function | ELBS and Nelson | 1979, 2 nd edition |

Pedagogy

- Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, seminar.

Course Designers:

1. Dr. P.B.Harathi
2. Dr. M. Sheeba

| COURSE NUMBER | COURSE NAME | CATEGORY | L | T | P | CREDIT |
|----------------------|--------------------|-----------------|----------|----------|----------|---------------|
| AS17CO2 | CHORDATA | CORE | 71 | 4 | - | 5 |

Preamble

To understand basic classification, structural and functional details of chordates and to interpret the evolutionary relationships among the major taxa

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|------------------|--|---|
| CO1 | Identify the general and specific characteristics of the different classes and the organization of the representative types. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2 | Recognize and describe the major groups of chordates | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3 | Understand the diversity of Chordates and its outline systematic. Discuss their affinities and adaptations to different modes of life. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4 | Understand the unique features, taxonomy and functional morphology of different classes of chordates | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5 | To infer the affinities, evolutionary relationships and adaptation of the major taxa and to explain their economic importance with respect to Chordates. | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|------------|------------|------------|------------|------------|------------|
| CO1 | L | S | M | M | M |
| CO2 | L | S | M | M | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |

S- Strong; M-Medium; L-Low

CHORDATA- AS17CO2

(71 Hrs)

Syllabus

UNIT I

(15 Hrs)

Phylum Chordata

Introduction, Three fundamental Chordate characters, Advancements of Chordates over other phyla. Brief classification of chordate with characters.

PROTOCHORDATA- General Characters

Type study: Amphioxus- Affinities and Systematic Position, Habits and Habitat, External features, Body wall, Coelom, Atrium, Digestive System, Respiratory mechanism, Circulatory system, excretory system and Reproductive system.

General Essays: Dipnoi- lung fishes-affinities and systematic Position

PISCES- General Characters

Type study: Shark - Systematic Position, Habits and Habitat, External features, Exoskeleton-Placoid Scales, Digestive System, Respiratory system & Mechanism of respiration, Circulatory system -Blood, Heart and pericardium, Arterial system, Venous system, Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves. Sense organs-Olfactory organs, Eyes, Internal ears, Neuromast or lateral line system, Ampullae of Lorenzini. Urinogenital system.

General Essays: Accessory respiratory organs in fishes, General account of a) *Oreochromis mossambicus* b) *Labeo rohita* c) *Catla catla*

UNIT II

(14 Hrs)

AMPHIBIA-General Characters

Type study: Frog- Systematic Position, Habits and Habitat, External features, Endoskeleton-Axial skeleton- Skull, Ribs, Sternum Appendicular skeleton -Girdles and Limbs, Sexual dimorphism, Digestive System, Respiratory system- Cutaneous respiration, Buccal respiration and Pulmonary respiration. Respiratory mechanism-inspiration and expiration. Circulatory system-Blood, Heart-Internal structure, Arterial system, Venous system. Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves. Sense organs- Tangoreceptors, Tastebuds, Olfactory organs, Internal structure and functions of Eye and Ear, Urinogenital system

General Essays: Parental care in Amphibia, Neoteny in Amphibia

UNIT III

(14 Hrs)

REPTILIA - General Characters

Type study: *Calotes* - Systematic Position, Habits and Habitat, External features, Digestive System, Respiratory system- Respiratory mechanism, Circulatory system-Blood, Heart-Internal structure, Arterial system, Venous system. Nervous system- Brain, Spinal cord, cranial nerves and spinal nerves. Sense organs, Jacobson's organs, Internal structure and functions of Eye and Ear, Urinogenital system

General Essays: Poison apparatus, Biting mechanism, First aid treatment for snake bite, Common poisonous and non – poisonous snakes in India.

UNIT IV

(14 Hrs)

AVES- General Characters

Type study: Pigeon -Systematic Position, Habits and Habitat, External features, Feathers- Structure of a typical feather in Pigeon, Types of feathers in pigeon. Muscular System- Flight muscles, Digestive System, Respiratory system- Syrinx and voice production, Air sacs and functions. Respiratory mechanism, Circulatory system -Blood, Heart-Internal structure, Arterial system, Venous system. Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves, Structure and function of Eye and Ear, Urinogenital system.

General Essays: Flightless birds, Migration in birds.

UNIT V

(14 Hrs)

MAMMALIA - General Characters

Type study: Rabbit- Systematic Position, Habits and Habitat, External features, Digestive System, Respiratory system, Circulatory system-Blood, Heart-Internal structure, Arterial system, Venous system. Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves. Structure and function of Eye and Ear, Excretory system, Reproductive system.

General Essays: An account on Prototheria, Metatheria and Eutheria, Aquatic adaptations in mammals.

TEXT BOOK:

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|---------------|---|--------------------------|--------------------|----------------------------|
| 1 | Jordan.E.L and Verma.P.S | Chordate Zoology | S. Chand & Co | 2014 |
| 2 | Thangamani A, Prasanna Kumar S., Narayanan L.M., Arumugam N | A Text book of Chordates | Saras Publications | 2013 |

REFERENCE BOOKS

| S.No. | Author | Title of the Book | Publisher | Year of Publication |
|--------------|--|---|---------------------------|----------------------------|
| 1 | Ekambaranatha Ayyar.M & Ananthkrishnan.T.N | A Manual of Zoology Vol.II- Part I & II | S.Vishwanathan Pvt.Ltd | 2010 |
| 2 | Kotpal R.L | Modern Text book of Zoology – Vertebrates | Global Media Publications | 2012 |
| 3 | Waterman B and Allyn J | Chordate Structure and Function | Mac Milan & Co | 1971 |

Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, power point presentation.

Course Designers:

1. Dr. G. Sasikala
2. Dr. P.B. Harathi

| COURSE NUMBER | COURSE NAME | Category | L | T | P | Credit |
|----------------------|-------------------------|-----------------|----------|----------|----------|---------------|
| AS16CP1 | CORE PRACTICAL I | Practical | - | - | 90 | 4 |

Preamble

- To enable the students to expose practically
- To learn the taxonomy of invertebrates and Chordates.
- To understand the relationships between invertebrates, Chordates and their environment.
- To learn the location and appearance of internal organs in a typical insect.
- To understand the structure and functional organization of animals.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|------------------|--|------------------------|
| CO1 | Understand the basic concepts of zoological classification, the diversity and relationships between major groups of invertebrates and Chordates. Dissection helps to distinguish among different types of tissues within an insect's body. | K2 |
| CO2 | Analyse invertebrates and Chordates in laboratory and field conditions, and use taxonomic keys for identification. | K4 |
| CO3 | Application of the skills necessary for self-employment in adopting Field observations of sericulture and Apiary farm. | K3 |
| CO4 | To compare and contrasts the life processes in different phyla. | K5 |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|------------|------------|------------|------------|------------|------------|------------|
| CO1 | S | S | S | S | S | S |
| CO2 | S | S | S | S | S | S |
| CO3 | S | S | S | S | S | S |
| CO4 | S | S | S | S | S | S |

S- Strong; M-Medium; L-Low

CORE PRACTICAL - I AS16CPI

(90 Hrs)

Syllabus

Dissections

1. Cockroach Digestive system, Nervous system, Male & Female Reproductive systems
2. Fish (*Tilapia*)- Viscera, Digestive system, Reproductive system
3. Digital Dissection (15 Hrs)

Mounting:

1. Mounting of scales of a marketable fish.
2. Mounting of gill arch.
3. Mounting of earthworm setae
4. Mounting of mouth parts of cockroach (2 Hrs)

Spotters:

Classify giving reasons: -Paramecium, Leucosolenia, Obelia colony, Prawn, Octopus, Star fish, Ascidian, Shark, Salamander, Pigeon, Bat (8 Hrs)

Draw labelled sketches: -T.S. of Tape worm, Leech, Amphioxus, Frog – Skull, Vertebrae - typical, VIII, IX, X, Pectoral girdle, Pelvic girdle, Fore limb and Hind limb (8 Hrs)

Relate structure and function: - Gemmule, Scolex of tapeworm, Nereis - parapodium, Heteronereis, Prawn - Appendages, Honey bee-Queen, Drone, Worker; Quill feather, Tortoise – Carapace and plastron, Narcine – Electric organ, Placoid scale, Snake poison apparatus. (8 Hrs)

Write descriptive notes: - Nauplius larva, Pila, Bipinnaria larva, Balanoglossus, Echineis - Sucker fish, Draco - Flying lizard, Rat snake, Cobra, Hyla (7 Hrs)

Give biological significance: - Tape worm entire, Chaetopterus, Peripatus, Limulus, Scorpion, Pearl oyster, Hippocampus male and female, Exocoetelus – Flying fish, Chameleon. (6Hrs)

Observations on the Metamorphosis of silkworm (1 Hr)

Field observations combined with photography and/or videography

- 1) Study of live water specimens in nearby water bodies (5 Hrs)
- 2) Study of insect fauna in the college campus (5 Hrs)
- 3) Visit to a sericulture farm (5 Hrs)
- 4) Visit to an Apiary (5 Hrs)
- 5) Visit to a Museum (5 Hrs)
- 6) Study of pond ecosystem (5 Hrs)

Culture Methods

- 1) Culture of unicellular organisms (Amoeba, Paramecium, and Euglena)
- 2) Culture of multicellular organisms (Earthworm) (5 Hrs)

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|--|---|--|---------------------|
| 1 | Sinha. J, Chatterjee. A. K, Chattopadhyay. P | Advanced Zoology Practical | Arunabha Sen Books and Allied (P) Ltd | 2011 |
| 2 | Lal S. S., A | Textbook of Practical Zoology Vertebrate | Rastogi Publication | 2004 |
| 3 | Lal S. S., A | Textbook of Practical Zoology Invertebrate | Rastogi Publication | 2004 |

Pedagogy

- Demonstration, practical, dissection, slides, spotters, field visit, culture methods, power point presentation, e-content, group discussion.

Course Designers:

1 Dr. P.B. Harathi

2 Dr. M. Sheeba

| COURSE NUMBER | COURSE NAME | CATEGORY | L | T | P | CREDIT |
|---------------|------------------------|----------|----|---|---|--------|
| AS16CO3 | ECOLOGY AND EMBRYOLOGY | CORE | 56 | 4 | - | 4 |

Preamble

To understand the basic concepts of ecology & Embryology and to understand the functional details of environments and embryo & its stages.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|--|---|
| CO1 | Explain the basic aspects of classification details of ecology Understand biodiversity, habitat, adaptation organization and flora & fauna of soil & water. effect of light and temperature on living things | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2 | Recall certain morphological attributes and physiological processes that are distinct and significant to each chapter | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3 | Understand the systemic and functional morphology of various concepts of ecology and embryology Explain the basic aspects of structural and functional details of environments and embryo & its stages. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4 | To compare and understand the general and specific characteristics within and other environments in relation to abiotic & biotic factors and stages and development of an embryo | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5 | Interpret the major environments and to explain their ecological importance with respect to abiotic & biotic, with animal relationships and different changes in stages of embryo in its development. | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | S | S | M | M | M |
| CO2 | S | S | M | M | M |
| CO3 | S | S | S | S | M |
| CO4 | S | S | S | S | M |
| CO5 | S | S | S | M | M |

S- Strong; M-Medium; L-Low

ECOLOGY AND EMBRYOLOGY - AS16CO3

(56 Hrs)

Syllabus

UNIT I

(12 Hrs)

Scope of Environmental Biology, Abiotic factors – Soil, Water, Light, Temperature. Biotic factors, Animal Relationships: Symbiosis, Mutualism, Commensalism, Antagonism, Parasitism, Predation, Competition, Population attributes: natality, mortality, population growth, population density, growth curves, Age pyramids, Biotic potential, Population regulation.

*Biogeochemical cycles–Carbon, Oxygen, Nitrogen, Phosphorus and Sulphur cycles.

UNIT II

(11 Hrs)

Community ecology – Definition, Types and Characteristics of community, Ecotone and Edge Effect, Ecological niche, Concepts of community, Ecological succession- sere and climax, Significance of succession. Habitat ecology – Marine Habitat-Definition, Stratification, Pelagic region – communities, plankton, Pelagic adaptations; Intertidal seashore – rocky, muddy, sandy – biota and adaptations.

*Mangroves –Definition, Mangrove fauna and flora, Ecological conditions of mangroves.

UNIT III

(11 Hrs)

Scope of Developmental Biology-definition, sub-divisions (Descriptive, Comparative, Experimental and Chemical). Early history of embryology. (Preformation and Epigenesis, Recapitulation theory or Biogenetic law, Germplasm theory (Weisman). Gametogenesis-Spermatogenesis –Spermiogenesis, Structure and types of sperms; Oogenesis- Growth of oocyte, vitellogenesis, organization of egg cytoplasm, Polarity and Symmetry, Maturation of egg, egg envelopes, Structure of Ovum; Fertilization-Definition, External and internal fertilization, Mechanism of fertilization. Cleavage- Patterns of cleavage-radial, spiral and bilateral; Types of cleavage - meroblastic and holoblastic. Blastulation -Types of Blastula; Fate map of frog, Gastrulation in frog. Morphogenetic movements- epiboly and emboly.

*Types of eggs.

UNIT IV**(11 Hrs)**

Organogenesis in frog – Development of eye, ear, brain & heart. Organizer concept: Embryonic Induction, Role of organizers in development- Transplantation experiments of Spemann and Mangold. Chemistry of organizers. Extra-embryonic membranes in chick. Placentation in mammals-Classification of placenta based on Nature of contact, Mode of implantation, Histological intimacy of foetal and maternal tissue. Functions of placenta.

* Metamorphosis in frog

UNIT V**(11 Hrs)**

Human Reproduction: Puberty, Menstrual cycle, Reproductive Hormones Menopause, Pregnancy, Parturition, Lactation, Infertility, Artificial insemination, Cryopreservation, Embryo transfer, Amniocentesis, Artificial Reproductive Technology-. ZIFT, GIFT and IVF. Birds eye view of stem cells

*Test-tube baby and its Merits & Demerits.

* Denotes self study

TEXT BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|------------------------------|---------------------------|--------------------|---------------------|
| 1 | Arumugam, N | A Text Book of Embryology | Saras Publication | 2003 |
| 2 | Verma P.S., Agarwal., V.K | Environmental Biology | S. Chand & Company | 2000 |

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|---------------|----------------------------|--------------------------------------|---------------------|
| 1 | Balinsky, B.I | Introduction to Embryology | Saunders College Publishing | 1981 |
| 2 | Berrill, N.J | Developmental Biology | Tata Mc Graw Hill Publication Co.Ltd | 1986 |

| | | | | |
|---|---|--------------------------------------|---|------|
| 3 | Clarke,G.L. | Elements of Ecology | John Wiley & Son Inc. New York & London | 1954 |
| 4 | Kotpal,R.L. and Bali,N.P. | Concepts of Ecology | Vishal Publication,Delhi | 1986 |
| 5 | Odum, E.P. | Basic Ecology | Saunders College Publishing , New York | 1983 |
| 6 | Scott F. Gilbert, | Developmental Biology | Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts | 1997 |
| 7 | Vijayaraghavan Nair K & P.V. George | A Manual of Developmental Biology | Academica | - |
| 8 | Vincent Terrence Robello, John P.C. and Prema A K | Developmental Biology | Zoological Society Study Material Series, Zoological Society of Kerala, Kottayam | 2012 |

Pedagogy

- Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, seminar

Course Designers

1. Dr. N. Ezhili
2. Dr. M. Sheeba

| Course Number | COURSE NAME | Category | L | T | P | Credit |
|---------------|-------------------------------|----------|----|---|---|--------|
| AS16C04 | CELL BIOLOGY AND BIOCHEMISTRY | Core | 56 | 4 | - | 4 |

Preamble

To enable the students to explore the intricacies of cell architecture and their complex biochemical interactions.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|---|---|
| CO1 | To impart knowledge about the prokaryotic and eukaryotic cell, its complex organization, biosynthesis of cellular membranes and organelles and the unified role it plays for the ultimate sustainability of the organisms | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2 | Rigorous foundation in the principles of molecular and cellular biology give insights into the mechanisms involved in the synthesis and function of macromolecules such as DNA, RNA, and proteins | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3 | Ability to make connections between the molecular mechanisms, holistic understanding of biological organisation and function from the molecules to cells, tissues, organs and entire organism | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4 | Studying biochemistry and molecular cell biology trains the students to think logically, critically and quantitatively | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5 | Learn to interpret statements made in the scientific literature, as well as in non-science areas, based on evidence, not anecdotes | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | S | S | S | M | M |
| CO2 | S | S | S | M | M |
| CO3 | S | S | S | S | S |
| CO4 | L | S | S | S | S |
| CO5 | S | S | S | S | S |

S- Strong; M- Medium; L-Low

CELL BIOLOGY AND BIOCHEMISTRY- AS16C04

(56 Hrs)

Syllabus

UNIT I

(12 Hrs)

Scope of Cell Biology; Cell theory, General Characteristics of Prokaryotes, Structure of a Typical Animal Cell and its Organelles, Plasma Membrane - Structure, Fluid Mosaic Model, Unit Membrane Model – Functions- Active Transport, Passive Transport - Cytoskeleton

*Microscopes – Principle and Uses of Optical, Phase Contrast and Electron Microscope

UNIT II

(11 Hrs)

Golgi Bodies – Ultra Structure and Functions, Endoplasmic Reticulum - Ultrastructure, Types and Functions, Lysosomes - Ultrastructure and Functions, Polymorphism in Lysosomes, Ribosomes – Structure and Functions Cell centre - Structure and Functions

*Cancer – Types and Properties of Cancer Cells; Theories on Carcinogenesis

UNIT III

(11 Hrs)

Mitochondria – Ultrastructure, mDNA and functions, Mitochondrial enzymes, Oxidative phosphorylation, Krebs's cycle, Fatty acid oxidation, ATP production. Ultrastructure of Interphase Nucleus and Nucleolus; Chromosome – structure, organization, types and functions.

*Giant chromosomes – polytene, lamp brush chromosomes.

UNIT IV

(11 Hrs)

DNA – Structure, Chemical Composition, Watson and Crick, Replication; RNA - Structure, Chemical Composition, Types – mRNA, tRNA, rRNA; DNA Repair Mechanism – Enzymatic Photo reactivation, Excision Repair, Recombination Repair; cell cycle.

*Cell Cycle and Cell Division

UNIT V

(11 Hrs)

Scope of Biochemistry–Classification–Aldoses, Ketoses, Monosaccharide, Disaccharides, Polysaccharides (homo, hetero). Proteins–Types of Amino acids, Primary, Secondary, Tertiary Structure of Proteins. Lipids – Simple lipids, Complex lipids, Phospholipids, Glycolipids, Lipoproteins. Enzymes– Michaelis–Menten Equation

*Enzyme action – Factors Affecting Enzyme Action, Mechanism of Enzyme Action

*Denotes self study.

TEXT BOOKS

| S. No. | Authors | Title of the Book | Publisher | Year of Publication |
|--------|---------------------------|---|---|---------------------|
| 1 | Ambika Shanmugam | Fundamentals of Biochemistry for Medical Students | Wolters Kluwer (India) Pvt Ltd, New Delhi | 2012 |
| 2 | Verma P.S., Agarwal., V.K | Cytology | S. Chand & Company | 2012 |
| 3 | Veer Bala Rastogi | Introduction to Cytology | Introduction to Cytology | 2003 |

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|--|--|---|-------------------------------|
| 1 | Albert L Lehninger | Biochemistry, Second Edition | Kalyani Publishers, New Delhi | 2 nd Edition |
| 2 | De Robertis, E.D.P. and De Robertis, E.M.F | Cell and Molecular Biology | Lippincott Williams and Wilkins, Philadelphia | 8 th Edition |
| 3 | Satyanarayana U and Chakrapani U | Essentials of Biochemistry | Book and Allied (P) Ltd. | 2009 |
| 4 | Karp, G | Cell and Molecular Biology: Concepts and Experiments | John Wiley & Sons. Inc. | 6 th Edition, 2010 |

Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

Course Designers

1. Dr. P.B. Harathi
2. Dr.M. Sheeba

| COURSE NUMBER | COURSE NAME | Category | L | T | P | Credit |
|----------------------|--------------------------|-----------------|----------|----------|----------|---------------|
| AS16CP2 | CORE PRACTICAL II | Practical | - | - | 90 | 4 |

Preamble

To provide practical knowledge on cell biology, environmental and developmental biology and to develop practical biological skills.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|------------------|--|------------------------|
| CO1 | Understand the basic concepts biology-based knowledge on the life of animal forms and the environment. To understand the concepts of natural habitats and the effects of ecological parameters. To understand the process by which organisms grow and develop. | K2 |
| CO2 | Analyse basic components of the ecosystem and their interactions and inter-relationships to sustain life on earth. Analyse the different ecological parameters and to analyse the mechanisms that intervene in developmental alterations. | K4 |
| CO3 | Application of the acquired skills and adopting it for future research. | K3 |
| CO4 | To compare the practical knowledge on cell biology, environmental and developmental biology and develop practical biological skills. | K4 |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|------------|------------|------------|------------|------------|------------|
| CO1 | S | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |

S- Strong; M-Medium; L-Low

CORE PRACTICAL II - AS16CP2

(90 Hrs)

Syllabus

CELL BIOLOGY

(12 Hrs)

1. Squash preparation of onion root tip.
2. Squash preparation of Grasshopper Testis/ Tradescantia anther.
3. Mounting of giant chromosomes in Drosophila larva.

BIOCHEMISTRY

(6 Hrs)

1. Qualitative analysis of carbohydrates, proteins and lipids.

ENVIRONMENTAL BIOLOGY

(42 Hrs)

1. Estimation of dissolved oxygen in water samples by Winkler's method.
2. Estimation of salinity, pH and temperature in water samples.
3. Estimation of free carbon dioxide in water samples.
4. Mounting and identification of Marine and Fresh water plankton.
5. Identification and study of inter tidal, rocky sandy and muddy shore fauna.
6. Estimation of total alkalinity of water and soil.
7. Estimation of total hardness of water.
8. Trip to a terrestrial ecosystem

DEVELOPMENTAL BIOLOGY

(30 Hrs)

Spotters

1. Observation of different types of eggs – Amphioxus, frog, hen's egg, ovum of mammal
2. Observation of different types of sperms- Sperm of frog, sperm of man.
3. Embryology of Frog – Cleavage, Blastula, Gastrula, Yolk plug.
4. Chick embryo whole mount – 24, 48, 72 & 96 hours.
5. Metamorphosis in frog.
6. Placenta of mammals - pig, sheep and man.

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|--|---|--|---------------------|
| 1 | Sinha. J, Chatterjee. A. K, Chattopadhyay. P | Advanced Zoology Practical | Arunabha Sen Books and Allied (P) Ltd | 2011 |
| 2 | Lal S. S., A | Textbook of Practical Zoology Vertebrate | Rastogi Publication | 2004 |
| 3 | Lal S. S., A | Textbook of Practical Zoology Invertebrate | Rastogi Publication | 2004 |

Pedagogy

- Demonstration, practical, dissection, slides, spotters, field visit, culture methods, power point presentation, e-content, group discussion.

Course Designers

1. Dr. G. Sasikala
2. Dr. M. Sheeba

| Course No | Course Name | Category | L | T | P | Credit |
|-----------|---------------|---------------------|----|---|---|--------|
| SB17SC01 | SERICULTURE I | Skill Based Subject | 43 | 2 | - | 4 |

Preamble

This course aims to understand the fundamental concepts of Sericulture and to impart scientific & entrepreneurial principles and techniques involved in silkworm production etc.

| CO Number | CO Statement | Knowledge Level |
|-----------|---|---------------------------------|
| CO1 | To recall the historical perspective of sericulture, concepts of its origin, scope and significance. To understand the economic advantages of sericulture and its role towards rural development and employment. | K ₁ , K ₂ |
| CO2 | To acquaint the general aspects of sericulture industry. To study the biodiversity of silkworms in India and worldwide and importance of sericulture byproducts. | K ₁ , K ₂ |
| CO3 | To understand the classification of biology of silkworm <i>Bombyx mori</i> . To study the morphology of silkworm and its anatomical features. | K ₁ , K ₂ |
| CO4 | To understand the biology and rearing of non-mulberry silkworms. To gain knowledge on silkworm rearing techniques | K ₁ , K ₂ |
| CO5 | To familiarize with the common diseases and pests of non-mulberry silkworms and their management. | K ₂ , K ₃ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | S | S | S | M | M |
| CO2 | S | S | S | M | M |
| CO3 | S | S | S | S | S |
| CO4 | L | S | S | S | S |
| CO5 | S | S | S | S | S |

S- Strong; M- Medium; L-Low

SERICULTURE I - SB17SC01

(43 Hrs)

Syllabus

UNIT I

(8 Hrs)

Introduction to sericulture – Origin and history of Sericulture – Silk Road, spread of Sericulture to Europe, South Korea, Japan, India and other countries. Sericulture map of India and World: Components of Sericulture. Employment generation in sericulture-Role of women in sericulture. Role of silk fibers amongst natural fibers

UNIT II

(8 Hrs)

Classification and Taxonomic characters: Phylum, class, order, family, genus and Species- Distribution and varieties of silkworms – Mulberry & non-mulberry – Tasar, Eri, Muga worms. Distribution and Races: Geographical distribution in the world and India and Exotic and indigenous races.

UNIT III

(9 Hrs)

Egg: External and internal morphology and colour change. Larvae: Mouth parts, legs, prolegs, spiracles, eyes, claspers and integumentary hair and sexual markings. Pupa: Male and Female Morphology and sexual dimorphism Adult: Mouth parts, antenna, wings, external genitalia. Digestive system: Alimentary canal and physiology of digestion. Silk glands: Structure, development and mechanism of silk synthesis. Circulatory system: Dorsal vessel, haemolymph and haemocytes.

UNIT IV

(9 Hrs)

Reproductive system: Male and female systems, mechanism of egg development. Life cycle of *Bombyx mori* – Reproductive system, Morphology of egg, larva, pupa and adult life span and bionomics, circadian rhythm, and behavior and growth rate of *Bombyx mori*. Exocrine glands: Structure, morphology and secretion of exocrine glands. Pheromone: sex attractants and their role in mating.

UNIT V**(9 Hrs)**

Diseases of silkworms – Viral, bacterial, fungal, and protozoan: pathogens –Flacherie, Grasserie, Muscardine, Pebrine. Causes of various diseases, precaution Measures, control of diseases – disinfection methods. Disinfection and maintenance of hygiene during silkworm rearing

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|---------------|-------------------------------------|--------------------------------|--|----------------------------|
| 1 | Ganga, G and Sulochana Chetty | An Introduction to Sericulture | Oxford and IBH Publishing Co., Pvt., Ltd., New Delhi | 1991 |
| 2 | Venkata Narasiah | Sericulture in India | Ashesh Publishing House, New Delhi | 2003 |
| 3 | Dr. N. G. Djha and Dr.Priyan Panday | Silk Production | APH publishing Corporation, New Delhi | 2004 |

Pedagogy

- Lecture by chalk and talk, power point presentation, demonstration, field visit, e-content, doing experiments, group discussion, assignment, peer learning, seminar.

Course Designer

1. Mrs. Susheela.P

| Course Number | Course Name | Category | L | T | P | Credit |
|---------------|---------------------------|-----------|---|---|----|--------|
| SB17SCP1 | SERICULTURE PRACTICAL - I | Practical | - | - | 45 | 2 |

Preamble

To enable the students to understand the life cycle and morphological features of different types of silkworms, types of silk, pests of silkworm, learn the anatomical features of *Bombyx mori* and its rearing and various diseases that affect the silkworms and their management.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|--|---------------------------------|
| CO1 | To learn the history and distribution of sericulture in India and world. | K ₁ |
| CO2 | To distinguish between the properties of different types of silk | K ₂ , K ₃ |
| CO3 | To understand the characteristic features of young age and late age silkworms | K ₂ , K ₃ |
| CO4 | To correlate the production of silk and other fibres in India and other countries of the world | K ₂ , K ₃ |
| CO5 | To give scientific knowledge about silkworm rearing techniques so as to enable entrepreneurship skill. | K ₂ , K ₃ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | S | S | S | M | M |
| CO2 | S | S | S | M | M |
| CO3 | S | S | S | S | S |
| CO4 | L | S | S | S | S |
| CO5 | S | S | S | S | S |

S- Strong; M- Medium; L-Low

SERICULTURE PRACTICAL I - SB17SCP1

(43 Hrs)

Spotters:

1. Morphology and Life cycle of the mulberry silkworm - *Bombyx mori*.
2. Identification of silkworm races/ breeds.
3. Identification of different types of silk.
4. Pests and diseases of silkworm.
5. Microscopic and physical properties of natural fibres-cotton, silk.
6. Morphology and life cycle of Eri silkworm.
7. Morphology and life cycle of Tasar silkworm.
8. Morphology and life cycle of Muga silkworm.

Dissection:

9. Dissection of the digestive systems in silkworm
10. Dissection of nervous system and silk glands in silkworm
11. Dissection of male and female reproductive systems of silk moths

Sericulture maps:

12. World maps and Silk Road.
13. Sericulture map of India and Tamil Nadu.

Preparation of histograms and pie charts on:

14. Production of textile fibers in India.
15. World silk production.
16. Pie chart on mulberry and non-mulberry silk production in India

Field visit:

17. Visit to a Sericulture unit and submission of report

| Course Number | Course Name | Category | L | T | P | Credit |
|---------------|------------------------|----------|----|---|---|--------|
| AS16CO5 | GENETICS AND EVOLUTION | Core | 56 | 4 | - | 5 |

Preamble

To understand the fundamental concepts of genetics, the principles and mechanism of inheritance and the origin and evolutionary process of organisms

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|--|---|
| CO1 | Understand the core principles of genetics, the historical background, genetic crosses, basic laws governing the pattern of qualitative characters, linkage and crossing over. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2 | Apply knowledge about transcription, translation and the genetic code to understand the flow of genetic information from DNA to proteins | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3 | Understanding the applications of genetics for the welfare of health and treatment of disease, and the impact of selective advantage and natural selection on human genetic disorders. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4 | To understand the evolutionary events those has occurred throughout Earth's geological history starting with the hypotheses on the origin of life and identify the key events in human evolution. Know how to obtain current information about scientific and clinical applications of genetics, particularly from specialized genetics services. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5 | Analyze the processes in population genetics and describe how they affect the genetic diversity within a species Compare and contrast the various theories on formation of new species and identify the factors that play a role in the process of evolution and understand the genetic basis of evolutionary change. | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | L | S | M | M | M |
| CO2 | S | S | M | M | S |
| CO3 | L | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO4 | S | S | S | M | S |

S- Strong; M-Medium; L-Low

Syllabus**UNIT I****(12 Hrs)**

Mendelian Principles- Monohybrid cross and Dihybrid cross, Interaction of genes- Supplementary genes, Complementary genes, Epistasis, Atavism, Linkage in Drosophila – Complete and Incomplete Linkage, Theories of linkage, factors affecting linkage; Crossing over- types of crossing over, mechanism of crossing over, Cytological basis of crossing over – Stern's experiment, Significance and factors affecting crossing over.

*Sex Linked Inheritance- Inheritance of eye colour in Drosophila; Inheritance of colour blindness and Haemophilia in man; Y linked inheritance- hypertrichosis, Sex limited inheritance

UNIT II**(11 Hrs)**

Fine structure of a gene -Cistron, Recon, Muton, Operon Concept, Genetic Code. Gene mutation - Molecular basis- tautomerism, base analogues, Spontaneous and induced mutations. Detection of mutation by CLB method. Chromosomal aberrations: Types- Intra chromosomal aberrations: deficiencies, duplication, inversions, shifts & isochromosomes. Inter chromosomal aberrations: translocation. Ploidy – Euploidy, aneuploidy.

*Mutagens- physical and chemical

UNIT III**(11 Hrs)**

Animal breeding, inbreeding, out breeding-heterosis / hybrid vigour, Eugenics Positive and Negative Eugenics; Euphenics and Euthenics; Inborn errors of metabolism- Phenyl Ketonuria, Galactosemia, Genetic disorders in man – Klinefelter's syndrome, Turner's syndrome, Down's syndrome, Cri – du – chat, Inherited single gene disorder- Sickle cell anaemia, Cystic fibrosis, Thalassaemia; Sex determination – Heterogametic male and Homogametic female. Geneic balance theory of Bridges

*Gene Therapy.

UNIT IV**(11 Hrs)**

Origin of life - Abiogenesis and Biogenesis. Concept of Oparin - Haldane, Miller-Urey Experiments, Theories of evolution – Lamarckism and Neo-Lamarckism, Darwinism and Neo-Darwinism, Modern synthetic theory. Geological time scale - eras, periods and epochs, Fossils – fossilization and its significance, dating of fossils, Causes and Role of Extinction in Evolution.

*Evolution of Man- *Ramapithecus*, *Australopethicus*, Java man, Peking man, Neanderthal man, Cro- Magnon man and Modern man

UNIT V**(11 Hrs)**

Population Genetics - Gene pool, gene frequency, Factors affecting Hardy-Weinberg Law; Forces of Evolution – mutation, gene flow, genetic drift, and natural selection. Isolation – Pre-mating and post mating isolating mechanisms; Micro and Macro evolution, Co-evolution.

Speciation-Methods of speciation – Allopatric, sympatric, Parapatric, and Quantum Speciation; Continental Drift – distribution of animals.

*Origin of India and its Mega diversity

*Denotes self study

TEXT BOOKS

| S.No. | Author | Title of the Book | Publisher | Year of Publication |
|--------------|------------------------------|--------------------------|------------------|----------------------------|
| 1 | Verma,P.S and Agarwal,V.K | Genetics | S.Chand & Co | 1995, 8 th Edn. |
| 2 | Verma,P.S and Agarwal,V.K | Concept of Evolution | S.Chand &Co | 2002 |

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|--|------------------------------------|------------------------|----------------------------|
| 1 | Dodson, E.O | Evolution: Process & Product | East West Press Co | 1968 |
| 2 | Gardner E.J. | Principles of Genetics | Wiley Eastern Pvt. Ltd | 1972 |
| 3 | Robert H.Tamarin | Principles of Genetics | Tata McGraw Hill | 2002 |
| 4 | Sinnott. E.W. Dunn. L.C and Dobzhansky. T. | Principles of Genetics | Tata McGraw Hill | 1973. 4 th Edn. |
| 5 | Gangane, S. D. | Human Genetics | Churchill Livingstone | 2000 |
| 6 | Hall, B. K. and Hallgrimsson, B. | Evolution | Jones and Bartlett | 2008, 4 th Edn. |
| 7 | Dobzansky, T. | Genetics and the origin of species | Oxford and IBH Co | 1976 |
| 8 | Savage, J.M. | Evolution | Amerind Publishing Co | 1976 |

Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

Course Designer

1. Mrs, Susheela.P

| COURSE NUMBER | Course Name | Category | L | T | P | Credit |
|----------------------|---|-----------------|----------|----------|----------|---------------|
| AS16C06 | BIOPHYSICS, BIOSTATISTICS & BIOINFORMATICS | Core | 56 | 4 | - | 4 |

Preamble

Develop a fundamental understanding of basic concepts and tools in biophysics, biostatistics and bioinformatics

Course Outcome

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|------------------|---|---|
| CO1. | To determine the physical phenomena which influence living organisms. Fundamental statistical concepts and some of their basic applications in science and society Develop a fundamental understanding of basic concepts of biophysics and bioinformatics | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2. | Develop a thorough grounding in fundamental analytical approaches for quantitative study of living systems and life processes. Shall know how to organize, manage, and present data. Describe the contents and properties of the most important bioinformatics databases, perform text- and sequence-based searches | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3. | Application of physics to the study of biological molecules, living systems and life processes Carrying out exercises or small projects that incorporate data presentation. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4. | Obtain and analyse information and data relating to specific genes using a number of specific databases, bioinformatics principles and tools | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5. | To educate the interdisciplinary nature of advances in biophysics, bioinformatics and computational biology | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|------------|------------|------------|------------|------------|------------|------------|
| CO1 | S | S | M | M | L | H |
| CO2 | S | S | M | M | M | H |
| CO3 | S | S | S | S | M | H |
| CO4 | S | S | S | S | M | M |
| CO5 | S | S | S | S | M | M |

S- Strong; M-Medium; L-Low

BIOPHYSICS, BIOSTATISTICS & BIOINFORMATICS – AS16C06 (56 Hrs)

Syllabus

UNIT I (12 Hrs)

Biophysics

Light- components – its effect on living organisms – Vision, Pigmentation, Bioluminescence. Laws (First and Second law) of Thermodynamics - Living systems and Entropy changes – Free Energy - Living systems and Equilibrium State. Radioactivity : Isotopes – General properties of radioactive reactions – Alpha, Beta and Gamma radiation – Half-life, Unit of radioactivity.

*Uses of Radioactivity

UNIT II – Biophysics (11 Hrs)

PH meter: Digital, Analog - Colorimetry and Spectrophotometry : Principle, Instrument description and Application - Chromatography :Paper, Thin Layer chromatography, Ion exchange chromatography and Applications - Electrophoresis: Paper and Gel electrophoresis - Principle and Applications. Centrifuge - Basic Principle of Centrifugation, Instrumentation of Ultracentrifuge

* Colloids-description, types, properties and separation.

UNIT III – Biostatistics (11 Hrs)

Organization of Statistical investigation- object and scope - Data: Sources, primary and secondary methods of collection, tabulation - Types of variables: Continuous and discontinuous variables, Qualitative and quantitative-variables. Diagrammatic representation: line, bar, pie, pictogram, cartogram – Graphic representation : Histogram, Frequency polygon, Frequency curve, Ogive Frequency distribution. (Direct Method)

*Frequency graphs.

UNIT IV – Biostatistics (11 Hrs)

Arithmetic mean - Standard deviation - Standard error - Chi – square test - Students ‘t’ test - Regression – Correlation – ANOVA one way (Direct Method).

* Basics of Research Methodology.

UNIT V – Bioinformatics**(11 Hrs)**

Introduction to bioinformatics – Biological Databases, Comparison of sequences: pair wise and multiple alignments – popular search methods – FASTA, BLAST & CLUSTAL – GENBANK, EMBL. Molecular visualization tools : RasMol.

*Applications of Bioinformatics in the field of Biology; Medical Transcription.

* Denotes self study

TEXT BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|---------------------------------|-------------------------------------|------------------------------------|---------------------|
| 1 | Daniel, M | Basic Biophysics and Biologists | Wiley International, New Delhi | 1992 |
| 2 | Das, D | Biophysics and Biological Chemistry | Academic Publishers, Calcutta | 1996 |
| 3 | Mani K and Vijayaraj. N | Bioinformatics for Beginners | Kalaikathir Achchagam, Tamilnadu | 2002 |
| 4 | Palanichamy S and M. Manoharan | Statistical methods for Biologists | Paramount Publications | 2009 |
| 5 | Pranab Kumar Banerjee | Introduction to Biostatistics | S. Chand Publishers | 2011 |
| 6 | Roy R N | A Textbook Of Biophysics | Publisher, New Central Book Agency | 2001 |
| 7 | Snedecor, G.W. and W.G. Cochran | Statistical Methods | Oxford & IBH Publishing, New Delhi | 2001 |

REFERENCE BOOKS

| S.No. | Author | Title of the Book | Publisher | Year of Publication |
|-------|-----------------|--------------------------------|-------------------------------------|---------------------|
| 1 | Arthur. M. Lesk | Introduction to Bioinformatics | Oxford University Press | 2003 |
| 2 | Gupta S P | Statistical Methods | S. Chand & Sons | 2008 |
| 3 | Zar, J.H | Biostatistical analysis | Prentice Hall Inc., New Jersey, USA | 1974 |

Pedagogy

- Lecture by chalk and talk, power point presentation, e-content, Numerical exercise, group discussion, assignment, quiz, peer learning, seminar, On- line learning

Course Designer

1. Dr. P. B. Harathi

| Course Number | Course Name | Category | L | T | P | Credit |
|---------------|---------------|----------|----|---|---|--------|
| AS16C07 | BIOTECHNOLOGY | Core | 56 | 4 | - | 4 |

Preamble

Upon successful completion of this course the students recognize the foundation of modern biotechnology, principles and the different applications of biotechnology. Though Biotechnology has ancient roots, recent developments in genetic engineering has made this subject more attractive.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|---|---|
| CO1 | To impart comprehensive understanding of the principles and practices of biotechnology. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2 | Understanding the principles and practices of biotechnology give insights into the DNA Technology, Technique of genetic engineering, DNA Finger printing, Methods of DNA profiling and animal tissue culture. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3 | Application of genetic engineering in prevention and diagnosis of diseases and discuss the different applications of biotechnology | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4 | Understanding the application of genetic engineering, DNA Finger printing, DNA profiling and animal tissue culture in Life Sciences Research trains the students to think logically. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5 | Interpretation will empower students to think and solve problems in the field of biotechnology. | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | L | L | S | S | S |
| CO2 | M | S | S | S | S |
| CO3 | M | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |

S- Strong; M-Medium; L-Low

BIOTECHNOLOGY- AS16C07

(56 Hrs)

Syllabus

UNIT I

(12 Hrs)

Definition and landmarks in the history of Biotechnology. Global impact of Biotechnology- Biotechnology in India - Prevention of misuse of Biotechnology - Microorganisms important in Biotechnology – Virus, Bacteria and Fungi. Applications of genetic engineering in industry - Alcoholic fermentation: Ethanol - Medicine: Insulin, Antibiotic production: Penicillin - Agriculture : Nitrogen fixation by symbiotic and non-symbiotic bacteria nodule formation, Cloning of nif genes - Vaccines for Polio virus, Hepatitis B virus, Rabies virus, Small pox virus, Malaria vaccines.

*Major areas of Biotechnology.

UNIT II

(11 Hrs)

Basics of genetic engineering (DNA Technology). Enzymes :Exonucleases, Endonucleases, Restriction enzymes, DNA Ligase, DNA Polymerase - Vectors : Plasmid vectors, Vectors based on the lambda Bacteriophage, Cosmids, M13 vectors, Expression vectors, Vectors for cloning and expression in Eukaryotic cells, Insertion vector, Replacement vector.

*Genomic library

UNIT III

(11 hrs)

Technique of genetic engineering – cDNA library - Gene transfer – Introduction of rDNA into host cells - Microinjection, Electroporation, Microprojectile, Shot Gun method, Ultrasonication, Liposome fusion, Microlaser - Application of the cloned genes in diagnosis of diseases through DNA probe, Prevention of diseases.

*Polymerase chain reaction

UNIT IV

(11 Hrs)

DNA Finger printing, Methods of DNA profiling - Applications of DNA finger printing– Hurdles of DNA profiling -- Satellite DNA,. Biosensors – Types of biosensors, Biochips - Principles of Biochips - Applications of biochips. Antisense RNA technology – Cancer and Treatment.

*Human genome project.

UNIT V**(11 Hrs)**

Principles and techniques of animal tissue culture: Requirements for animal cell, tissue and organ culture – Cultivation of animal cell in bioreactor – Somatic cell culture, Organ culture – Insect culture, Production of commercial products from insect culture – Transgenic Technology – Manipulation of reproduction in animals – In vitro fertilization and gene transfer in Humans - Transgenic Fish, Sheep - Antenatal diagnosis. Monoclonal antibodies production and application – Cryobiology.

*Transgenic Pig – Molecular Pharming.

*Denotes self study

TEXT BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|---------------|------------------|------------------------------|---|----------------------------|
| 1 | Ignachimuthu, S. | Basic Biotechnology | Tata McGraw Hill Publishing Company Ltd., New Delhi | 1998 |
| 2 | Dubey R.C. | A Text Book of Biotechnology | S. Chand & Co., Ltd., New Delhi | 2005 |
| 3 | Kumaresan, V. | Biotechnology | Saras Publications, Nagercoil | 2004 |
| 4 | Bhatia, S.C. | Textbook of Biotechnology | Atlantic | 2006 |

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|---|---|---|---------------------|
| 1 | Alexander, N. Glazer and Hiroshi Nikado | Microbial Biotechnology: Fundamentals of Applied Microbiology | Cambridge University Press | 1995 |
| 2 | Glick, B.R., Pasternak, J.J. | Molecular Biotechnology | ASM Publisher | 2003 |
| 3 | Jogdand, S.N. | Environmental Biotechnology | Himalaya Publishing House, Bombay | 1995 |
| 4 | Old, R.W. and Primrose, S.B. | Principles of Gene manipulation | Blackwell Scientific Publications | 1994 |
| 5 | Das, H.K. | Textbook of Biotechnology, Second Edition | Wiley-India Publications | 2010 |
| 6 | Sangita Malvee | Biotechnology-An Introduction | SBS Publishers and Distributors | 2007 |
| 7 | Prakash, M. | Textbook of Biotechnology | Sonali Publication | 2009 |

Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

Course Designers

1. Dr. G. Sasikala

| Course Number | Course Name | Category | L | T | P | Credit |
|---------------|--|----------|----|---|---|--------|
| AS16E01 | PATHOLOGY & MEDICAL LABORATORY TECHNOLOGY | Elective | 56 | 4 | - | 4 |

Preamble

Upon successful completion of this course the student will be able to

- Collect and prepare human samples for analysis.
- Operate and calibrate clinical laboratory instruments, recognize and correct basic instrument malfunctions
- Understand the technical and procedural aspects of laboratory testing for gastric juice, urine and faecal matter and perform various staining techniques for bacterial pathogens.
- Interpret body fluid tests, detect abnormalities, assign a diagnosis.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|--|-----------------|
| CO1 | Understand fundamental analytical principles and processes used in clinical laboratory testing for gastric juice, urine and faecal matter. Understand the concepts and safety measures of clinical laboratory instruments. | K1 |
| CO2 | Acquired technical skills will help the students for collecting and processing biological specimens for analysis. | K1 |
| CO3 | Application of medical laboratory procedures will enable the students to distinguish normal and abnormal microscopic pathogens. | K2 |
| CO4 | Students enable their critical and analytical thinking in the detection of diseases. | K2 |
| CO5 | Interpretation will empower students to compare and contrast clinical laboratory procedures, interpret data and predict diagnosis. | K3 |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | S | S | S | M | M |
| CO2 | S | S | S | M | M |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |

S- Strong; M- Medium

PATHOLOGY & MEDICAL LABORATORY TECHNOLOGY - AS16E01 (56 Hrs)

Syllabus

UNIT I

(12 Hrs)

Essential pre – requisites of a medical laboratory

Introduction, Scope of CLT, Collection of specimens-Collection of blood, CSF & other fluids and Urine. Use of preservatives. Anticoagulants. Maintenance of Laboratory records and preparation of reports. Cleaning, maintenance and care of glassware-Definitions and types of sterilization, disinfection, antisepsis. Different methods of sterilization: Heat, radiation, filtration, chemical methods. Disposal of specimens and infected materials, Safety precautions against infection by microbiological specimens.

Laboratory instruments

Method of measuring liquids and weighing solids, General laboratory equipments-Principle, use and maintenance of the following instruments/apparatus – Balance, centrifuge, cold centrifuge, homogenizer, desiccators, vortex mixer, magnetic stirrer, centrifuges, Albuminometer, Urinometer and Sahli's haemoglobinometer and haemocytometer.

*Spectrophotometry.

UNIT II

(11 Hrs)

Clinical haematology

Blood and its constituents, Collection of blood –capillary and venous blood collection, various anticoagulants and their uses. Total count of RBCs, WBC. Estimation of Haemoglobin – Principles, techniques. Haemoglobin estimation by Sahli's method. Erythrocyte Sedimentation Rate (ESR) (Wintrobe and Westergren method), Clinical significance of ESR and PCV. Bleeding time, clotting time. Principles of blood groups and antigen antibody reactions Blood groups – ABO system, Blood grouping & typing . Blood transfusion – Indication, universal donor and recipient concept. Anticoagulants – Classification, examples and uses. Compatibility test (Coombs test) and its significance, A – B – O Grouping : Tile method, Standard tube technique.

*Rhesus grouping techniques

*Total RBC, WBC count and Differential count

UNIT III

(11 Hrs)

Gastric & liver function tests

Composition, collection and stimulation of gastric juice secretion. Augmented histamine test; Estimation of titrable free and total acidity and inference. Functions of Liver, Fouchest test, Qualitative test for urine urobilinogen. Scheleringer's test for urine urobilin. Disease of the liver-Jaundice, acute and chronic hepatitis, Cirrhosis, Cholestasis etc.

Urine Analysis

Urine composition, volume, appearance, color, collection and preservation. Physical and chemical examination of urine- Heat and acetic acid test, Sulfosalicylic acid test. Microscopic examination of organized and unorganized deposits and blood; Urine test for bile salts. Detection of protein in urine (Bence Jones protein test); Determination of specific gravity using urinometer.

Faecal Examination

Collection and preservation, examination of faeces for color, mucus, consistency, ova, ameba, cysts, parasites, pus cells, RBC and crystals. Detection of occult blood in stool-Benedictine test, Guaiactest, Orthotolidine test. Stool concentration methods- Sodium chloride and formaldehyde methods for concentration of parasites. Staining of faecal smears and blood films. Examination of faeces for adult helminth worms.

*Examination of faeces ova and cysts of *Entamoeba coli*, *E. histolytica*, *Giardia lamblia*, *Enterobius vermicularis*.

UNIT IV

(11 Hrs)

Microbiological Examination

Microscopic examination of bacteria smearing; Hanging drop preparation and wet preparation. Staining *Corynebacterium diphtheriae*. Examination of sputum. Volume, Consistency, Appearance and color. Examination of throat swab. Collection and preparation of smears. Bacteriological examination of urine. VDRL – test. Brief biology and pathology of *Vibrio cholera*, *Corynebacterium diphtheriae*, *Mycobacterium tuberculosis*, *M. leprae*, *Treponema palladium*, *Salmonella typhi* and *Clostridium tetani*.

*Hanging drop preparation–gram's staining +ve and –ve; Outline biology of fungi

UNIT V

Microorganisms and pathology

(11 Hrs)

Collection of microbiological specimens and precautionary measures for investigation. Bacterial toxins and their effects Routine mycological methods. Laboratory diagnosis of mycotic infection. Superficial wounds and pathology of Poliomyelitis, Rhinovirus group, Influenza virus, Measles virus (Rubella), Meningitis virus, Serum hepatitis virus (HBV)

*Indigenous microbial flora of man- Its significance in health and diseases of man.

* Denotes self study.

TEXT BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|-----------------------|----------------------------------|---|---------------------|
| 1 | Kanai, L Mukherjee | Medical Laboratory Technology | Tata McGraw Hill Publishing Company Ltd., New Delhi | 1998 |
| 2 | Ramnck Sood, M.D | Medical Laboratory Technology | Medical Publishers(P)Ltd | 1985 |

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|--------------------------------|---|---------------------------------------|---------------------|
| 1 | Arumugam. N | Microbiology (General & Applied) | Saras Publication | 2000 |
| 2 | Madhavan Kutty, K | Text Book of Medical Laboratory Technology | Medcen Poonthanam | 1992 |
| 3 | Mary Ellen Wedding, Sally A | Medical Laboratory Procedures | Jaypee Brothers Medical Publishers | 1992 |
| 4 | Samuel, K.M | Notes on Clinical Lab Techniques | Published by M.K.Gopalan, | 1999 |

| | | | | |
|---|-------------------------------|--|-------------------------------------|------|
| 5 | Sathish Gupte | Short Textbook of Medical Laboratory for Technicians | Jaypee Brothers, Medical Publishers | 1998 |
| 6 | Baker F.J. And Silverton R. E | Introduction to Medical Laboratory Technology | Hodder Education Publishers | 1998 |

Pedagogy

- Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, seminar.

Course Designers:

1 Dr. N. Ezhili

2 Dr. M. Sheeba

| Course Number | Course Name | Category | L | T | P | Credit |
|---------------|------------------|----------|----|---|---|--------|
| AS17E02 | WILDLIFE BIOLOGY | Elective | 56 | 4 | - | 4 |

Preamble

To enable the students to understand the introduction of wildlife management, management of vertebrate pest and wildlife utilisation and conservation.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|---|---|
| CO1. | To understand the main components of wildlife management and wildlife conservation | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2. | Develop an understanding of how to utilize management techniques to achieve desired management goals. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3. | Develop an understanding of how animals interact with each other and their natural environment | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4. | Understand the planning, preparation, techniques, and wildlife surveys. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5. | Develop an ability to analyze, present and interpret wildlife conservation management information. | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|------|-----|-----|-----|-----|-----|
| CO1. | L | S | M | M | M |
| CO2. | S | S | M | M | S |
| CO3. | L | S | S | S | S |
| CO4. | S | S | S | S | S |
| CO5. | S | S | S | M | S |

S- Strong; M-Medium; L-Low

WILDLIFE BIOLOGY - AS17E02

(56 Hrs)

Syllabus

UNIT I

(12 Hrs)

Definition of Wildlife: Causes of wildlife depletion; Economic importance of wildlife; need for wildlife conservation; rare, endangered, threatened and endemic species of fishes, amphibians, reptiles, birds and mammals in India-India as a mega wildlife diversity country.

UNIT II

(11 Hrs)

Forest types in India- identification, dendrology; Deforestation & Impacts; Forest Inventory; Natural and artificial regeneration of forests; nursery techniques-seed-technology- Collection, storage, pretreatment and germination, establishment and tendings.

UNIT III

(11 Hrs)

Harmful Insects and their role in forest economy: Insect pests of important trees of India -Teak, Sal and Bamboo; Beneficial Insects and their role in forest economy: Scavenger insects- dung beetles; Pollinators, Predatory insects, and parasitic insects on insect pests; control of forest insects.

UNIT IV

(11 Hrs)

Vegetative analyses – Point Centered Quadrat, Quadrat, Strip transect; GIS and Remote sensing in wildlife habitat surveys-Habitat manipulation: food, water, shade improvement; impact and removal of invasive alien species.

UNIT V

(11 Hrs)

In-situ and ex-situ conservation: Wildlife Sanctuaries, National Parks, Tiger Reserves and Biosphere reserves: Definition, formation, management and administration; Wildlife Projects: Tiger, Elephant, Lion and Hangul; Zoos and Zoological Parks: Definition- Aims of Zoos- Formation and Management of Zoos and Zoological Parks; Role of Government and Non-Governmental organizations in conservation.

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|----------------------|--------------------------------|--|-------------------------------|
| 1 | Saharia, V.B. | Wildlife in India | Nataraj Publishers, Dehra Dun | 1982 |
| 2 | Seshadri, B. | India's Wildlife reserves | Sterling Pub'rs Pvt. Ltd., New Delhi | 1986 |
| 3 | Giles, R.H. Jr. (Ed) | Wildlife Management Techniques | The wildlife Society, Washington. D.C. Nataraj Publishers, Dehradun. India | 1984 3 rd edition. |
| 4 | Dasman, R F | Wildlife Biology | John and Wiley and sons New York | 1964 |

Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

Course Designer

1. Dr. G. Sasikala

| | |
|-----------------------------|-----------------------|
| Semester | : V |
| Advance Level Course | : 1 |
| Paper | : 1 |
| Title | : Microbiology |
| Sub code | : AS16AC1 |
| Credits | : 5* |

Preamble :

Knowledge of different aspects of Microbiology has become crucial and indispensable to everyone in the society.

UNIT-I

Introduction: History and scope of Microbiology; Classification and biology of virus, bacteria, fungi; Application of microbes in food, industry, genetic engineering, biotechnology, agriculture, environment, medicine, pollution.

UNIT-II

Culture techniques: Sterilization techniques- physical and chemical agents in control. Nutrient requirements: types of micro organisms, growth factors. Culture media: types, collection of samples, methods of isolation, identification and maintenance of culture Culture media- Simple and Special nutritional media. Nutrient broth. Microbial growth: pattern, factors, measurement of growth-growth curve.

UNIT – III

Food Microbiology: Food spoilage-intrinsic and extrinsic factors; food preservation – filtration, low or high temperature, chemicals and radiation; food borne diseases- fermented food products – wine and beer. Botulism

UNIT – IV

Environmental Microbiology: Microbial Analysis of Water, Sanitary Test for Coliforms- Sewage Treatment, Bioremediation - Petroleum Prospecting and Formation of Oil Spills,

Wastewater Treatment, Chemical Degradation, Heavy Metals – Indicator Microorganism in Polluted Water

UNIT – V

Medical Microbiology: Viral diseases Chickenpox, Measles, Influenza, Rubella, Yellow Fever, Rabies, Hepatitis, Poliomyelitis, Aids. Bacterial Diseases- Diphtheria, Tuberculosis, Pertussis, Leprosy, Gonorrhoea, Syphilis, Cholera and Salmonellosis. Fungal Diseases – Superficial, Cutaneous, Sub-Cutaneous, Systemic and Opportunistic Mycoses.

TEXT BOOKS

| S.No. | Author | Title of the Book | Publisher | Year of Publication |
|-------|---------------------------------|-------------------------------------|----------------------------------|---------------------|
| 1 | Dubey, R.C. and Maheswari, D.K. | A Text Book of Microbiology | S. Chand and Company Ltd., | 2006 |
| 2 | Sundara Rajan, S | College Microbiology – Vol. I to IV | Vardhana Publications, Bangalore | 2002 |

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|--|------------------------------------|---------------------------------------|----------------------------|
| 1 | Alcamco, I.D. | Fundamentals of Microbiology | The Benjamin Cummings Publishing Co., | 1997, 5 th Edn. |
| 2 | Atlas, R.M. | Principles of Microbiology | Mosby-Year Book, Inc., Missouri., | 1995, 1 st Edn. |
| 3 | Barry L. Batzing | Microbiology-An Introduction | Wadsworth Group | 2000, 1 st Edn. |
| 4 | Lansing M. Prescott, John P. Harley, Donald A. Klein. | Microbiology | , McGraw Hill Companies | 1999, 4 th Edn. |
| 5 | Mani, A., Selvaraj, A.M., Narayanan, L.M. and Arumugam, N. | Microbiology – General and Applied | Saras Publications | 1999 |
| 6 | Powar, C.B. and Daginawala, H.F. | General Microbiology | Himalaya Publishing House | 2001 |

| | |
|-----------------------------|------------------------------------|
| Semester | : V |
| Advance Level Course | : II |
| Paper | : 2 |
| Title | : Public Health and Hygiene |
| Sub code | : AS16AC2 |
| Credits | : 5* |

Preamble :

To train human resources in the science of public health, with a firm understanding of the determinants of health and the public health system in the country, the community context, the determinative influences of globalization, urbanization, global and national policies and a strong foundation in research methodology.

UNIT-I

Determinants of health. Health indicators; Personal hygiene; Public health; health - Dynamics of disease transmission – host, agents, environment.

UNIT-II

Concepts of Health and Disease. Nutrition and Health: Classification of foods – Nutritional deficiencies - Vitamin and Mineral deficiencies - Balanced diet - Nutritional requirements of special groups.

UNIT III

Environment and Health: Types of Pollution - Air Pollution, Water Pollution, Soil Pollution, Noise Pollution Radiation – effects; Solid waste and excreta disposal. Impact of pollutants on Health.

UNIT IV

Communicable Diseases: Measles, Cholera, Amoebiasis, Malaria, Filariasis, Japanese encephalitis, Swine flu, STD and AIDS. Non-Communicable Diseases: Coronary Heart Disease. Hypertension Diabetes, Obesity, Stroke, Cancer.

UNIT V

Health Education: Health care services in India. Health planning in India. Health Programmes in India, WHO, Non-Governmental Voluntary Health organizations. First Aid and Nursing: Methods, Dressing, Care, Duties, Preparations

TEXT BOOKS

| S.No. | Author | Title of the Book | Publisher | Year of Publication |
|--------------|----------------|---|--|----------------------------|
| 1 | Park and Park. | Text Book of Preventive and Social Medicine | Banarsidas Bhanot Publishers, Jabalpur | 1995 |
| 2 | Verma, S. | Medical Zoology | Rastogi Publications | 1998 |

| Course Number | Course Name | Category | L | T | P | Credit |
|---------------|-------------------------------|----------|----|---|---|--------|
| AS16CO8 | PHYSIOLOGY & ENDOCRINOLOGY | Core | 86 | 4 | - | 5 |

Preamble

Physiology is the fountain head of “Natural Sciences” as it deals with the functions of the body of organisms. Emphasis is on interrelationships among systems and regulation of physiological functions involved in maintaining homeostasis. The reactions are vehicled through chemical co – ordination of hormones – hence this combined subject on physiology and endocrinology is prescribed.

Course Outcomes

| CO Number | CO Statement | Knowledge Level |
|-----------|--|---------------------------------|
| CO1 | To understand the basic organization of organisms and subsequent development to an organ system. | K ₁ |
| CO2 | To analyze the physiological processes that regulates body functions and the regulation of an organ system from the molecular all the way to the whole animal level. | K ₂ |
| CO3 | Recognize the complimentary relationship of structure and function and describe the interactions between different organ systems to maintain homeostasis | K ₂ , K ₃ |
| CO4 | Able to explain the role of the endocrine glands in maintaining homeostatic mechanisms utilized by each body system in response to internal and external environmental changes. | K ₂ ,K ₃ |
| CO5 | To compare the impact and changes of different and to apply knowledge of a physiological mechanism for further understanding of the cellular and molecular mechanisms of action in health and disease. | K ₃ |

Mapping with Programme Outcomes

| Cos | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | S | S | M | M | L |
| CO2 | S | S | M | M | M |
| CO3 | S | S | S | S | M |
| CO4 | S | S | S | S | M |
| CO5 | S | S | S | M | M |

S- Strong; M-Medium; L-Low

PHYSIOLOGY & ENDOCRINOLOGY - AS16CO8

(86 Hrs)

Syllabus

UNIT I

(18 Hrs)

NUTRITION

Nutrition in animals, mechanisms of food intake in different animals, Physiology of digestion and absorption; Metabolism of carbohydrates, proteins & lipids; vitamins. Obesity- causes and consequences, Leptin: synthesis, secretion and its role in adipogenesis

*Balanced diet.

RESPIRATION

Types of respiration; surfactants; Exchange & transport of gases; Respiratory Quotient and Bohr's effect, Chloride shift/Hamberger's phenomenon; Respiration in unusual environment – foetal and neonatal respiration, high altitude, diving; Metabolic rate: basal metabolic rate and its measurement

*Structure and functioning of respiratory pigments

UNIT II

(17 Hrs)

CIRCULATION

Composition and Functions of blood; Types of heart - chambered heart, tubular heart, ampullar heart, lymph heart, neurogenic and myogenic heart, Cardiac Cycle; Cardiac rhythm; Cardiac output; Origin of heart beat and its regulation; ECG and its principle; myocardial infarction, Blood pressure; Blood clotting; Circulatory shock, Circulatory arrest, Abnormal Heart Rhythm- Arrhythmia

*Human congenital heart diseases

EXCRETION

Classification of animals based on excretory products- ammonotelic, ureotelic, uricotelic; Vertebrate kidney, Structure of nephron, Physiology and regulation of urine formation; Hormonal regulation of urine formation, Dialysis, artificial kidney, kidney transplantation, kidney disorders.

*Osmoregulation in fresh water, marine and terrestrial animals.

UNIT III**(17 Hrs)****NERVE PHYSIOLOGY**

Structure of a neuron; types of neurons, Electrical and chemical transmission. Synaptic transmission of impulse, Modifications of synaptic transmission during fatigue, acidosis, alkalosis, hypoxia and drugs. Neuromuscular Junction: organization and properties of neuromuscular junction, Neurotransmitters, EEG, MRI, memory, neural disorders in man – Alzheimer's, Parkinson's and meningitis, Multiple sclerosis.

*Autonomic nervous system.

UNIT IV**(17 Hrs)****MUSCLE PHYSIOLOGY**

Structure of a muscle; Comparative physiology of skeletal, smooth and cardiac muscles, Skeletal muscle- ultra structure and molecular organization , Red and white muscles,. Mechanism of muscle contraction and relaxation. Energetics of muscle contraction. Effect of exercise on muscles. Catch muscle and fibrillar muscle, simple muscle twitch, latent and refractory periods, tetanus, tonus, fatigue, oxygen debt.

*Chemistry of muscle proteins.

UNIT V**(17Hrs)****ENDOCRINOLOGY**

Endocrine glands-structure, Neuro-endocrine regulation of hormone action, Secretions and functions of– Pituitary, Thyroid, Pancreas, Adrenal & Gonadial hormones.

*Diabetes mellitus.

*Denotes self study

TEXT BOOKS

| S.No. | Author | Title of the Book | Publisher | Year of Publication |
|--------------|---|---|--------------------|----------------------------|
| 1 | Verma P.S., Agarwal V.K. and Tyagi, B.S | Animal Physiology | S. Chand & Co | 1995 |
| 2 | Berry,A.K | A Text Book of Animal Physiology with related | Emkay Publications | 1993 |

| | | | | |
|---|---|-------------------------------|---------------|------|
| | | Biochemistry | | |
| 3 | Sarada Subrahmanyam., Madhavan Kutty ,K., & Singh H.D | Text Book of Human Physiology | S. Chand & Co | 2012 |

REFERENCE BOOKS

| S.No. | Author | Title of the Book | Publisher | Year of Publication |
|-------|--|--|--|---------------------|
| 1 | Lauralee Sherwood | Human Physiology.6 th Edition | Thomson Brooks, United States | 2007 |
| 2 | Hoar. W.S | General and Comparative Physiology | Prentice – Hall of India Pvt., Ltd | 1995 |
| 3 | G.J.Tortora & B.Derrickson | Principles of Anatomy and Physiology | John Wiley and Sons, Inc | 2009 |
| 4 | Guyton, A.C | TEXT BOOK of Medical Physiology | Prism Books Pvt.Ltd | 1996 |
| 5 | Ganong, W.F | Review of Medical Physiology | McGraw Hill, New Delhi | 2003 |
| 6 | Prosser, C.L | Comparative Animal Physiology | W.B.Saunders Co | 1978 |
| 7 | Schmidt-Nielson K | Animal Physiology | Prentice Hall India Ltd | 2002 |
| 8 | Vander, A.J., Sherman, J.H. and Luciano D.S. | Human Physiology | MacGraw Hill Publishing Co., New Delhi | 1998 |
| 9 | Withers P.C | Comparative animal physiology | Saunders College Publishing | 1992 |

Pedagogy

- Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, seminar

Course Designers:

1 Dr. N. Ezhili

2 Dr. M. Sheeba

| COURSE NUMBER | Course Name | Category | L | T | P | Credit |
|----------------------|--------------------|-----------------|----------|----------|----------|---------------|
| AS16C09 | IMMUNOLOGY | Core | 71 | 4 | - | 5 |

Preamble

To understand the basic immunological principles, structural and functional basis of immunoglobulins, the mechanism, and application of antigen-reaction in the immune system.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|--|---|
| CO1. | The mechanisms and differences between primary and secondary responses and their relevance to immunizations | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2. | Comprehensive and practical understanding of basic immunological principles and techniques involved in research/clinical/applied science | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3. | Identify the role of antigen presenting cells, lymphocytes, and phagocytic cells in immune responses | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4. | Role of immunology in protection against disease and autoimmune disorders | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5. | Advanced knowledge of the underlying principles of immunology and its application in biological systems. | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|------------|------------|------------|------------|------------|------------|
| CO1 | S | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | M | M |

S- Strong; M-Medium

IMMUNOLOGY - AS16C09**(71 Hrs)****Syllabus****UNIT I****(15 Hrs)**

History & Scope of Immunology, Types of Immunity- Innate, Acquired, Cell Mediated Immunity, Humoral Mediate Immunity. Active & Passive Immunity. Vaccination.

UNIT II**(14 Hrs)**

Lymphoid Organs – Primary, Secondary & Territory Lymphoid Organs. Cells of the Immune System – Lymphocytes (T&B Cells). Macrophage, Granulocyte, Natural Killer Cells. Cytokines, Lymphokines, Interleukins, Complement System

UNIT III**(14 Hrs)**

Antigens – Structure and Types. Antibodies – Immunoglobulins Family of Proteins - Structure and Types of Antibodies. Interaction of Antibodies with Antigens. Functions of Antibodies. Agglutination, Precipitation, ELIZA, Blotting Techniques.

UNIT IV**(14 Hrs)**

Immune Response against disease – Life Cycle, Symptoms, Causative agent: Treatment, Malaria, AIDS, Hepatitis, Meadow Disease, Avian Flu. Immune response to tumor

UNIT V**(14 Hrs)**

Transplantations. Types of Grafts, Graft Rejection, Immuno suppressive Drugs. Autoimmune Diseases – Addison's disease, Rheumatoid Arthritis. Hypersensitivity – I, II, III & IV. Stem Cell and its Applications

TEXT BOOKS

| S.No. | Author | Title of the Book | Publisher | Year of Publication |
|--------------|-----------------------------|---------------------------|--------------------|----------------------------|
| 1 | P. Madhavee Latha | A Text Book of Immunology | S.Chand | 2012 |
| 2 | Dulsy Fatima and Arumugam N | Immunology | Saras Publications | 2000 |

REFERENCE BOOKS

| S.No. | Author | Title of the Book | Publisher | Year of Publication |
|-------|-----------------------------|--|------------------------------------|---------------------|
| 1 | P. Madhavee Latha | A Text book of Immunology | S.Chand | 2012 |
| 2 | Kuby, J | Immunology | W.H. Freeman and Company, New York | 1997 |
| 3 | Roitt, I.M. | Essentials of Immunology | ELBS Editors, London | 1998 |
| 4 | Brown, F. and Chamock, R.A. | Vaccines 86 : New Approaches to Immunization | Lerner Colsspring Harbour Lab | 1986 |

Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

Course Designer

1. Dr. P.B.Harathi

| COURSE NUMBER | Course Name | Category | L | T | P | Credit |
|----------------------|---------------------------------------|-----------------|----------|----------|----------|---------------|
| AS16C10 | HUMAN GENETICS AND COUNSELLING | Core | 71 | 4 | - | 5 |

Preamble

To make the students understand the central and unifying position of genetics in biological services and to create awareness for a better community

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|---|---|
| CO1. | Understand the role of genetics as the underlying cause of various disorders of the human body | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2. | Knowledge of research principles and methods applicable in the discipline of genetic counselling and genetic testing approach taken for specific genetic disorders | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3. | Principles of the legal and professional duties and the responsibilities of genetic counsellors as health professionals | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4. | Role of the genetic counsellor in the context of the multidisciplinary approach to clinical genetic health care | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5. | Integrate knowledge of genetics and genomics, including dysmorphology, inherited and multifactorial disorders, cancer genetics, genetic and genomic testing, and screening including prenatal diagnosis for the purposes of genetic and genomic counselling | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|------------|------------|------------|------------|------------|------------|
| CO1 | S | S | L | S | S |
| CO2 | L | S | S | M | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | M |
| CO5 | S | S | S | S | M |

S- Strong; M-Medium; L-Low

HUMAN GENETICS AND COUNSELLING - AS16C10

(71 Hrs)

Syllabus

UNIT I

(15 Hrs)

Human chromosomes: Karyotyping, Idiogram – Chromosome classification & Nomenclature – Lyon's hypothesis- Barr Body, Chromosomal study based on leukocyte culture – Banding Techniques – C, R, Q and G Banding - Uses of chromosomal analysis. *Chromosomal Aberrations (Structural)

UNIT II

(14 Hrs)

Chromosomal Aberrations (Numerical) – Syndromes – Down's, Turner's, Klinefelter's, Cat cry, Ulrich's – Ploidy, Autosome linked genetic disease – Sickle cell anemia, Alkaptonuria, Phenylketonuria - Dermatoglyphics

*Sex linked genetic diseases : Hemophilia, Color blindness.

UNIT III

(14 Hrs)

Blood groups – ABO group. MN Group, Rh factor – Cancer : Oncogenes and oncogenicity – Population genetics – Gene pool, Panmixis - Hardy Weinberg Law – Definition and factors affecting equilibrium - Calculating gene frequencies in a population – Autosomal gene, Sex linked gene.

*Twins : Monozygotic, Dizygotic, Siamese twins

UNIT IV

(14 Hrs)

Pedigree analysis – pedigree chart for hemophilia – problem solving in pedigree analysis, Genetic Counseling – marriage – consanguineous marriage – disputed parentage – child adoption: legal implication, procedure, and laws.

*Future of human genetics – Eugenics, Euthenics, Euphenics

UNIT V

(14 Hrs)

Diagnosis of genetic diseases - β - Thalassemia, Alkaptonuria, Phenylketonuria, Sickle cell anemia – Analysis of human genome – Blotting techniques – Southern, Northern, Western and Dot blotting – Prenatal diagnosis: Amniocentesis, Chronic villi sampling, Cardocentesis, and Scanning.

*Embryonic Stem Cell

* Denotes self study

TEXT BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|--|-----------------------------------|--------------------------|---------------------------------------|
| 1 | Bhatnagar S M, Kothari Lopa M L. | Essentials of Human Genetics | Orient Longman (P) Ltd., | 1999 (Reprint 2004) 4th Edn. |
| 2 | Mandal S | Fundamentals of Human Genetics | New Central Book Agency | 2002 |

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|---------------------------|---|--|-------------------------------|
| 1 | Lewin | Genes VIII | Pearson Prentice Hall International | 1985 |
| 2 | Monre. W. Stick Berger | Genetics | Eastern Economy | 2003, 3 rd Edn. |
| 3 | Rickie Lewis | Human genetics – Concept and application | Tata Mc. Graw Hill | 2011, 2 nd Edn. |
| 4 | Robert. H Tamarin | Principles of Genetics | Tata Mc. Graw Hill | 2002 |

Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

Course Designer

1. Dr.P.B.Harathi

| Course Number | Course Name | Category | L | T | P | Credit |
|---------------|-------------------------|----------|----|---|---|--------|
| AS16E03 | APPLIED FISHERY BIOLOGY | Elective | 71 | 4 | - | 5 |

Preamble

This multidisciplinary course aims to educate the understanding and managing fisheries. It include biology, physiology, nutrition, processing, value addition, by-products, aquatic pollution and technology. After completion of this course, students will have many career opportunities.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|---|---|
| CO1 | To study, explore various techniques used in fishery and polyculture practices. Understanding the scientific terms, concepts, facts, phenomenon & their interrelationship of fish. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2 | To provide an overview of the application of biotechnological tools in fish breeding, feed, health, processing and other issues in fisheries. Application of knowledge in Fisheries for nutrition, agriculture & live stock | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3 | To gain in depth knowledge and field exposure on sustainable pisciculture practices | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4 | To impart understanding of the nutritional requirements of fish and knowledge on mass culture and enrichment of live food organisms | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5 | To comprehend the taxonomy, morphology, pathology and host-parasite relation of common parasites of aquatic organisms and to understand the significance of parasites in fish health | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | S | S | L | M | M |
| CO2 | S | S | S | M | M |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |

S- Strong; M- Medium; L-Low

APPLIED FISHERY BIOLOGY - AS16E03

(71 Hrs)

Syllabus

UNIT I

(15 Hrs)

Introduction: Current status, problems and future prospective for aquaculture and fish farming in the world and India. Economics of different fish farming systems. Aquaculture systems: Extensive, semi-intensive and intensive culture of fish, Pen and cage culture in lentic and lotic water bodies, polyculture, composite fish culture. Fish farming: Nursery and grow-out, pond preparation, stocking, feeding and water quality management in the farming of major and minor carps, magur, singh, murrels, tilapia, pangasius, freshwater turtle, etc. Introduction to commercial pisciculture practices in inland water.

UNIT II

(14 Hrs)

Aquaculture and ecosystem relationship: Ecosystems and productivity, biotic interaction within ecosystems and ecological homeostasis. Impact of environment on aquaculture: Raw water source, physical and chemical characteristics, contaminants and pollutants (algae, pathogens, heavy metals, pesticides) and their effect on productivity. Environmental variables related to fish health; Water quality and sediment characteristics. Biological indicators and indices of water quality. Sanitation in aquaculture systems.

UNIT III

(14 Hrs)

Fish nutrition, feed and feeding: Principles of fish nutrition and terminologies, nutritional requirements of cultivable finfish: larvae, juveniles and adults. Live fish feed: phytoplankton-Spirulina culture techniques and zooplankton –Daphnia culture techniques, Artemia and Rotifer culture techniques, and their role in larval nutrition.

UNIT IV

(14 Hrs)

General characteristics, life cycle, diagnosis, prevention and treatment of parasitic, bacterial, fungal and viral diseases of fish. Health management strategies in Aquaculture: Vaccines, Immuno-stimulants, Probiotics, Good and Best management practices.

UNIT V**(14 Hrs)**

Nutritional biochemistry of fish: Classification, nutrient quality and evaluation of proteins, lipids and carbohydrates. Role of nutrients: amino acids, fatty acids, proteins, lipids, carbohydrates, vitamins and minerals. Types of by-products and Value-Added Products. Introduction: Scope of biotechnology in fisheries and aquaculture research. Transgenics: Principles of transgenic technology and its application in fisheries. Feed biotechnology: Probiotics, single cell proteins, Nutraceuticals. Application of nanotechnology in aquaculture. Recent Technological Innovations in Aquaculture- Aquaponics and Biofloc technology.

TEXT BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|--|--|--|---------------------|
| 1 | Jhingran V.G | Fish and fisheries of India | Hindustan Publishing Corporation, New Delhi. | 1982 |
| 2 | Lannan J.F.H.D. Smitherman and G. Tehobanglous (eds) | Principles and practice of pond culture: A state of the art review | S. Chand & Company | 2012 |
| 3 | Balchandran | Fisheries technology | Introduction to Cytology | 2003 |

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|---------------------------------------|---|--|-------------------------|
| 1 | Ravi Reddy, Mohan Babare, Ramraopatil | General topics in fishery | Kalyani Publishers, New Delhi | 2 nd Edition |
| 2 | Rounsfell G.A. and W.H | Fisheries-Its methods and applications | Lippincott Williams and Wilkins, Philadelphia | 8 th Edition |
| 3 | Bardach JE. | Sustainable Aquaculture | John Willey & Sons. Bardach JE, Rhyther JH & Mc. Larney WO. 1972 | 1997 |
| 4 | Elangovan K. | GIS: Fundamentals, Applications and Implementations | New India Publ. Agency. ESRI. | 2005 |

| | | | | |
|---|---|---|---------------------------------|------|
| 5 | Meaden GJ & Kapetsky JM | Geographical Information System and Remote Sensing in Inland Fisheries and Aquaculture. | FAO Tech. | 1991 |
| 6 | Hart, Paul & Reynolds, John. | Handbook of Fish Biology and Fisheries | Volume 1: Fish Biology. 1 - 11. | 2002 |
| 7 | Reynolds, John & Dulvy, Nicholas & Roberts, Callum. | Handbook of Fish Biology and Fisheries | Volume 2: Fisheries. 319 - 341. | 2002 |

Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

Course Designer

1. Dr. G. Sasikala

| Course Number | Course Name | Category | L | T | P | Credit |
|---------------|---------------|----------|----|---|---|--------|
| AS17E04 | DAIRY SCIENCE | Elective | 71 | 4 | - | 5 |

Preamble

To train and impart practical knowledge in clean milk production, processing of milk and preparation of milk products. To provide knowledge to give them an opportunity to get employment in Cooperative Milk Producers Union Limited, and in private dairy product factories

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|--|---|
| CO1 | Impart technical knowledge and skills required concerning the selection and breeding of dairy cattle, management of animals of different physiological status, nutrition, health, housing and feeding. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2 | Principles and practices essential in the production of clean milk | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3 | Able to classify feeds according to their nutritive values. Students will know the different types of microbes in milk, their morphology and milk borne diseases | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4 | Analysis the microbial examination of various dairy products, bacteriological grading of raw milk and to estimate the Bacteriological problems associated with pasteurization, sterilization processes | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5 | Completion of the programme may seek employment in private dairy farm, milk processing plants and dairy product factories. | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | S | L | L | S | M |
| CO2 | S | S | S | S | M |
| CO3 | S | S | S | S | M |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |

S- Strong; M-Medium; L-Low

DAIRY SCIENCE - AS17E04

(71 Hrs)

Syllabus

UNIT I

(15 Hrs)

Dairy Farming-Definition, Scope, Dairy breeds of India and its classification. Exotic cow breed- Jersey and Red Sindhi. Buffalo-Murrah and Surti. Goat –Jamunapari and Malapuri.

UNIT II

(14 Hrs)

Common cattle feed and their nutritive values. Rations-its computational and qualities-Balanced ration. Anatomy and physiology of mammary glands. Milk secretion and importance of Colostrum.

UNIT III

(14 Hrs)

Milk composition-Nutritive value. Pasteurization of milk –spoilage of milk. Milk products- Butter, Cream, *Khoa* and Ghee. Adulteration of milk.

UNIT IV

(14 Hrs)

Viral diseases-Cow pox-Foot and mouth disease-Rinder pest. Bacterial diseases –Anthrax-Mastitis- Tuberculosis-Haemorrhagic septicemia. Non-contagious diseases-Milk fever, Parasites of dairy breeds

UNIT V

(14 Hrs)

Role of Co-operative societies in milk production and marketing. Techniques adopted in cattle breeding – inbreeding, Outbreeding and Artificial insemination. Merits and demerits of Dairy Business

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|---------------|---|--------------------------------------|----------------------------------|----------------------------|
| 1 | G. H. Schmidt, L. D. Vivek & N. N. Pathak | Principles of Dairy Science | Prentice Hall | 1998 |
| 2 | C. R. Sane | Reproduction in farm animals | Bombay Varghese Publishing House | 1982 |
| 3 | R. D. Frandson | Anatomy & Physiology of farm animals | Blackwell Publishing | 2006 |
| 4 | K. C. Mahanta | Handbook of Dairy science | Kitalistan, Allahabad | 1964 |

Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

Course Designer

1. Mrs. Susheela. P.

| | |
|-----------------------------|-----------------------------------|
| Semester | : VI |
| Advance Level Course | : III |
| Paper | : Industrial Biotechnology |
| Sub code | : AS16AC3 |
| Credits | : 5* |

Syllabus

UNIT I

Fermentation Technology – Fermenter design and types - Culture of microorganisms: Solid, Semisolid, Batch culture, Continuous culture, Fed-batch culture – Metabolic pathways in microorganisms - microbial products: Primary metabolites - Amylases, Proteases, Ethanol, Citric acid and Lipases, Secondary metabolites - Penicillin, Tetracycline, Streptomycin, Vitamin B12.

*Biogas production.

UNIT II

Source and production of commercially important enzymes – Cellulase, Amylase, Pectinase. Proteinases. Immobilization of enzymes and its applications – Biofertilizers – Mass cultivation of *Rhizobium*, *Azotobacter*, *Azolla*, *Azospirillum* - Biopesticides- Biological control of plant pathogens, insects pests and weeds. Genetic engineering of biocontrol agents.

*Benefits from Biofertilizers.

UNIT III

Application of enzymes in commercial Industries – Food Industries – Detergent Industries – Leather Industries – Pharmaceutical Industries – Enzymes in clinical diagnostics - Enzymes as therapeutic agents.

*Genomes and its applications to health

UNIT IV

Production of Single Cell Protein (SCP) - Advantages of producing microbial protein – Microorganisms used as SCP – Substrates used for the production of Bacterial, Algal, Fungal and Yeast biomass - Nutritional value of SCP - Genetic improvements of microbial cells.

*Mushroom culture

UNIT V

Bioremediation – *In-situ* and *Ex-situ* bioremediation – Factors affecting bioremediation – Use of genetically engineered bacterial strains – VAM fungi – Bioremediation of heavy metals, Xenobiotics, dyes - Microbial leaching: copper leaching - Biosafety – IPR – Patenting. Biowar, Bioprivacy, Plant Breeder right (PBR)

*Bacteriology of water and sewage.

*Denotes self study

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|---|---|---|---------------------|
| 1 | Ignachimuthu, S. | Basic Biotechnology | Tata McGraw Hill Publishing Company Ltd., New Delhi | 1998 |
| 2 | Dubey R.C. | A TEXT BOOK of Biotechnology | S. Chand & Co., Ltd., New Delhi | 2005 |
| 3 | Kumaresan, V. | Biotechnology | Saras Publications, Nagercoil | 2004 |
| 4 | Alexander, N. Glazer and Hiroshi Nikado | Microbial Biotechnology: Fundamentals of Applied Microbiology | Cambridge University Press | 1995 |
| 5 | Prakash, M. | Textbook of Biotechnology | Sonali Publication | 2009 |

| | |
|-----------------------------|--------------------------|
| Semester | : VI |
| Advance Level Course | : IV |
| Paper | : 4 |
| Title | : Applied Zoology |
| Sub code | : AS16AC4 |
| Credits | : 5* |

Preamble: To emphasis entrepreneurial potential and skills by incorporating applied topics in the field of Zoology

UNIT I

Parasites in Man: Protozoan Parasites – *Entamoeba histolytica*, *Giardia lamblia*, *Plasmodium*, *Trypanosoma gambiense*; Helminth Parasite – *Ancylostoma duodenale*, *Ascaris lumbricoides*, *Enterobius vermicularis*, *Wuchereria bancrofti*, *Taenia solium*; Host Parasite Relationship.

UNIT II

Beneficial Insects – Apiculture – Different Species; Social Organization; Equipment connected with bee keeping; Newton hive; Bee products: Honey extraction – Bee wax and their uses; Diseases and enemies of bees.

Sericulture: Different types of silkworms used in sericulture; Life history of *Bombyx mori*; Rearing; Silk extraction and reeling; Diseases of silkworm; Economic importance. Lac insect – biology and life cycle

UNIT III

Insect Pests – Salient features, Nature of destruction and control measures of the following - Pests of rice: Rice stem borer, Green rice leaf hopper. Pests of Cotton: Cotton leaf hopper, Pink boll worms. Pests of coconut: Rhinoceros beetle, Black headed caterpillar. Pests of Sugarcane - Indian sugarcane leaf hopper, Sugarcane root borer, Sugarcane top shoot borer.

UNIT IV

Aquaculture: Kinds of aquaculture – Mono, Poly-extensive, Semi intensive, Intensive; Monosex sewage integrated fish farming (brief account). Culture of selected species – Major carps,

oysters. Recent developments in aqua culture: Application of hormones – Spawning-Eye stalk ablation. Preservation and processing of fish, prawns, Chilling, Freezing, Freeze drying, Salting, Smoking, Canning (Briefly). Fish parasites and diseases (any3). Ornamental Fish Culture

UNIT V

Economic importance of birds and mammals. Different breeds of fowls – Selective breeding; Housing and rearing; Role of nutrition in egg laying; Common diseases. Indirect and direct value of mammals - Dairy, Sheep, and piggery farming; Novel methods of breeding livestock.

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|--|---|--|---------------------|
| 1 | Ahsan, J. and Sinha, S.P. | Handbook of Economic Zoology | S. Chand & Co., New Delhi | 1985 |
| 2 | Ayyar, T.V.T.M | Handbook of Economic Entomology for South India | Govt. Press. Madras | 1963 |
| 3 | Banerjee, G.C. | Poultry | Oxford and IBH Publishing Co., Pvt Ltd. | 1992 |
| 4 | Bardach, John E., Ryther, John, H. and McLamey William, O. | Aqua culture | John Wiley and Sons Inc., New Delhi | 1972 |
| 5 | Crofton, H.D. | Nematodes | Hutchinson University Library, London | 1966 |
| 6 | Chaterjee, K.D | Parasitology | Chaterjee Medical Publishers Calcutta | 1982 |
| 7 | Ganga, G. and Sulochana Chetty | An Introduction to Sericulture | Oxford and IBH Publishing Co., Pvt., Ltd., | 1991 |

| COURSE NUMBER | Course Name | Category | L | T | P | Credit |
|----------------------|---------------------------|-----------------|----------|----------|----------|---------------|
| AS16CP3 | Core Practical III | Practical | - | - | 180 | 5 |

Preamble

The curriculum will reflect on the current changing needs of the students which includes basic as well as advanced concepts in Zoology to provide hands-on experience of the latest techniques, skill development for continuing higher education, to aspire as an entrepreneur, employability in Industries, Educational and research Institutes.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|------------------|---|--|
| CO1 | To provide thorough knowledge about various animal sciences from primitive to highly evolved animal groups | K ₁ , K ₂ , K ₃ |
| CO2 | To equip the students with skills related to laboratory as well as field based studies | K ₁ , K ₂ , K ₃ |
| CO3 | To instill best laboratory practices among the student community and to equip them about scientific handling of important instruments and model organisms, statistical analysis for problem solving | K ₁ , K ₂ , K ₃ |
| CO4 | To provide an insight to the basic clinical health aspects of human life | K ₁ , K ₂ , K ₃ |
| CO5 | To nurture and inculcate interest towards life sciences and foundation for further studies | K ₁ , K ₂ , K ₃ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|------------|------------|------------|------------|------------|------------|
| CO1 | L | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | M | M |
| CO4 | S | S | S | M | M |
| CO5 | S | S | S | S | M |

S- Strong; M-Medium; L-Low

Core Practical III - AS16CP3

(180 Hrs)

Syllabus

GENETICS AND STATISTICS

(40 Hrs)

1. Study of phenotypic characters of drosophila
2. Drosophila handling, culture and experimentation
3. Preparation and identification of salivary gland polytene chromosomes from drosophila/chironomous larva
4. Blood group in man (ABO and Rh)
5. Observation of Barr body in human epithelia
6. Study of frequency of Mendelian traits in a population (tongue rolling and folding, use of hands – left, right)
7. Verification of Monohybrid and Dihybrid cross through chi-square test
8. Pedigree analysis
9. Measures of central tendency
10. Measures of dispersion
11. Correlation analysis,
12. Regression analysis
13. Student t-test

PHYSIOLOGY & ENDOCRINOLOGY, EVOLUTION AND BIOTECHNOLOGY (60 Hrs)

1. Qualitative analysis of excretory products – Ammonia, Urea, Uric acid
2. Kymograph - Instrument
3. Preparation of blood smear
4. Endocrinology-Pituitary gland, Islets of Langerhans, thyroid, adrenal gland.
5. Homologous organs – Fore and Hind limb skeleton of vertebrates
6. Analogous organs-wings of butterfly, bird, bat.
7. Isolation and estimation of DNA & RNA.
8. Blotting techniques- observation and photographs.
9. Techniques of sterilization dry and wet.
10. Preparation of medium – nutrient agar, nutrient broth.
11. Antibiotic sensitivity
12. Distribution of microbes in soil, air and water.

13. Composition of blood
14. Determination of microbiological quality of milk using MBR test.
15. Preparation of Normal, molar and standard solutions, phosphate buffers, serial dilutions
16. Colorimetric estimation of glucose in the given solution.
17. Quantitative estimation of protein by modified Lowry's colorimetric method
18. Determine the concentration of the unknown sample using the standard curve plotted.
19. Demonstration of antibiotic resistance and interpretation of results
20. *Drosophila*-Study the developmental stages and the life cycle from fruit fly stock culture.
21. Separation of proteins by SDS-PAGE.
22. Visit to a clinical laboratory
23. Visit to a museum
24. Visit to a biotechnological industry – A report to be submitted.

SPOTTERS

(10 Hrs)

Spirulina; *Bacillus thuringiensis*- Biopesticide; Mushroom seed; Yeast; Antibiotic Erythromycin/ Streptomycin; Azolla-Biofertiliser; Test kits – Typhoid kit, Syphilis kit, Agarose electrophoresis kit, Instruments used such as autoclave, air filter, centrifuge.

MEDICAL LABORATORY TECHNOLOGY

(30 Hrs)

1. RBC Total count
2. Haemoglobin estimation
3. Bleeding time
4. Clotting time
5. Differential count of WBC
6. Preparation of Haemin Crystals in human blood
7. Urine specific gravity
8. Urine albumin
9. Glucose in urine.
10. Motility of bacteria using hanging drop method
11. Gram's staining
12. Identification of urine crystals in urine sample.

SPOTTERS

Entamoeba, malarial parasite, Pin worm (*Enterobious vermicularis*), hook worm, *Ascaris*, *Wuchereria bancrofti*; instruments used such as albuminometer, Hamocytometer, ESR tube, Urinometer, Haemoglobinometer, Sphygmomanometer, glucometer, stethoscope, heart rate monitor, Body Fat Analyzer Digital Monitor.

APPLIED FISHERY BIOLOGY

(40 Hrs)

1. Setting up and maintenance of a freshwater pond/aquarium tank, Aquarium accessories (Aerator, Under Gravel Filter, Internal Filter, External/Canister Filter, Food dispensers) and equipments.
2. Identification of commercially important cultivable fish species, ornamental fishes.
3. Estimation of Total RBCs and WBCs counts, haemoglobin of fish (Demonstration).
4. Field visit to reservoir/artificial commercial fish culture pond to survey on environmental impact, identification of fish diseases and monitoring fish health, treatment and chemicals/Feed manufacturing units for understanding fish nutrition, feeds, feed formulation, feeding and estimation of growth parameters (length, weight relationships) from feeding trials and report to be submitted/Training on freshwater fish/Ornamental fish hatchery extending a period not less than a week to an aquarium may be attended - a certified report may be submitted.

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|---|----------------------------------|---|---------------------|
| 1 | Sinha J, Chatterjee A K, Chattopadhyay P | Advanced Zoology Practical | Arunabha Sen Books and Allied (P) Ltd | 2011 |
| 2 | Gupta S P | Statistical Methods | S. Chand & Sons | 2008 |
| 3 | Pranab Kumar Banerjee | Introduction to Biostatistics | S. Chand Publishers | 2011 |
| 4 | Kanai, L Mukherjee | Medical Laboratory Technology | Tata McGraw Hill Publishing | 1998 |

| | | | | |
|---|-------------------|---|--|------|
| 5 | Ramnack Sood, M.D | Medical Laboratory Technology | Medical Publishers(P)Ltd | 1985 |
| 6 | Sathish Gupte | Short Textbook of Medical Laboratory for Technicians | Jaypee Brothers, Medical Publishers | 1998 |
| 7 | Jhingran V.G | Fish and fisheries of India | Hindustan Publishing | 1982 |

Course Designers

1. Mrs. Susheela. P
2. Dr. G. Sasikala

| Course Number | Course Name | Category | L | T | P | Credit |
|---------------|----------------|---------------------|----|---|---|--------|
| SB17SC02 | SERICULTURE II | Skill Based Subject | 43 | 2 | - | 4 |

Preamble

India occupies second position among the silk producing countries in the world besides being the largest silk consumer. In recent years, developing countries focused their attention in the production of natural silk. This course aims to infuse knowledge and skills in the field of sericulture.

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|---|---------------------------------|
| CO1 | To study the scope & importance of sericulture in India To understand cultivation of mulberry, establishment of mulberry garden | K ₁ |
| CO2 | To acquaint with nursery preparation, cultivation of mulberry plantation and rearing house for silkworm culture | K ₁ , K ₂ |
| CO3 | To understand the role of haemolymph, silk gland and silk synthesis of silkworm To know the importance of silk reeling industry To learn the role of cultural practices in plant and silkworm disease management To acquire knowledge of economics of egg production | K ₂ |
| CO4 | To compare and understand the general and specific characteristics of different types of silkworm and its life stages To understand about the young age rearing methods and late age rearing methods, cocoon harvesting, sorting, transporting and marketing of cocoons | K ₁ |
| CO5 | To know about the Chawki rearing methods and its importance To Learn Mountages and mounting of worms, spinning care effective rate of rearing, cocoon harvesting and sorting To understand on the pest, parasite, predator, hyperparasite and other types of parasites on pests | K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | L | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | M | M |
| CO4 | S | S | S | M | M |
| CO5 | S | S | S | S | M |

S- Strong; M-Medium; L-Low

SERICULTURE II - SB17SC02

(43 Hrs)

Syllabus

UNIT I

(9 Hrs)

Mulberry cultivation: Definition of soil, different types of soils in India, Importance of soils with reference to mulberry cultivation; soil analysis- soil sampling, soil pH, organic carbon and NPK level, Propagation of mulberry- seedling, sapling, grafting and layering, Raising of commercial nursery, Application of root inducing hormones.

UNIT II

(9 Hrs)

Establishment of mulberry garden under rain-fed and irrigated conditions: Planting season, Selection and preparation of land, Planting systems, Selection and preparation of planting material, Manuring, inter-cultivation and irrigation, Initial harvesting, Chawki garden; importance and maintenance. Mulberry pests - Leaf roller, Bihar hairy caterpillar, scale insect, mealy bug, thrips, beetles, jassids and grasshoppers.

UNIT III

(9 Hrs)

Rearing- rearing house and appliances, types of brushing and rearing, Seed (grainage); rearing by *chawki*/young worms and rearing of late aged worms, Shoot rearing-Care during rearing and cleaning, optimum feeding, bed cleaning, spacing Optimum environmental conditions and selection of ripe worms- mounting-process ripening- process of spinning- Identification of spinning larva; spinning; mounting and mounting density; types of mountages, their advantages and disadvantages; environmental requirements during spinning. Harvesting- storage and transport. Improved rearing methods for young stage and late stage silkworms.

UNIT IV

(8 Hrs)

Cocoon composition-Physical and Commercial characteristics of cocoons- defective cocoons and their pathology. Stifling-Reeling appliances- Process of Reeling – Finishing and testing- By-Products of silk reeling and silk marketing-Economics of sericulture. Selection of Cocoons of silkworm for breeding based on various characters.

UNIT V**(8 Hrs)**

Sericulture as cottage industry- Farm Management: Training of Farmers- subsidy and loan for farm development. Silkworm as a model animal for biotechnological studies- transgenic and gene expression studies. Sericulture marketing organization – cocoon market and silk exchange.

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|---------------|-------------------------------------|--------------------------------|--|----------------------------|
| 1 | Ganga, G and Sulochana Chetty | An Introduction to Sericulture | Oxford and IBH Publishing Co., Pvt., Ltd., New Delhi | 1991 |
| 2 | Venkata Narasiah | Sericulture in India | Ashesh Publishing House, New Delhi | 2003 |
| 3 | Dr. N. G. Djha and Dr.Priyan Panday | Silk Production | APH publishing Corporation, New Delhi | 2004 |

Pedagogy

- Lecture by chalk and talk, power point presentation, demonstration, field visit, e-content, doing experiments, group discussion, assignment, quiz, peer learning, seminar.

Course Designer

1.Dr.G.Sasikala

| Course Number | Course Name | Category | L | T | P | Credit |
|---------------|----------------------------|-----------|---|---|----|--------|
| SB17SCP2 | SERICULTURE PRACTICAL - II | Practical | | 2 | 43 | 2 |

Preamble

To enable the students to

- impart training in mulberry cultivation, silkworm rearing and silk reeling
- be involved in various aspects of silk product science
- establish and cultivate mulberry plantation for silkworm feed
- Construct rearing house for rearing silkworms
- Rear silkworm till the completion stage upto cocoon formation
- Harvest the cocoons
- Undertake Pest & Disease Management

Course Outcomes

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|---|---------------------------------|
| CO1 | define and recognize the external morphology and developmental stages of life of silkworm, Mulberry nursery, farm inputs and improved techniques | K ₁ |
| CO2 | examine and discuss on the mulberry cultivation, silkworm rearing, silk reeling and post reeling | K ₁ , K ₂ |
| CO3 | distinguish the silkworm rearing and silk reeling devices | K ₂ |
| CO4 | define and understand the operations of rearing appliances and its uses Machineries in sericulture Economics of rearing house and Benefit cost ratio of silkworm rearing Learn processes of silk winding, doubling, twisting, warping, bleaching, dyeing, printing and weaving | K ₁ |
| CO5 | state and apply Pest Management Strategies | K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | L | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | M | M |
| CO4 | S | S | S | M | S |
| CO5 | S | S | S | S | S |

S- Strong; M-Medium; L-Low

Spotters:

1. Silkworm rearing equipment and their uses
2. Silk reeling devices and operations
3. Types of disinfectants-Any four
4. Identification of different types of silk waste; floss, cooker, reeler, basin refuse and re-reeling waste, dupion silk.
5. Identification of mulberry pests: Leaf roller, Bihar hairy caterpillar, scale insect, mealy bug, thrips, beetles, jassids and grasshoppers.

Field Visit:

6. Field observations of popular mulberry cultivars.
7. Visit to field and farmers rearing house to study sericulture technologies adopted.
8. Visit to a Reeling unit/museum/value added products.
9. Study of silk fabric manufacturing unit- Power & handloom and identification of weaving defects.

Developmental Biology and Physiology of silkworm:

10. Identification of silk, cotton, wool and synthetic fibre (viscose/nylon/polyester) by physical method- flame and microscopic test.
11. Morphology of silkworm egg and mounting of 7th, 8th and 9th day old embryos
12. Estimation of proteins in haemolymph/egg, haemolymph glucose level.
13. Morphology of haemocytes in silkworm.

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|-------------------------------|--------------------------------|--|---------------------|
| 1 | Ganga, G and Sulochana Chetty | An Introduction to Sericulture | Oxford and IBH Publishing Co., Pvt., Ltd., New Delhi | 1991 |
| 2 | Venkata Narasiah | Sericulture in India | Ashesh Publishing House, New Delhi | 2003 |
| 3 | Djha N. G and Priyan Panday | Silk Production | APH publishing Corporation, New Delhi | 2004 |

Pedagogy

- Lecture by chalk and talk, power point presentation, demonstration, field visit, practice experiments during practical hours, group discussion, project, peer learning, seminar.

Course Designer

1. Dr. G .Sasikala

| COURSE NUMBER | COURSE NAME | Category | L | T | P | Credit |
|---------------|---------------------------|----------|----|---|---|--------|
| AS16A01 | INVERTEBRATA AND CHORDATA | Allied | 71 | 4 | - | 3 |

Preamble

An introduction to basic concepts in biology through study of the major lineages of invertebrate and vertebrate animals, with emphasis on the ontogeny, structure, and function of organ systems in an evolutionary context in allied Zoology to understand biodiversity, adaptation, organization and taxonomic position, explaining the basic aspects of classification, structural and functional details of the invertebrates and chordates.

Course Outcomes

On the successful completion of the course, students will be able to fill up the lacunae in the study of natural sciences.

| CO Number | CO Statement | Knowledge Level |
|-----------|--|---|
| CO1 | To understand the systematics, morphology, functional, and structural modification in various groups of invertebrates & chordates. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2 | Recollection of certain morphological and physiological processes that are distinctive and important to each Phyla | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3 | To understand the structure and physiology of the types included with special emphasis on the adaptations to their modes of life and environment. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4 | <ul style="list-style-type: none"> To compare and understand the general and specific characteristics within each Phyla Develop some of the general principles of zoology as they are encountered in the survey of the animal kingdom. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5 | <ul style="list-style-type: none"> Develop a general familiarity with all major groups of animals, including specific information about selected representatives of each group Learning Zoology will lead to discuss the diversity of both invertebrate and vertebrate animal life and the fascinating adaptations that enable animals to inhabit nearly all conceivable ecological niches | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | L | L | L | M | M |
| CO2 | S | S | M | M | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | M | S |

S- Strong; M-Medium; L-Low

Syllabus

Outline classification of animal kingdom upto class level with two examples each. Type study under each phylum to deal with structure, organization and life cycle.

Unit 1**(14 Hrs)**

Phylum Protozoa: Structure and life cycle of *Paramecium caudatum* –External features, Nutrition, Locomotion- effective stroke, recovery stroke, Metachronal rhythm, Reproduction- Asexual- Binary fission, Sexual reproduction –Conjugation, Autogamy, Endomixis, Hemimixis and Cytogamy.

Phylum Porifera: Structure and life cycle of *Leucosolenia botryoides*- External features, Body wall, Spicules, Canal System, Nutrition, Reproduction.

Phylum Coelenterata: Structure and life cycle of Hydra- External features, Histology of body wall, Cnidoblast and its functions, Nutrition, locomotion, Respiration, Excretion and Osmoregulation, Nervous System, Reproduction – asexual – budding; sexual – testis and spermatogenesis, ovary and oogenesis, fertilization, development, hatching - regeneration in Hydra.

Unit 2**(14 Hrs)**

Phylum Helminthes: Structure and life cycle of *Taenia solium* - External features, Body wall, Feeding, Respiratory system, Excretory system-flame cells, Nervous system, Reproductive system, Life cycle- Onchosphere and Cysticercus larvae.

Phylum Annelida- Structure and life cycle of *Megascolex mauritii* - External features, Body wall, Coelom, Locomotion, Digestive system, Respiratory system, Excretory system- Meganephridia, Micronephridia, Pharyngeal nephridia, Nervous system, Reproductive system.

Phylum Arthropoda- Structure and life cycle of *Periplaneta americana* - External features, Body wall, Mouthparts, Digestive system, Respiratory system, Circulatory system, Nervous system, Sense organs, Excretory system, Reproductive system.

Unit 3

(14 Hrs)

Phylum Mollusca- Structure and life cycle of *Pila globosa* - External features, Shell, Digestive system, Respiratory system, Circulatory system, Nervous system, Sense organs- Eyes, Osphradium, Statocyst, Tentacles, Excretory system, Reproductive system.

Phylum Echinodermata- Structure and life cycle of *Asterias rubens*- External features, Pedicellaria-Structure and Function, Digestive system, Respiratory system, Water vascular system-Structure and Function, Circulatory system-Perihaemal and Haemal system, Nervous system, Sense organs, Excretory system, Reproductive system.

Unit 4

(14 Hrs)

Phylum Chordata-Morphology and organ systems of Shark & Frog (Excluding endoskeleton)

Class Pisces: Shark - Systematic Position, Habits and Habitat, External features, Exoskeleton-Placoid Scales, Digestive System, Respiratory system & Mechanism of respiration, Circulatory system, Nervous system, Sense organs-Olfactory organs, Eyes, Internal ears, Neuromast or lateral line system, Ampullae of Lorenzini. Urinogenital system.

Class Amphibia: Frog- Systematic Position, Habits and Habitat, External features, Sexual dimorphism, Digestive System, Respiratory system, Circulatory system, Nervous system -Sense organs- Tangoreceptors, Tastebuds, Olfactory organs, Internal structure and functions of Eye and Ear, Urinogenital system

Class Reptilia: Calotes- Systematic Position, Habits and Habitat, External features, Digestive System, Respiratory system- Respiratory mechanism, Circulatory system -Blood, Heart-Internal structure, Arterial system, Venous system. Nervous system- Brain, Spinal cord, cranial nerves and spinal nerves. Sense organs, Jacobson's organs, Internal structure and functions of Eye and Ear, Urinogenital system

Unit 5

(15 Hrs)

Phylum Chordata - Morphology and organ systems of Pigeon & rabbit (excluding endoskeleton)

Class Aves: Pigeon -Systematic Position, Habits and Habitat, External features, Feathers-Structure of a typical feather in Pigeon, Types of feathers in pigeon. Muscular System- Flight muscles, Digestive System, Respiratory system- Syrinx and voice production, Air sacs and

functions. Respiratory mechanism, Circulatory system -Nervous system, Structure and function of Eye and Ear, Urinogenital system.

Class Mammalia: Rabbit- Systematic Position, Habits and Habitat, External features, Digestive System, Respiratory system, Circulatory system, Nervous system. Structure and function of Eye and Ear, Excretory system, Reproductive system.

TEXT BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|----------------------------|----------------------|---------------------------|---------------------|
| 1 | Jordan. E.L & Verma, P.S. | Invertebrate Zoology | S. Chand & Co., New Delhi | 1993 |
| 2 | Jordan. E.L and Verma.P.S. | Chordate Zoology | S. Chand & Co, New Delhi | 2014 |

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|-------------------------|--|--------------------------|---------------------|
| 1 | Ekambaranatha Ayyar, M. | Outlines of Zoology | Viswanathan Publication | 1992 |
| 2 | Fatik Baran Mandal | Invertebrate Zoology Ist Edn | Eastern Economy Edition | 2012 |
| 3 | Jan A. Pechenik | Biology of the Invertebrates 7th Revised Edition | McGraw-Hill Companies, | 2014 |
| 4 | Barrington EJW, | Invertebrate Structure and Function II Edn | ELBS and Nelson, | 1979 |
| 5 | Waterman, Allyn J. | Structure and Function, | Mac Milan & Co., NewYork | 1971 |

Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

Course Designers

- 1.Mrs. Susheela. P
2. Dr. G. Sasikala

| Course Number | Course Name | Category | L | T | P | Credit |
|---------------|-------------------------------|----------|----|---|---|--------|
| AS16A02 | GENERAL PRINCIPLES IN ZOOLOGY | Allied | 71 | 4 | - | 3 |

Preamble

The course imparts knowledge and understanding of basic cell structure and function, genetics, developmental biology, physiology, and evolution.

Course Outcomes

On the successful completion of the course, students will be able to understand the structural-functional relationships of living organisms. Students will come to appreciate and enjoy the subject of zoology and be able to place the subject in the larger context of human knowledge and experience on a global scale.

| CO Number | CO Statement | Knowledge Level |
|-----------|--|---|
| CO1 | Learn that the cells are the basic units of life, which contribute to form tissue, organs, and organ systems and their functions, diversity and evolutionary relationships among animals | K ₁ , K ₂ , K ₃ , K ₄ |
| CO2 | Recognize and understand the fundamentals of cell biology, genetics, animal physiology and evolution | K ₁ , K ₂ , K ₃ , K ₄ |
| CO3 | Understand the diversity of Chordates and its outline systematic. Discuss their affinities and adaptations to different modes of life. | K ₁ , K ₂ , K ₃ , K ₄ |
| CO4 | Students will be able to explain how organisms function at the level of the gene, genome, cell, tissue, organ and organ-system. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and behavior of different forms of life | K ₁ , K ₂ , K ₃ , K ₄ |
| CO5 | Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped animal morphology, physiology, life history, and behavior. | K ₁ , K ₂ , K ₃ , K ₄ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | L | L | L | M | M |
| CO2 | S | S | M | M | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | M | S |

S- Strong; M-Medium; L-Low

GENERAL PRINCIPLES IN ZOOLOGY - AS16A02

(71 Hrs)

Syllabus

UNIT I Cell Biology & Genetics

(14 Hrs)

Cell concept-life and living things, cell history, cell theory, cell diversity, internal organization, cell structure and function, Cell types-Prokaryotic, Eukaryotic cell (plant and animal cell), Eukaryotic Animal cell – Structure and functions of Plasma membrane, Golgi apparatus, Mitochondria, Nucleus, Cell cycle - Cell division, Mitosis, Meiosis.

UNIT II Genetics and Physiology

(14 Hrs)

Mendel's Laws of inheritance-Punnett square, Types of genetic cross-Monohybrid and dihybrid cross, Sex determination in man.

Nutrition in man – food types, vitamins and minerals. Digestion and absorption of food in man, balanced diet.

UNIT III Embryology

(14 Hrs)

Gametogenesis – spermatogenesis and oogenesis, Fertilization, cleavage-study of cleavage patterns. Radial and spiral cleavage- Early cleavage in frog- uncleaved egg, two cell stage, morula stage, Blastulation, Gastrulation in Frog - study of different types of eggs- Classification based on amount and distribution of yolk

UNIT IV Endocrinology

(14 Hrs)

Structure, secretions and functions of pituitary- Anterior pituitary and posterior pituitary, thyroid, pancreas and reproductive glands – testes, ovary.

UNIT V Evolution

(15 Hrs)

Origin of life and evolution of cell- Theories on evolution by Lamarck, Charles Darwin & De Vries, living fossils, organic evolution, Evidences of evolution - fossil evidence, morphological, comparative anatomy, embryological, vestigial structures, biochemical and paleontological evidences. Origin of India and its Mega diversity.

TEXT BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|-------------------------------|--|----------------------------------|---------------------|
| 1 | Verma P.S., Agarwal., V.K. | Cytology Reprint Edition | S. Chand and Company | 2012 |
| 2 | Arumugam, N. | Cell Biology, Genetics, Embryology | S. Chand and Company | 2012 |
| 3 | Arumugam, N | Cell Biology, Genetics & Evolution Volume-3. | Saras Publication | 1999 |
| 4 | Verma P.S. & Tyagi B.S. | Animal Physiology, | S. Chand and Company | 2012 |
| 5 | Verma. P.S. and Agarwal. V.K. | Chordate Embryology | S. Chand and Co. Ltd., New Delhi | 1998 |

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|--------|---|---|---------------------------------|---------------------|
| 1 | Berry, A.K. | A text book of Animal Physiology with related Biochemistry | Emkay Publications | 1993 |
| 2 | Sarada Subrahmanyam., Madhavan Kutty , K., & Singh H.D. | Text book of Human Physiology, Reprint | S. Chand & Co, | 2012 |
| 3 | De Rebertis EDP & De Robertis EMF | Cell & Molecular Biology. 8 th Ed. | BI Wauerly Pvt. Ltd, New Delhi. | 1996 |
| 4 | Berrill, N.J. | Developmental Biology | McGraw Hill, New Delhi. | 1986 |
| 5 | Bodmer, Modern Embryology, Hold Rinefiar & Winston. N.Y. Balinsky | Introduction to Embryology International student edition, 3 rd Edition | Saunders Philadelphia. | 1981 |

Pedagogy

- Chalk and Talk method, Seminar, Quiz, Group discussion, Power point presentation

Course Designers

1. Mrs. Susheela. P
2. Dr. G. Sasikala

| COURSE NUMBER | Course Name | Category | L | T | P | Credit |
|----------------------|---------------------------------|-----------------|----------|----------|----------|---------------|
| AS16AP1 | ALLIED ZOOLOGY PRACTICAL | Practical | - | - | 60 | 2 |

Preamble

Topics related to fundamentals of zoology, including exposure to diversity in animal groups based on the zoological areas are covered. The practical course is aimed to equipped the students with skills required for animal identification and classification and also applications of zoology in the various allied fields

Course Outcome

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|------------------|---|---------------------------------|
| CO1 | Understand general taxonomic rules on animal classification and general characteristics of animals | K ₁ |
| CO2 | Appreciate basic concepts of developmental biology and cell biology | K ₁ , K ₂ |
| CO3 | Learn fieldwork modalities & Temporary slides are prepared from fresh water culture medium | K ₃ |
| CO4 | Dissections of invertebrate animal will aid the students to understand different systems | K ₃ |
| CO5 | Prepared slides are studied to understand the structures and arrangement Study of museum specimens which are present in the departmental museum helps the students to have practical knowledge | K ₁ , K ₂ |

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 |
|------------|------------|------------|------------|------------|------------|
| CO1 | S | S | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | M | M |
| CO4 | S | S | S | M | M |
| CO5 | S | S | S | S | M |

S- Strong; M-Medium; L-Low

ALLIED ZOOLOGY PRACTICAL - AS16AP1

(60 Hrs)

1. Dissections: Demonstration Only

(12 Hrs)

Cockroach: Mounting of Mouth parts, Digestive system, Nervous system, Reproductive system.

Fish: Ctenoid scales mount

2. Spotters

(30 Hrs)

- Paramecium – Entire, binary fission, conjugation
- Leucosolenia
- Hydra vulgaris – Entire
- Taenia solium – Entire, T.S
- Ascaris -male,female
- Earth worm
- Pila
- Star fish
- Amphioxus
- Shark
- Frog
- Skeleton of frog- Skull, Vertebrae-Typical, VIII, IX, X, Girdles& Limbs
- Calotes
- Pigeon
- Quill feather
- Rabbit
- Mitosis stages

Frog embryology

- Egg
- Sperm
- Blastula
- Gastrula

3. Field observations combined with photography and/or videography (4 Hrs)

Study of insect fauna in the college campus

4. Culture methods (2 Hrs)

Culture of unicellular organisms.

5. Models (12 Hrs)

- Animal Cell
- Mitochondria
- DNA
- RNA
- Chromosomes
- Alimentary Canal of Man
- Male Reproductive Tract
- Female Reproductive Tract
- Human Placenta
- Protein Structure

REFERENCE BOOKS

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|---------------|--|---|--|----------------------------|
| 1 | Sinha J, Chatterjee A K, Chattopadhyay P | Advanced Zoology Practical | Arunabha Sen Books and Allied (P) Ltd | 2011 |
| 2 | Lal S S | Textbook of practical Zoology Invertebrate | Rastogi Publication | 2004 |
| 3 | Lal S S | Textbook of practical Zoology Vertebrate | Rastogi Publication | 2004 |

Pedagogy

- Observation of slides, specimens and models; field visit, dissection

Course Designer:

1. Dr. P. B. Harathi

Semester : III & IV

Paper : Job Oriented Course

Title : Vermiculture and Mushroom Culture

Subject Code : JOB0409

Lecture Hours: 40

Preamble: Vermicompost is a valuable fertilizer and edible mushrooms are rich source of proteins. Simple cultivation methods, which can be practiced even at home, if the students are interested can help them become entrepreneurs.

UNIT –I

(6 hrs)

Earthworm – A brief introduction. General morphology of earthworm – body structure, colour, anatomy, biology, reproduction. Three common species: *Eisenia foetida*, *Eudrilus eugeniae*, *Megascolex* (or *Lampito*) *mauritii*. Definitions of vermiculture, vermicompost, vermitechnology.

UNIT – II

(6 Hrs)

Vermiculture and production of vermicompost: Vermicomposting materials – animal refuse, agricultural waste, forestry waste, kitchen waste, city refuse, industrial waste. Types of vermicomposting: small scale, large scale. Requirements: environmental-air, moisture. temperature. Setting up a vermiculture unit. Value addition of vermicompost.

UNIT – III

(6 Hrs)

Vermicomposting schemes; maintenance of beds, harvesting worms and compost. Advantages of vermicomposting; vermitechnology - chemical composition of vermicompost; vermicompost as quality manure; Vermi wash. Uses of earthworms in animal feed industry – biochemical and biotechnological studies – Bioremediation through vermitechnology

UNIT – IV**(6 hrs)**

Mushroom culture-importance of mushrooms; Edible and poisonous mushrooms; Morphology of edible mushrooms; Advantages of mushrooms: nutritive and medicinal values.

UNIT – V**(6 hrs)**

Steps in mushroom growing: selection of type, Methods of culture: Bed method, Polythene bag method; Production of culture: preparation of spawn, preparation of substrate, spawning, harvesting, storage-short term, long term, preservation and processing, marketing. Recipes of mushrooms – biriyani, cutlet, etc.

FIELD VISIT: To vermiculture and mushroom culture unit

(10 Hrs)**REFERENCE BOOKS**

| S. No. | Author | Title of the Book | Publisher | Year of Publication |
|---------------|------------------|---|----------------------------|----------------------------|
| 1 | Tripathi G | Vermi source Technology | Discovery Publishing House | 2003 |
| 2 | Ismail S. A | Vermicology: The biology of Earthworm. | Orient Longman, | 1997 |
| 3 | Ranganathan L. S | Vermi biotechnology: – From Soil Health to Human Health | Agrobios India | 2006 |
| 4 | Gupta P. K | Vermicomposting for Sustainable Agriculture | Agrobios India | 2008, 1 st Edn. |
| 5 | Sathe T. V | Vermiculture and Organic Farming | Daya Publishing House | 2004 |